



PROGRAM TUISYEN RAKYAT SELANGOR

SPM



MATEMATIK

DWIBAHASA



KITASELANGOR



UNIVERSITI

DIKUASAI OLEH:



PROGRAM TUISYEN RAKYAT SELANGOR



SPM



MATEMATIK

DWIBAHASA

PANEL PENULIS

Norsiah binti Mohamed
SM Sains Hulu Selangor

Roshayati binti Salleh
SMK Bandar Saujana Putra

Maisarah binti Mohd Adnan
SMK Batu Laut

Norsiah binti Mohd Desa
SMK USJ 23

Premmalah a/p Subramaniam
SMK Dengkil

Haniza binti Abdul Rahman
SMK Serendah

Program Tuisyen Rakyat Selangor Matematik SPM

CIRI-CIRI EKSklusif

- Modul dibina berdasarkan silibus Matematik KSSM dan disusun mengikut bab Tingkatan 4 dan Tingkatan 5.
- Modul dilengkapi dengan analisis soalan SPM Matematik bagi tahun 2022 hingga tahun 2024 yang terperinci mengikut topik.
- Modul ini mengandungi Soalan Objektif (Kertas 1) dan Soalan Subjektif (Kertas 2) pada setiap bab.
- Soalan dibina berdasarkan Format SPM terkini.
- Latihan merangkumi pelbagai aras yang membolehkan guru mencakupi keperluan murid.
- Guru boleh mempraktikkan modul ini secara kaedah latih tubi berperingkat ataupun latih tubi sendiri kepada murid.
- Satu set Kertas Model SPM disediakan pada akhir modul.
- Satu set Ujian Pertengahan Sesi Akademik (Kertas 2 sahaja) juga disediakan yang boleh dimuat turun melalui kod QR.
- Jawapan disediakan bagi memberi panduan kepada guru dan murid untuk menjawab soalan.
- Modul ini mengandungi video ulasan jawapan bagi soalan yang terpilih.
- Latihan tambahan boleh dimuat turun dengan mengimbas kod QR.
- Penggubal berpengalaman luas sebagai penulis modul dalam mata pelajaran Matematik SPM.

KANDUNGAN

Format Instrumen Peperiksaan SPM Matematik	iv
Analisis Soalan SPM 2022-2024 Matematik	v
Senarai Rumus	vii
Ulang Kaji Menengah Rendah	1 – 12

Tingkatan 4

BAB 1	Fungsi dan Persamaan Kuadratik dalam Satu Pemboleh Ubah <i>Quadratic Functions and Equations in One Variable</i>	13 – 18
BAB 2	Asas Nombor <i>Number Bases</i>	19 – 24
BAB 3	Penaakulan Logik <i>Logical Reasoning</i>	25 – 29
BAB 4	Operasi Set <i>Operations on Sets</i>	30 – 34
BAB 5	Rangkaian dalam Teori Graf <i>Network in Graph Theory</i>	35 – 39
BAB 6	Ketaksamaan Linear dalam Dua Pemboleh Ubah <i>Linear Inequalities in Two Variables</i>	40 – 46
BAB 7	Graf Gerakan <i>Graphs in Motion</i>	47 – 54
BAB 8	Sukatan Serakan Data Tak Berkumpulan <i>Measures of Dispersion of Ungrouped Data</i>	55 – 61
BAB 9	Kebarangkalian Peristiwa Bergabung <i>Probability of Combined Events</i>	62 – 67
BAB 10	Matematik Pengguna: Pengurusan Kewangan <i>Consumer Mathematics: Financial Management</i>	68 – 70

Tingkatan 5

BAB 1	Ubahan <i>Variation</i>	71 – 76
BAB 2	Matriks <i>Matrices</i>	77 – 81
BAB 3	Matematik Pengguna: Insurans <i>Consumer Mathematics: Insurance</i>	82 – 87
BAB 4	Matematik Pengguna: Percukaian <i>Consumer Mathematics: Taxation</i>	88 – 94
BAB 5	Kekongruenan, Pembesaran dan Gabungan Transformasi <i>Congruency, Enlargement and Combined Transformations</i>	95 – 101
BAB 6	Nisbah dan Graf Fungsi Trigonometri <i>Ratios and Graphs of Trigonometric Functions</i>	102 – 110
BAB 7	Sukatan Serakan Data Berkumpulan <i>Measures of Dispersion for Grouped Data</i>	111 – 117
BAB 8	Pemodelan Matematik <i>Mathematical Modelling</i>	118 – 120
Kertas Model SPM		121 – 152

UJIAN PERTENGAHAN
SESI AKADEMIK



KOLEKSI VIDEO



JAWAPAN



FORMAT INSTRUMEN PEPERIKSAAN SPM MATEMATIK

Bil.	Perkara	Kertas 1 (1449/1)	Kertas 2 (1449/2)
1	Jenis Instrumen	Ujian Bertulis	
2	Jenis Item	Objektif Aneka Pilihan	• Subjektif Respons Terhadap • Subjektif Berstruktur
3	Bilangan Soalan	40 soalan (40 markah) (Jawab semua soalan)	Bahagian A: 10 soalan (40 markah) (Jawab semua soalan) Bahagian B: 5 soalan (45 markah) (Jawab semua soalan) Bahagian C: 2 soalan (15 markah) (Jawab satu soalan)
4	Jumlah Markah	40	100
5	Konstruk	• Mengingat dan Memahami • Mengaplikasi • Menganalisis	• Mengingat dan Memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta
6	Tempoh Ujian	1 jam 30 minit	2 jam 30 minit
7	Cakupan Konstruk	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 1 hingga Tingkatan 5)	
8	Aras Kesukaran	Rendah : Sederhana : Tinggi 5 : 3 : 2	
9	Kaedah Penskoran	Dikotomus	Analitik
10	Alatan Tambahan	Kalkulator saintifik yang tidak boleh diprogram	• Kalkulator saintifik yang tidak boleh diprogram • Alatan geometri

ANALISIS SOALAN SPM 2022-2024

MATEMATIK

KERTAS 1

TAJUK	SPM 2022	SPM 2023	SPM 2024
Tingkatan 1			
Nombor Nisbah	1	1	
Ungkapan Algebra			1
Persamaan Linear		1	1
Ketaksamaan Linear	1	1	1
Poligon Asas		1	
Perimeter dan Luas		2	
Pengendalian Data		2	
Tingkatan 2			
Pola dan Jujukan	1	1	1
Pemfaktoran dan Pecahan Algebra	1		
Poligon			1
Rumus Algebra	1		1
Bentuk Geometri Tiga Dimensi	2		
Graf Fungsi	1	1	
Laju dan Pecutan		1	
Kecerunan Garis Lurus	1		
Transformasi Isometri	1	1	1
Sukatan Kecenderungan Memusat	2		
Kebarangkalian Mudah	2	1	
Tingkatan 3			
Indeks	1		1
Matematik Pengguna: Simpanan dan Pelaburan, Kredit dan Hutang	1	1	
Sudut dan Tangen Bagi Bulatan	1	1	
Pelan dan Dongakan	1		
Lokus dalam Dua Dimensi			1
Garis Lurus			1
Tingkatan 4			
Fungsi dan Persamaan Kuadratik dalam Satu Pemboleh Ubah			1
Asas Nombor	3	2	2
Penaakulan Logik	2	2	2
Operasi Set	3	2	2
Rangkaian dalam Teori Graf	1	1	1
Ketaksamaan Linear dalam Dua Pemboleh Ubah	1	2	
Graf Gerakan	1	2	2
Sukatan Serakan Data Tak Berkumpul	1	1	4
Kebarangkalian Peristiwa Bergabung		1	2
Tingkatan 5			
Ubahan	3	2	3
Matriks	2	2	2
Matematik Pengguna: Insurans		1	3
Matematik Pengguna: Percukaian	2	2	1
Kekongruenan, Pembesaran dan Gabungan Transformasi	1	1	2
Nisbah dan Graf Trigonometri	1	2	2
Sukatan Serakan Data Berkumpul	1	2	1
Jumlah Soalan	40	40	40

*Jadual menunjukkan bilangan soalan bagi tajuk yang keluar pada tahun tersebut.

KERTAS 2

TAJUK	SPM 2022			SPM 2023			SPM 2024		
	Bahagian			Bahagian			Bahagian		
	A	B	C	A	B	C	A	B	C
Tingkatan 1									
Persamaan Linear			3						
Garis dan Sudut		8					3		
Perimeter dan Luas	3								
Pengendalian Data									4, 4
Teorem Pythagoras						3			
Tingkatan 2									
Bentuk Geometri Tiga Dimensi			4			5			
Graf Fungsi				3			3		
Transformasi Isometri	3, 5								
Sukatan Kecenderungan Memusat			4						
Tingkatan 3									
Matematik Pengguna: Simpanan dan Pelaburan, Kredit dan Hutang		2	4						
Garis Lurus				3					
Tingkatan 4									
Fungsi dan Persamaan Kuadratik dalam Satu Pemboleh Ubah	4					5, 3	4		4, 4
Penaakulan Logik	4			5			4		
Operasi Set		8		5				9	
Rangkaian dalam Teori Graf			4		9		4		
Ketaksamaan Linear Dalam Dua Pemboleh Ubah		9		4				9	
Graf Gerakan			4, 3	4			5		
Sukatan Serakan Data Tak Berkumpul	3			3		4		8	
Kebarangkalian Peristiwa Bergabung			4			3			
Matematik Pengguna: Pengurusan Kewangan	4				8		4		
Tingkatan 5									
Ubahan									2, 2
Matriks	5				10				5, 5
Matematik Pengguna: Insurans	4			4			3		
Matematik Pengguna: Percukaian		8		5				10	
Kekongruenan, Pembesaran dan Gabungan Transformasi				4				9	
Nisbah dan Graf Trigonometri	5				8	4	4		
Sukatan Serakan Data Berkumpul		10			10	3	6		
Jumlah Markah	40	45	30	40	45	30	40	45	30

*Jadual menunjukkan markah setiap soalan bagi tajuk yang keluar pada tahun tersebut.

SENARAI RUMUS

NOMBOR DAN OPERASI NUMBERS AND OPERATIONS

- 1 $a^m \times a^n = a^{m+n}$
- 2 $a^m \div a^n = a^{m-n}$
- 3 $(a^m)^n = a^{mn}$
- 4 $a^{\frac{m}{n}} = (a^{\frac{1}{n}})^m$
- 5 $a^{\frac{m}{n}} = (a^m)^{\frac{1}{n}} = (a^{\frac{1}{n}})^m$
- 6 $a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$
- 7 Faedah mudah / Simple interest, $I = Prt$
- 8 Nilai matang / Maturity value,

$$MV = P \left(1 + \frac{r}{n} \right)^{nt}$$
- 9 Jumlah bayaran balik / Total repayment, $A = P + Prt$
- 10 Premium

$$= \frac{\text{Nilai muka polisi}}{\text{RMx}} \times (\text{Kadar premium per RMx})$$

$$\text{Premium} = \frac{\text{Face value of policy}}{\text{RMx}} \times (\text{Premium rate per RMx})$$
- 11 Jumlah insurans yang harus dibeli

$$= \left(\begin{array}{c} \text{Peratusan} \\ \text{ko-insurans} \end{array} \right) \times \left(\begin{array}{c} \text{Nilai boleh} \\ \text{insurans harta} \end{array} \right)$$

$$\text{Amount of required insurance} = \left(\begin{array}{c} \text{Percentage of} \\ \text{co-insurance} \end{array} \right) \times \left(\begin{array}{c} \text{Insurance value} \\ \text{of property} \end{array} \right)$$

PERKAITAN DAN ALGEBRA RELATIONSHIP AND ALGEBRA

- 1 Jarak / Distance $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- 2 Titik tengah / Midpoint, $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
- 3 Laju purata $= \frac{\text{Jumlah jarak}}{\text{Jumlah masa}}$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$
- 4 $m = \frac{y_2 - y_1}{x_2 - x_1}$
- 5 $A^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$
- 6 $m = -\frac{\text{pintasan-y}}{\text{pintasan-x}}$

$$m = -\frac{\text{y-intercept}}{\text{x-intercept}}$$

SUKATAN DAN GEOMETRI MEASUREMENT AND GEOMETRY

- 1 Teorem Pythagoras / Pythagoras Theorem, $c^2 = a^2 + b^2$
- 2 Hasil tambah sudut pedalaman poligon

$$\text{Sum of interior angles of a polygon} = (n - 2) \times 180^\circ$$
- 3 Lilitan bulatan $= \pi d = 2\pi r$

$$\text{Circumference of circle} = \pi d = 2\pi r$$
- 4 Luas bulatan $= \pi r^2$

$$\text{Area of circle} = \pi r^2$$
- 5 $\frac{\text{Panjang lengkok}}{2\pi r} = \frac{\theta}{360^\circ}$

$$\frac{\text{Arc length}}{2\pi r} = \frac{\theta}{360^\circ}$$
- 6 $\frac{\text{Luas sektor}}{\pi r^2} = \frac{\theta}{360^\circ}$

$$\frac{\text{Area of sector}}{\pi r^2} = \frac{\theta}{360^\circ}$$
- 7 Luas layang-layang

$$= \frac{1}{2} \times \text{hasil darab panjang dua pepenjuru}$$

$$\text{Area of kite} = \frac{1}{2} \times \text{product of two diagonals}$$
- 8 Luas trapezium

$$= \frac{1}{2} \times \text{hasil tambah dua sisi selari} \times \text{tinggi}$$

$$\text{Area of trapezium} = \frac{1}{2} \times \text{sum of two parallel sides} \times \text{height}$$
- 9 Luas permukaan silinder $= 2\pi r^2 + 2\pi rh$

$$\text{Surface area of cylinder} = 2\pi r^2 + 2\pi rh$$
- 10 Luas permukaan kon $= \pi r^2 + \pi rs$

$$\text{Surface area of cone} = \pi r^2 + \pi rs$$
- 11 Luas permukaan sfera $= 4\pi r^2$

$$\text{Surface area of sphere} = 4\pi r^2$$
- 12 Isi padu prisma $= \text{luas keratan rentas} \times \text{tinggi}$

$$\text{Volume of prism} = \text{area of cross section} \times \text{height}$$
- 13 Isi padu silinder $= \pi r^2 h$

$$\text{Volume of cylinder} = \pi r^2 h$$

14 Isi padu kon = $\frac{1}{3}\pi j^2 t$

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

15 Isi padu sfera = $\frac{4}{3}\pi j^3$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

16 Isi padu piramid = $\frac{1}{3} \times \text{luas tapak} \times \text{tinggi}$

$$\text{Volume of pyramid} = \frac{1}{3} \times \text{base area} \times \text{height}$$

17 Faktor skala, $k = \frac{PA'}{PA}$

$$\text{Scale factor, } k = \frac{PA'}{PA}$$

18 Luas imej = $k^2 \times \text{luas objek}$

$$\text{Area of image} = k^2 \times \text{area of object}$$

STATISTIK DAN KEBARANGKALIAN STATISTICS AND PROBABILITY

1 Min / Mean, $\bar{x} = \frac{\sum x}{N}$

2 Min / Mean, $\bar{x} = \frac{\sum fx}{\sum f}$

3 Varians / Variance, $\sigma^2 = \frac{\sum x^2}{N} - \bar{x}^2 = \frac{\sum (x - \bar{x})^2}{N}$

4 Varians / Variance, $\sigma^2 = \frac{\sum fx^2}{\sum f} - \bar{x}^2 = \frac{\sum f(x - \bar{x})^2}{\sum f}$

5 Sisihan piawai / Standard deviation, $\sigma = \sqrt{\frac{\sum x^2}{N} - \bar{x}^2} = \sqrt{\frac{\sum f(x - \bar{x})^2}{N}}$

6 Sisihan piawai / Standard deviation, $\sigma = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2} = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$

7 $P(A) = \frac{n(A)}{n(S)}$

8 $P(A') = 1 - P(A)$

Ulang Kaji Menengah Rendah

TOPIK
1
Matematik Pengguna: Simpanan dan Pelaburan, Kredit dan Hutang
Consumer Mathematics Savings and Investments, Credit and Debt

NOTA EFEKTIF
Jenis-jenis Akaun
Types of Accounts
1 Akaun Simpanan
Savings Account
2 Akaun Simpanan Tetap
Fixed Deposit Account
3 Akaun Semasa
Current Account
Perbandingan Simpanan dan Pelaburan
Comparison of Savings and Investments

Simpanan/Pelaburan <i>Savings/Investment</i>	Simpanan <i>Saving</i>	Simpanan tetap <i>Fixed deposit</i>	Saham syarikat <i>Company shares</i>	Amanah saham <i>Unit trust</i>	Hartanah <i>Real estate</i>
Tahap risiko <i>Risk level</i>	Bebas risiko <i>Risk-free</i>	Bebas risiko <i>Risk-free</i>	Tinggi <i>High</i>	Rendah <i>Low</i>	Rendah <i>Low</i>
Tahap pulangan <i>Return level</i>	Rendah <i>Low</i>	Rendah <i>Low</i>	Tinggi <i>High</i>	Sederhana <i>Moderate</i>	Tinggi <i>High</i>
Tahap kecairan <i>Liquidity level</i>	Tinggi <i>High</i>	Tinggi <i>High</i>	Sederhana <i>Moderate</i>	Tinggi <i>High</i>	Rendah <i>Low</i>

Rumus/Formula
Faedah mudah
Simple interest

$$I = Prt$$

Nilai matang
Matured value

$$MV = P \left(\frac{1+r}{n} \right)^{nt}$$

Jumlah bayaran balik
Total repayment

$$A = P + Prt$$

I = faedah / interest
P = prinsipal / principal
r = kadar faedah / interest rate
t = tempoh (tahun) / time (years)
n = bilangan kali faedah dikompaun dalam setahun
number of periods the interest is compounded per year


LATIHAN INTENSIF

- 1** Murni membeli sebuah peti ais berharga RM3 400. Dia membayar deposit sebanyak 10% daripada harga tersebut dan membayar baki secara ansuran bulanan selama 18 bulan. Kadar faedah mudah yang dikenakan ialah 8% setahun.

Murni bought a refrigerator costing RM3 400. She paid a deposit of 10% of the price and paid the balance in monthly installments over 18 months. The simple interest rate charged is 8% per annum.

Berapakah ansuran bulananannya?

What is her monthly installment?

[4 markah/marks]

Jawapan/Answer:

- 2 Puan Aisyah menyimpan RM60 000 dalam akaun simpanannya di Bank Sejahtera, mengikut prinsip wadiah sejak Januari 2025. Pada Disember 2025, beliau telah mendapat RM61 500 sebagai pulangan daripada simpanannya yang merupakan hibah (hadiah) daripada Bank Sejahtera.

Puan Aishah deposited RM60 000 into her savings account at Bank Sejahtera, according to the principle of wadiah since Januari 2025. In December 2025, she earned RM61 500 as a return on her savings which is a hibah (gift) from Bank Sejahtera.

Hitung jumlah wang dalam akaun simpanannya pada Disember 2027.

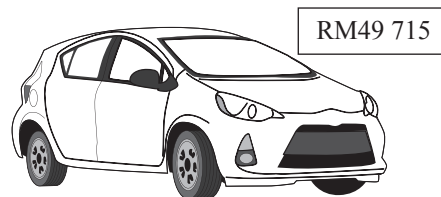
Calculate the amount of money in her savings account in December 2027.

[5 markah/marks]

Jawapan/Answer:

- 3 Puan Irfa membeli sebuah kereta untuk anaknya. Setelah 5 tahun, anaknya ingin melangsaikan baki pinjaman kereta tersebut pada pihak bank.

Puan Irfa bought a car for her son. After 5 years, her son wants to pay off the remaining loan of the car to the bank.



Rajah 1 / Diagram 1

Hitung jumlah baki pinjaman kereta tersebut, jika Puan Irfa telah membayar pendahuluan sebanyak 10% dengan kadar faedah 3.5% bagi pinjaman selama 9 tahun.

Calculate the total balance of the car loan, if Puan Irfa has paid 10% down payment with an interest rate of 3.5% for the loan over 9 years.

[5 markah/marks]

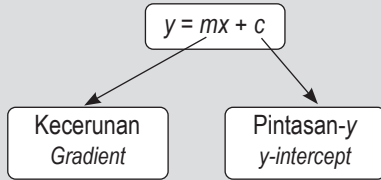
Jawapan/Answer:



TOPIK 2
Garis Lurus
Straight Lines

NOTA EFEKTIF

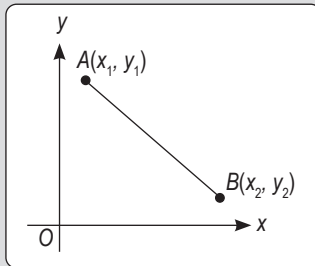
- 1 Persamaan garis lurus:
Equation of a straight line:



- 3 Kecerunan garis lurus, m :
The gradient of a straight line, m :

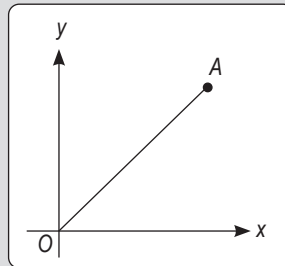
(a) $m = \frac{y_2 - y_1}{x_2 - x_1}$

(melalui dua titik)
(passes through two points)

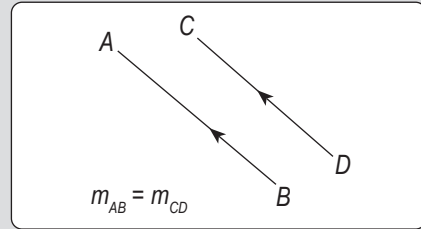


(b) $m = \frac{y}{x}$

(melalui asalan)
(passes the origin)



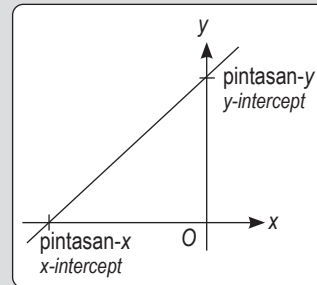
- 2 Garis selari mempunyai kecerunan yang sama.
The parallel lines have the same gradient.



(c) $m = -\frac{\text{pintasan-y}}{\text{pintasan-x}}$

$m = -\frac{\text{y-intercept}}{\text{x-intercept}}$

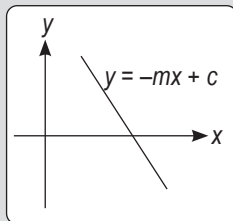
(melalui pintasan-x dan pintasan-y)
(passes x-intercept and y-intercept)



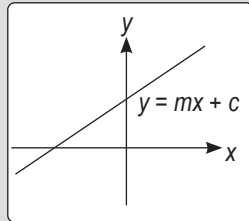
Pintasan-y adalah apabila $x = 0$.
The y-intercept is when $x = 0$.
Pintasan-x adalah apabila $y = 0$.
The x-intercept is when $y = 0$.

- 4 Persamaan garis lurus.
The equation of the straight lines.

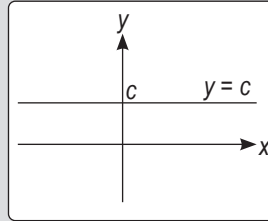
(a)



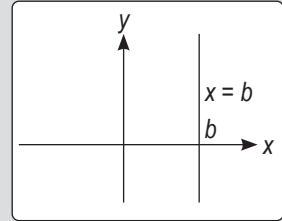
(b)



(c)



(d)

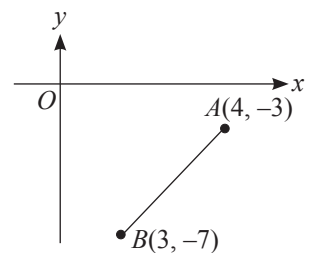


LATIHAN INTENSIF

- 1 Rajah 1 menunjukkan garis lurus yang melalui titik $A(4, -3)$ dan $B(3, -7)$.
Diagram 1 shows a straight line that passes through points $A(4, -3)$ and $B(3, -7)$.

Cari kecerunan bagi garis lurus itu.
Find the gradient of the straight line.

- A 4
B $\frac{1}{4}$
C $\frac{7}{10}$
D $\frac{10}{7}$



Rajah 1 / Diagram 1

- 2 Rajah 2 menunjukkan garis lurus PQ pada suatu satah Cartes.
Diagram 2 shows a straight-line PQ on a Cartesian plane.

Diberi bahawa $OP = \frac{3}{4}OQ$. Cari kecerunan garis lurus PQ .

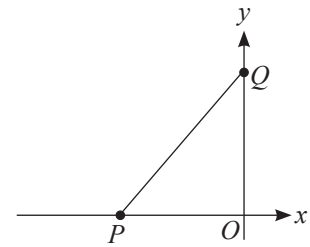
It is given that $OP = \frac{3}{4}OQ$. Find the gradient of the straight line PQ .

A $-\frac{4}{3}$

C $\frac{3}{4}$

B $-\frac{3}{4}$

D $\frac{4}{3}$



Rajah 2 / Diagram 2

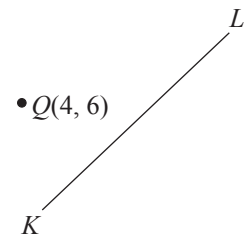
- 3 Rajah 3 menunjukkan garis lurus KL dengan persamaan $2y = -3x + 8$.
Diagram 3 shows the straight line KL with an equation of $2y = -3x + 8$.

Tentukan persamaan garis lurus yang selari dengan KL dan melalui titik Q .

Determine the equation of a straight line parallel to KL and passes through point Q .

[3 markah/marks]

Jawapan/Answer:



Rajah 3 / Diagram 3

- 4 Rajah 4 menunjukkan dua garis lurus, MN dan PQ , dilukis pada suatu satah Cartes. Garis lurus MN selari dengan garis lurus PQ .
Diagram 4 shows two straight lines, MN and PQ , drawn on a Cartesian plane. The straight line MN is parallel to the straight line PQ .

(a) Cari persamaan garis lurus MN .

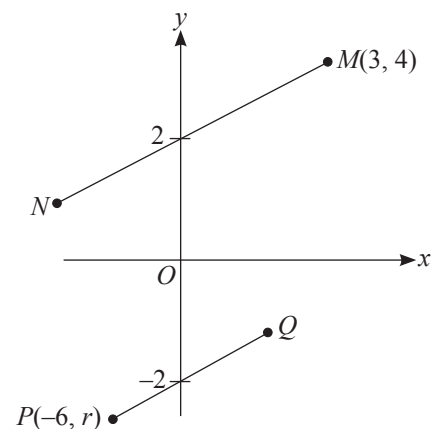
Find the equation of the straight line MN .

(b) Cari nilai r .

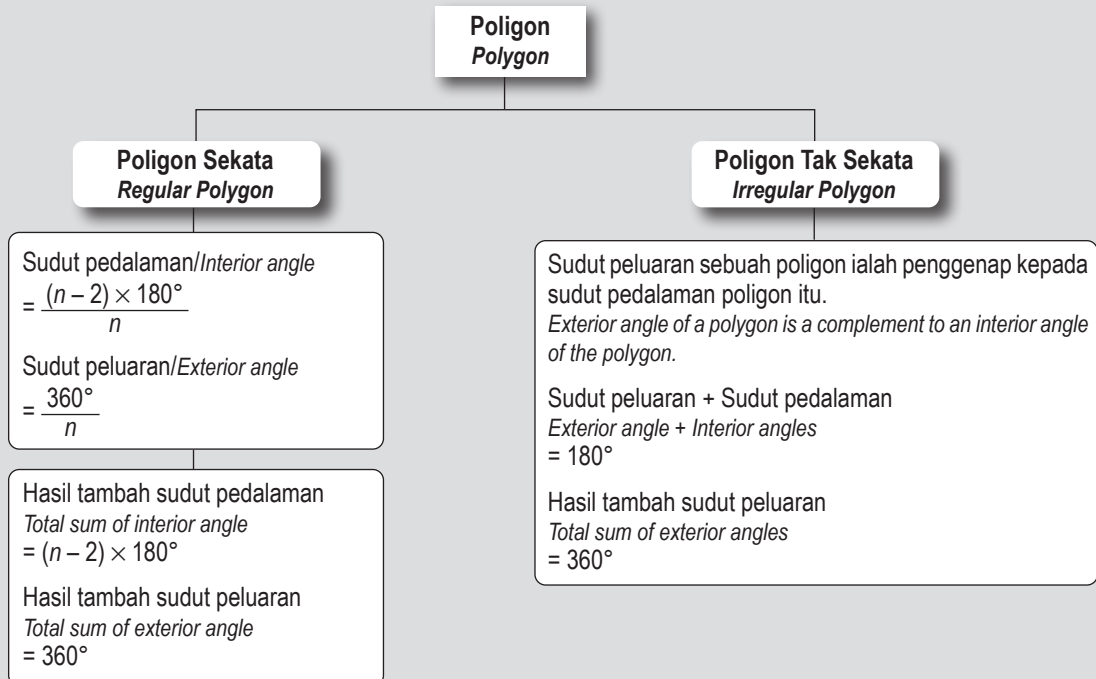
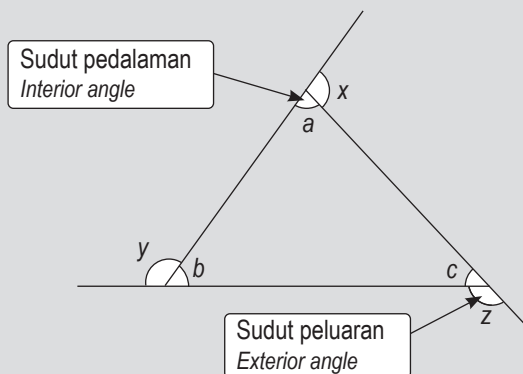
Find the value of r .

[4 markah/marks]

Jawapan/Answer:



Rajah 4 / Diagram 4

TOPIK
3 **Poligon**
Polygon
NOTA EFEKTIF

Sudut Pedalaman dan Sudut Peluaran Poligon
Interior Angles and Exterior Angles of Polygons

Sudut pedalaman
Interior angle

- Sudut yang terbentuk oleh dua sisi bersebelahan di dalam sesuatu poligon.
An angle that is formed by two adjacent sides of a polygon.
- Sudut a, b dan c ialah sudut pedalaman.
Angles a, b, and c are interior angles.

Sudut peluaran
Exterior angle

- Sudut yang terbentuk apabila satu sisi poligon dipanjangkan.
An angle that is formed when one side of the polygon is extended.
- Sudut x, y dan z ialah sudut peluaran.
Angles x, y, and z are exterior angles.

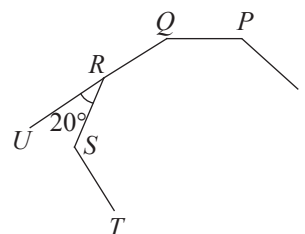

LATIHAN INTENSIF

- 1 Dalam Rajah 1, P, Q, R, S dan T ialah beberapa bucu bagi sebuah poligon sekata. Diberi QRU ialah satu garis lurus. Hitung bilangan sisi poligon sekata itu.

In Diagram 1, P, Q, R, S, and T are several vertices of a regular polygon. Given that QRU is a straight line. Calculate the number of sides of the regular polygon.

[2 markah/marks]

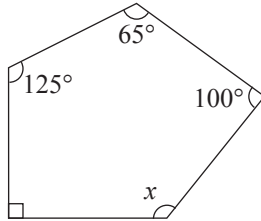
Jawapan/Answer:



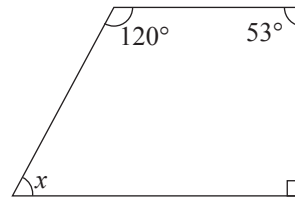
Rajah 1 / Diagram 1

- 2 Hitung nilai x bagi setiap yang berikut.
Calculate the value of x for each of the following.

(a)



(b)



[2 markah/marks]

Jawapan/Answer:

- 3 Rajah 2 menunjukkan heptagon sekata $ABCDEFGG$ dan garis lurus BAH .

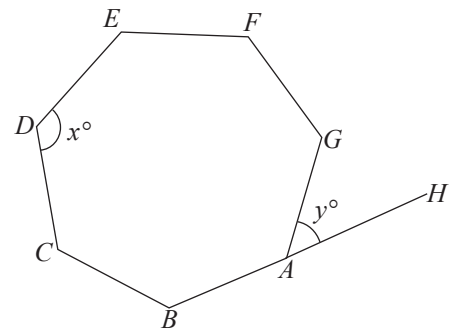
Diagram 2 shows a regular heptagon $ABCDEFGG$ and the straight line BAH .

Hitung nilai $y - x$.

Find the value of $y - x$.

[3 markah/marks]

Jawapan/Answer:



Rajah 2 / Diagram 2

- 4 Dalam Rajah 3, $EFGHIO$ ialah sebuah poligon tidak sekata. EOH dan FOI ialah garis lurus. Diberi $\angle EHG$ ialah dua kali $\angle EHI$.

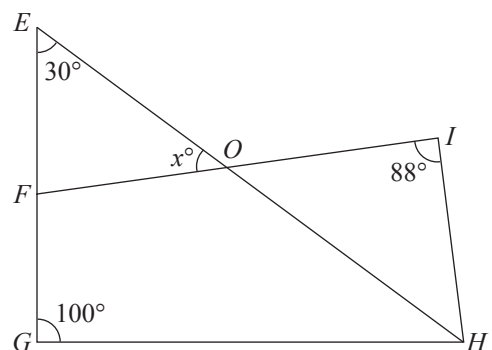
Diagram 3 shows, $EFGHIO$ is an irregular polygon. EOH and FOI are straight lines. Given $\angle EHG$ is twice $\angle EHI$.

Cari nilai x .

Find the value of x .

[3 markah/marks]

Jawapan/Answer:



Rajah 3 / Diagram 3



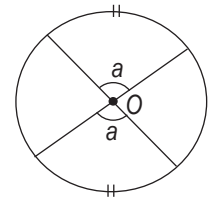
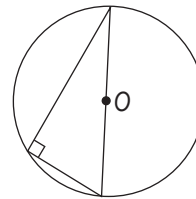
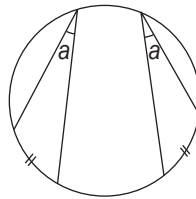
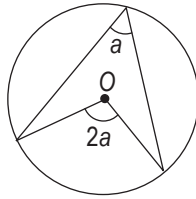
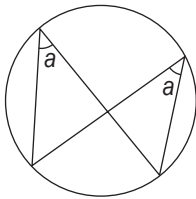
TOPIK
4

Sudut dan Tangen bagi Bulatan
Angles and Tangents of Circles

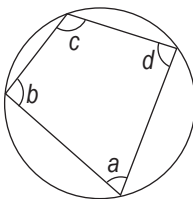


NOTA EFEKTIF

Ciri-ciri Sudut dalam Bulatan
Properties of Angles in a Circle

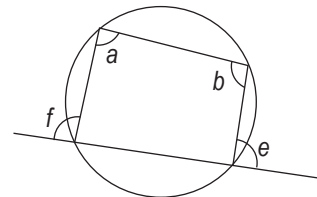


Sisi Empat Kitaran
Cyclic Quadrilaterals



$$\angle a + \angle c = 180^\circ$$

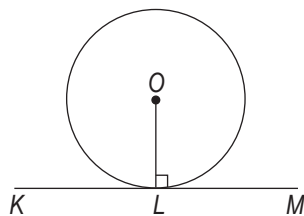
$$\angle b + \angle d = 180^\circ$$



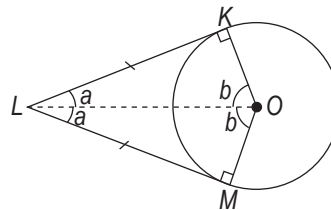
$$\angle a = \angle e$$

$$\angle b = \angle f$$

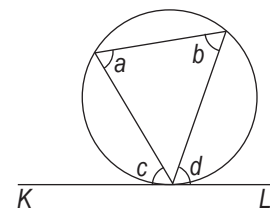
Tangen kepada Bulatan
Tangents to Circles



OL = jejari
radius
KLM = tangen kepada bulatan
tangent to circle



KL dan ML ialah tangen.
KL and ML are tangents.
 $\angle KLM + \angle KOM = 180^\circ$



$$\angle a = \angle d$$

$$\angle b = \angle c$$

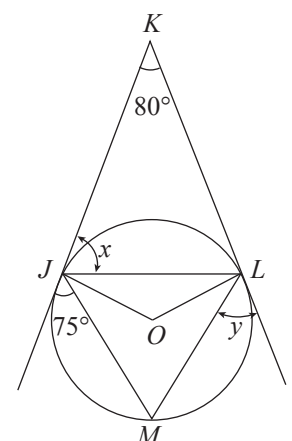


LATIHAN INTENSIF

- 1 Rajah 1 menunjukkan dua tangen kepada suatu bulatan berpusat O , masing-masing di titik J dan L .
Diagram 1 shows two tangents to a circle with centre O at points J and L respectively.
Cari nilai x dan nilai y .
Find the value of x and value of y .

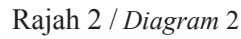
Jawapan/Answer:

[3 markah/marks]



Rajah 1 / Diagram 1

Ulang Kaji Menengah Rendah



[2 markah/*marks*]

[3 markah/*marks*]

Belum Menguasai

TOPIK
5Rumus Algebra
Algebraic FormulaeUlang Kaji
Menengah Rendah

NOTA EFEKTIF

Rumus Algebra
Algebraic Formulae

- Rumus Algebra** menggabungkan ungkapan algebra dengan operasi tambah, tolak, darab atau bahagi dalam bentuk persamaan.
Algebraic formulae connect the algebraic expressions through addition, subtraction, multiplication, and division in an equation form.

Contoh/Example:

$$\begin{array}{ll} 1 & y = 2x + 5 \\ 2 & p = \frac{7q-4}{r} \end{array} \quad \begin{array}{ll} 3 & A = \frac{1}{2}bh \\ 4 & V = \pi r^2 h \end{array}$$

- Suatu nilai **pemboleh ubah** dalam rumus algebra boleh diperoleh apabila diberi suatu nilai pemboleh ubah yang lain.
*The value of the **variable** in an algebraic formula can be obtained when the values of the other variables are given.*

Contoh/Example:

Diberi $p = \frac{7q-4}{r}$, hitung nilai r , jika $p = 6$, $q = 4$.

Maka, $r = 4$.

Given $p = \frac{7q-4}{r}$, calculate the value of r , if $p = 6$, $q = 4$.

Thus, $r = 4$.

- Perkara rumus** diwakili oleh abjad.
Subject of formula is represented by a letter.
- Perkara rumus boleh berubah bergantung kepada nilai pemboleh ubah yang ingin diperoleh.
Subject of formula can be changed according to the value of the variable.

Contoh/Example:

$$x = -8 - 4y \qquad y = \frac{-x-8}{4r}$$

- Penyelesaian masalah** melibatkan penukaran perkara rumus, gabungan operasi asas aritmetik, kuasa dan punca kuasa.
Solving problems involves changing the subject of a formula, combination of basic mathematical operations, square and square root.



LATIHAN INTENSIF

- 1 Ungkapkan huruf dalam kurungan sebagai perkara rumus.

Express the letters in the brackets as the subject of formula.

$$\begin{array}{ll} \text{(a)} & 5m + 3n = 7 + n \qquad [n] \\ \text{(b)} & p - 4 = \frac{2p}{5q} \qquad [p] \\ \text{(c)} & 2k^2 + 5n = 3p \qquad [k] \\ \text{(d)} & 2p = \sqrt{\frac{m-n}{2}} \qquad [m] \end{array}$$

[4 markah/marks]

Jawapan/Answer:

- 2 (a) Diberi $f = 5g + h$, hitung nilai g apabila $f = 8$ dan $h = 3$.
Given that $f = 5g + h$, calculate the value of g when $f = 8$ and $h = 3$.
- (b) Diberi $p - q = \frac{p+3}{k}$, hitung nilai p apabila $q = 4$ dan $k = \frac{1}{2}$.
Given that $p - q = \frac{p+3}{k}$, calculate the value of p when $q = 4$ and $k = \frac{1}{2}$.

[4 markah/marks]

Jawapan/Answer:

- 3 Luas permukaan melengkung, $L \text{ cm}^2$, sebuah silinder diberikan dengan rumus $L = 2\pi jt$.
The curved surface area, $L \text{ cm}^2$, of a cylinder is given by the formula $L = 2\pi jt$.
- (a) Bina satu rumus bagi jejari, $j \text{ cm}$, silinder itu.
Construct a formula for the radius, $j \text{ cm}$, of the cylinder.

- (b) Cari nilai j apabila $L = 120$, $t = 12$ dan $\pi = \frac{22}{7}$.
Find the value of j when $L = 120$, $t = 12$ and $\pi = \frac{22}{7}$.

[3 markah/marks]

Jawapan/Answer:


NOTA EFEKTIF

Hukum indeks <i>Law of indices</i>	Rumus <i>Formula</i>	Contoh <i>Example</i>
Pendaraban <i>Multiplication</i>	$a^m \times a^n = a^{m+n}$	$4^3 \times 4^2 = 4^5$
Pembahagian <i>Division</i>	$a^m \div a^n = a^{m-n}$	$7^8 \div 7^2 = 7^6$
Kuasa <i>Power</i>	$(a^m)^n = a^{mn}$	$(5^4)^2 = 5^8$
Indeks sifar <i>Zero index</i>	$a^0 = 1; a \neq 0$	$9^0 = 1$
Indeks negatif <i>Negative index</i>	$a^{-n} = \frac{1}{a^n}; a \neq 0$	$6^{-2} = \frac{1}{6^2}$
Indeks pecahan <i>Fractional index</i>	$a^{\frac{1}{n}} = \sqrt[n]{a}$	$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$
	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$	$8^{\frac{2}{3}} = \sqrt[3]{8^2} = 4$


LATIHAN INTENSIF

- 1 Permudahkan setiap yang berikut dan tulis jawapan dalam bentuk indeks.

Simplify each of the followings and write the answer in index form.

(a) $g^4 \times g^6 \times h^4 \times g^3 \times h^8 \times h^2$

(b) $\frac{50x^2y^{12}z}{10xyz}$

[2 markah/marks]

Jawapan/Answer:

- 2 Diberi $4^m \times 4^3 = 4\,096$. Cari nilai m .

Given $4^m \times 4^3 = 4\,096$. Find the value of m .

[2 markah/marks]

Jawapan/Answer:

- 3 Diberi bahawa $\frac{4^{12} \times 7^n}{4^m \times 7^4} = 784$. Cari nilai bagi $\frac{n}{m}$.

Given that $\frac{4^{12} \times 7^n}{4^m \times 7^4} = 784$. Find the value of $\frac{n}{m}$.

[4 markah/marks]

Jawapan/Answer:

- 4 Hitung nilai p bagi $(x^2)^{4p} \times x^{(3p-2)} = x^{(30-5p)}$.
Calculate the value of p for $(x^2)^{4p} \times x^{(3p-2)} = x^{(30-5p)}$.

[2 markah/marks]

Jawapan/Answer:

- 5 Darwish membeli $2^{(x-2)}$ biji durian pada harga RM32 sebiji dengan membayar RM $2^{(y+6)}$. Shazmin membeli $5^{(-2x+9)}$ biji durian pada harga RM 5^y dengan membayar RM 5^2 . Cari nilai x dan nilai y .
Darwish bought $2^{(x-2)}$ durians at RM32 each by paying RM $2^{(y+6)}$. Shazmin bought $5^{(-2x+9)}$ durians at RM 5^y by paying RM 5^2 . Find the value of x and the value of y .

[3 markah/marks]

Jawapan/Answer:

BAB 1

Fungsi dan Persamaan Kuadratik dalam Satu Pemboleh Ubah *Quadratic Functions and Equations in One Variable*


 VIDEO
PEMBELAJARAN


NOTA EFEKTIF

Ungkapan Kuadratik dalam Satu Pemboleh Ubah

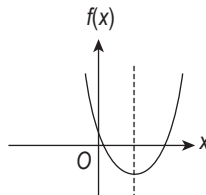
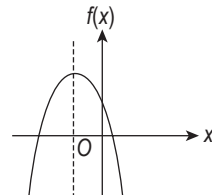
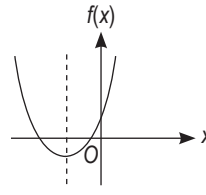
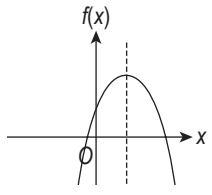
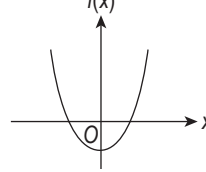
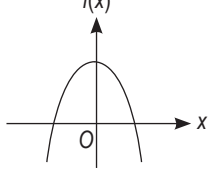
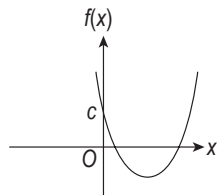
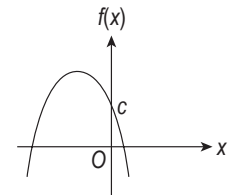
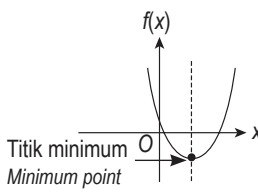
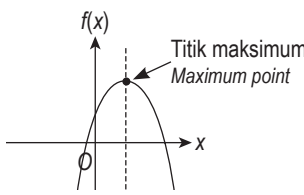
Quadratic Expressions in One Variable

- 1 Bentuk am $ax^2 + bx + c$ a, b dan c ialah pemalar, $a \neq 0$ dan x sebagai pemboleh ubah (**satu** pemboleh ubah).
*The general form where a, b and c are constants, $a \neq 0$ and x as a variable (**one** variable).*
- 2 Kuasa tertinggi pemboleh ubah ialah dua.
The highest power of a variable is two.

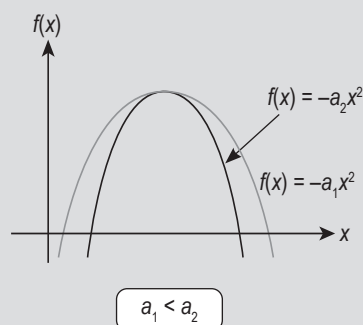
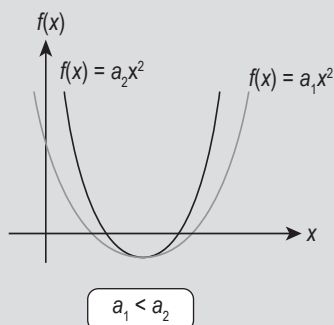
Fungsi Kuadratik

Quadratic Function

- 1 Bentuk am $f(x) = ax^2 + bx + c$
General form

Bentuk graf <i>Shape of graph</i>		 $a > 0$	 $a < 0$
Paksi simetri <i>Axis of symmetry</i> $x = -\frac{b}{2a}$	$b < 0$		
	$b > 0$		
	$b = 0$		
Pintasan-y <i>y-intercept</i>			
Titik minimum/maksimum <i>Maximum/minimum point</i>		 Titik minimum <i>Minimum point</i>	 Titik maksimum <i>Maximum point</i>

- 3 Perubahan nilai a menentukan kelebaran bentuk lengkung graf.
The changing value of a determines the width of the curved shape of the graph.



Kaedah Pemfaktoran

Factorisation Method

Kaedah pemfaktoran memerlukan persamaan kuadrat dalam bentuk $ax^2 + bx + c = 0$ ditulis dalam bentuk $(x + a)(x + b) = 0$. Maka, punca-punca persamaan kuadrat ialah $-a$ dan $-b$.

The factorisation method requires a quadratic equation in the general form $ax^2 + bx + c = 0$ to be written in the form $(x + a)(x + b) = 0$. Then, the roots of the quadratic equations are $-a$ and $-b$.

Melakar Graf Fungsi Kuadrat

Sketch Graphs of Quadratic Functions

Langkah-langkah untuk melakar graf fungsi kuadrat $f(x) = x^2 - 5x + 4$.

Steps to sketch the graph of quadratic function $f(x) = x^2 - 5x + 4$.

- ① Tentukan bentuk graf.
Determine the shape of the graph.
- ② Tentukan pintasan-y.
Determine the y-intercept.
- ③ Tentukan pintasan-x.
Determine the x-intercept.
- ④ Menentukan paksi simetri.
Determine the axis of symmetry.
- ⑤ Menentukan titik minimum/maksimum.
Determine the minimum/maximum point.
- ⑥ Lakarkan graf.
Sketch the graph.

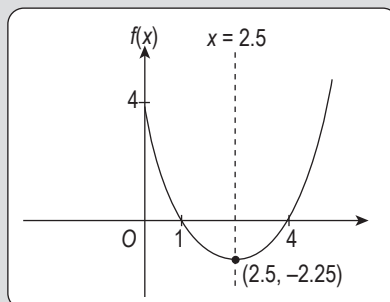
$$a > 0 \rightarrow \cup$$

$$y = 4$$

$$\begin{aligned} x^2 - 5x + 4 &= 0 \\ (x - 4)(x - 1) &= 0 \\ x &= 4, 1 \end{aligned}$$

$$\begin{aligned} x &= -\frac{(-5)}{2(1)} \\ &= 2.5 \end{aligned}$$

$$\begin{aligned} y &= (2.5)^2 - 5(2.5) + 4 \\ &= -2.25 \\ \therefore (2.5, -2.25) \end{aligned}$$



KALKULATOR

$$x^2 - 5x + 4 = 0$$

Tekan/Press:

MODE MODE MODE 1 ► 2

$$a? \rightarrow 1 =$$

$$b? \rightarrow - 5 =$$

$$c? \rightarrow 4 =$$

$$x = 4, 1$$



LATIHAN INTENSIF

Soalan Objektif

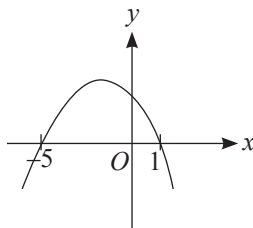
Jawab semua soalan.

- Salah satu faktor bagi $1 - 36x^2$ ialah
One of the factors of $1 - 36x^2$ is
 A $1 - 16x$
 B $1 + 6x$
 C $6x - 1$
 D $1 - 36x$
- Cari persamaan paksi simetri bagi fungsi kuadratik $g(x) = 2x^2 + 4x - 3$.
Find the equation of the axis of symmetry for the quadratic function $g(x) = 2x^2 + 4x - 3$.
 A $x = 1$
 B $x = -3$
 C $x = -2$
 D $x = -1$

- Selesaikan/Solve:

$$\frac{4}{2+x} = \frac{3x}{2-x}$$

- $x = -4, \frac{2}{3}$
 - $x = 4, -\frac{2}{3}$
 - $x = -4, 3$
 - $x = \frac{2}{3}, 4$
- Rajah 1 menunjukkan suatu graf fungsi kuadratik.
Diagram 1 shows a graph of quadratic function.

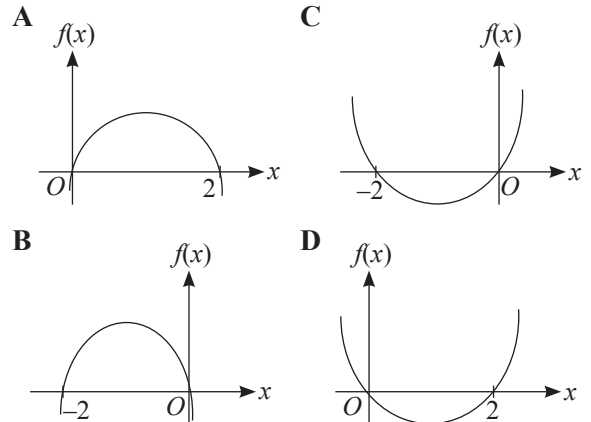


Rajah 1 / Diagram 1

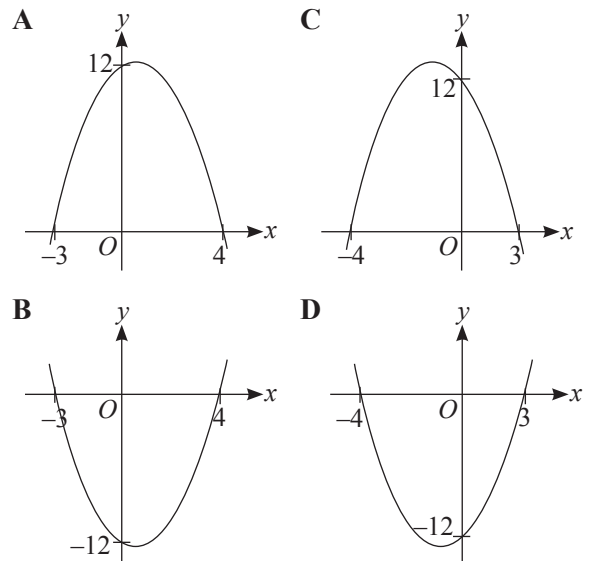
Tentukan persamaan paksi simetri bagi graf fungsi kuadratik tersebut.
Determine the equation of the axis of symmetry for the graph of quadratic function.

- $x = 1$
- $x = -2$
- $x = -3$
- $x = -5$

- Antara berikut, graf yang manakah mewakili $f(x) = -x^2 + 2x$?
Which of the following graphs represent $f(x) = -x^2 + 2x$?



- Antara berikut, graf yang manakah mewakili $f(x) = 12 - x - x^2$?
Which of the following graphs represents $f(x) = 12 - x - x^2$?



- Antara berikut, yang manakah salah satu punca bagi persamaan kuadratik $2x^2 - x - 45 = 0$?
Which of the following is one of the roots of the quadratic equation $2x^2 - x - 45 = 0$?

- 2
- 5
- 9
- $-\frac{9}{2}$

Soalan Subjektif

Jawab semua soalan.

- 1 Teena merupakan seorang penggemar buah-buahan tempatan. Dia membeli buah rambutan dengan harga $\text{RM}(3x + 2)$ bagi 1 kg. Teena memperoleh baki $\text{RM}x$ setelah membayar dengan 6 keping wang kertas $\text{RM}10$ untuk membeli x kg buah rambutan. Hitung harga 1 kg buah rambutan.

Teena is a fan of local fruits. She buys rambutans at the price of $\text{RM}(3x + 2)$ per kg. Teena receives balance of $\text{RM}x$ after paying with six $\text{RM}10$ notes to buy x kg of rambutans. Calculate the price for 1 kg of rambutans.

[4 markah/marks]

Jawapan/Answer:

Tingkatan 4



- 2 Bagi setiap fungsi kuadratik di ruang jawapan, nyatakan

For each of the quadratic functions in the answer space, state

- | | | |
|--|--|---|
| (i) bentuk graf,
<i>the shape of the graph,</i> | (ii) pintasan-y,
<i>the y-intercept,</i> | (iii) pintasan-x,
<i>the x-intercept,</i> |
| (iv) persamaan paksi simetri,
<i>the equation of symmetry line,</i> | (v) koordinat titik maksimum/minimum,
<i>the coordinate of maximum/minimum point,</i> | (vi) lakarkan graf.
<i>sketch the graph.</i> |

[6 markah/marks]

Jawapan/Answer:

(a) $f(x) = -2x^2 + 8x$

(b) $g(x) = x^2 - 7x + 10$

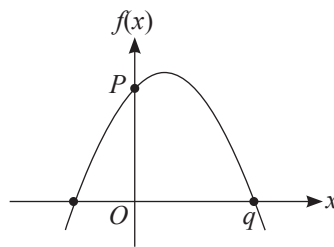
- 3 Qaiser seorang pemain bola sepak yang disegani ramai. Dalam satu perlawanan bola sepak, Qaiser menendang bola dengan ketinggian h m dalam masa t saat. Ketinggian sepakan bola diberi oleh persamaan $h = 2t^2 + 3t - 44$. Bilakah bola itu akan menyentuh permukaan tanah?

Qaiser is a well-respected football player. In a football match, Qaiser kicks the ball with the height h m in t seconds. The height of the kicked ball is given by the equation $h = 2t^2 + 3t - 44$. When will the ball touch the ground?

[4 markah/marks]

Jawapan/Answer:

- 4 Rajah 1 menunjukkan graf fungsi kuadratik $f(x) = -(x + 2)(x - 6)$.
Diagram 1 shows the graph of the quadratic function $f(x) = -(x + 2)(x - 6)$.



Rajah 1 / Diagram 1

Tentukan/Determine:

- nilai p dan q ,
the values of p and q ,
- persamaan paksi simetri,
the equation of the axis of symmetry,
- koordinat titik maksimum fungsi kuadratik.
the maximum point of the quadratic function.

[6 markah/marks]

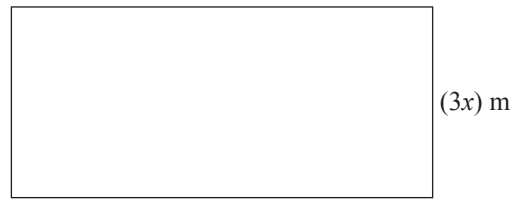
Jawapan/Answer:

(a)

(b)

(c)

- 5 Rajah 2 menunjukkan sebuah tapak pasar malam berbentuk segi empat tepat.
Diagram 2 shows a night market site in the shape of a rectangle.



Rajah 2 / Diagram 2

Panjang tapak pasar malam itu adalah 5 m lebih daripada lebarnya. Diberi bahawa luas tapak pasar malam itu ialah 84 m^2 . Hitung panjang, dalam m, tapak pasar malam itu.

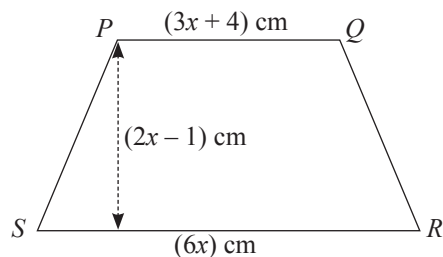
The length of the night market site is 5 m more than its width. Given that the area of the night market site is 84 m^2 , calculate the length, in m, of the night market site.

[4 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 6 Rajah 3 menunjukkan sebuah trapezium PQRS.
Diagram 3 shows a trapezium PQRS.



Rajah 3 / Diagram 3

- (a) Ungkapkan luas, L , trapezium itu dalam sebutan am, $ax^2 + bx + c$.
Express the area, L , of the trapezium in general form, $ax^2 + bx + c$.
(b) Diberi luas trapezium ialah 220.5 cm^2 , hitung nilai PQ .
Given that the area of the trapezium is 220.5 cm^2 , calculate the value of PQ .

[6 markah/marks]

Jawapan/Answer:

- (a) (b)

BAB 2

Asas Nombor Number Bases


 VIDEO
PEMBELAJARAN


NOTA EFEKTIF

Asas Nombor Number Bases

Nombor
Number

→ **23**₆ ← Asas
Base

dibaca sebagai/is read as
"dua tiga asas enam"
"two three base six"

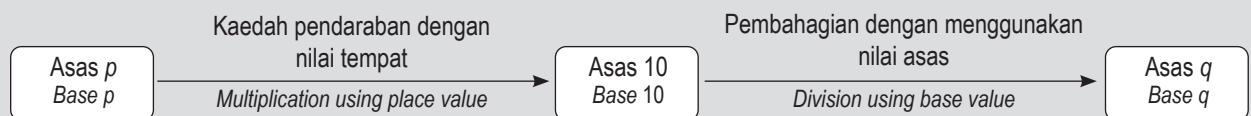
Nilai Tempat, Nilai Digit dan Nilai Nombor Place Value, Value of Digit and Value of Number

 Contoh/Example: 1324₇

Nombor Number	1	3	2	4
Nilai tempat Place value	7^3	7^2	7^1	7^0
Nilai digit Digit value	1×7^3 = 343	3×7^2 = 147	2×7^1 = 14	4×7^0 = 4
Nilai nombor Value of number	$343 + 147 + 14 + 4 = 508$			

Penukaran Nombor dalam Suatu Asas Tertentu kepada Asas yang Lain

Conversion a Number in a Certain Base to Another Base



Contoh/Example:

 Tukar 245₆ kepada asas sembilan.
Convert 245₆ to base nine.

 ① Tukar 245₆ kepada asas 10.
Convert 245₆ to base 10.

$$(2 \times 6^2) + (4 \times 6^1) + (5 \times 6^0) = 101$$

 ② Tukar 101 kepada asas sembilan.
Convert 101 to base nine.

		Baki Remainder	
9	101	2	$\therefore 122_9$
9	11	2	
9	1	1	
	0		

Operasi Tambah dan Tolak dalam Pelbagai Asas

Addition and Subtraction of Numbers in Various Bases

Bentuk Lazim/Vertical Form

Contoh/Example:

$$343_7 - 56_7 = 254_7$$

	2	3	7
	3	4	3 ₇
-		5	6 ₇
	2	5	4 ₇

$7 + 3 - 6 = 4_7$

$7 + 3 - 5 = 5_7$

Penukaran Asas/ Conversation of Base

Contoh/Example:

$$324_5 + 42_5 = 421_5$$

		Baki Remainder	
5	111	1	
5	22	2	
5	4	4	
	0		

$324_5 \rightarrow 89_{10}$
 $42_5 \rightarrow 22_{10}$
 $89 + 22 = 111$



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

Tingkatan 4

- Hitung beza antara 73_8 dan 45_8 .
Calculate the difference between 73_8 and 45_8 .
 A 22_8
 B 26_8
 C 32_8
 D 34_8
- Antara pasangan berikut, yang manakah mempunyai nilai yang sama?
Which of the following pairs has the same value?
 A $53_6 = 34_{10}$
 B $47_9 = 1021_3$
 C $31_4 = 23_{10}$
 D $201_3 = 10011_2$
- Rajah 1 menunjukkan empat kad nombor yang disusun dalam tertib menurun.
Diagram 1 shows four numbered cards arranged in descending order.

310_8	2310_4	x	10101100_2
---------	----------	-----	--------------

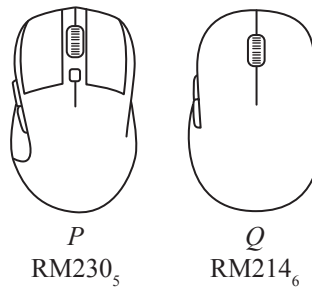
Rajah 1 / Diagram 1

Antara berikut, yang manakah mewakili nilai x ?
Which of the following represents the value of x ?
 A 252_8 C 2231_4
 B 264_8 D 11001001_2
- Ungkapkan $5^4 + 3 \times 5^6 + 4 \times 5^3 + 6$ sebagai satu nombor dalam asas tujuh.
Express $5^4 + 3 \times 5^6 + 4 \times 5^3 + 6$ as a number in base seven.
 A 256641_7
 B 256642_7
 C 256646_7
 D 256650_7
- Ungkapkan $1 + 1 \times 2^4 + 1 \times 2^3$ sebagai satu nombor dalam asas dua.
Express $1 + 1 \times 2^4 + 1 \times 2^3$ as a number in base two.
 A 11001_2
 B 11100_2
 C 10110_2
 D 10011_2

- Seorang murid Sains Komputer sedang menyelamatkan data lama yang disimpan dalam kod asas 7. Salah satu nombor ialah 225_7 . Dia perlu menukarkan nombor itu dalam asas 4 untuk digunakan dalam sistem baharu.
A Computer Science student is in the process of recovering old data stored in base 7 code. One of the numbers is 225_7 . He needs to convert this number into base 4 to be used in a new system.
 Apakah nombor tersebut dalam asas 4?
What is the number in base 4?
 A 117_4
 B 1022_4
 C 1311_4
 D 2201_4
- Ramli membeli sebotol minyak wangi dengan harga $\text{RM}356_8$ selepas potongan diskaun sebanyak 30%. Berapakah harga asal minyak wangi itu dalam asas lapan?
Ramli bought a bottle of perfume for $\text{RM}356_8$ after a discount of 30%. What is the original price of the perfume in base eight?
 A $\text{RM}524_8$
 B $\text{RM}340_8$
 C $\text{RM}246_8$
 D $\text{RM}238_8$
- Diberi $104200_7 = 104m102_5$, dengan keadaan m ialah nombor satu digit. Cari nilai m .
Given $104200_7 = 104m102_5$, where m is a one-digit number. Find the value of m .
 A 1
 B 2
 C 3
 D 4
- Diberi $111000_2 - k_2 = 10011_2$, cari nilai k .
Given $111000_2 - k_2 = 10011_2$, find the value of k .
 A 101100
 B 110000
 C 100101
 D 100100

Soalan Subjektif
Jawab semua soalan.

- 1 Rajah 1 menunjukkan harga dua tetikus, dalam asas nombor yang berbeza.
Diagram 1 shows the prices of two mouses, in different number bases.



Rajah 1 / Diagram 1

Berapakah jumlah harga kedua-dua tetikus itu dalam asas sepuluh?
What is the total price of the two mouses in base ten?

[3 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 2 Sempena cuti persekolahan, Noah telah mengadakan jualan murah di kedai bukunya. Beliau menawarkan diskaun sebanyak 20% bagi setiap pembelian buku. Diberi bahawa harga asal sebuah ensiklopedia ialah $RM21001_3$. Hitung harga ensiklopedia tersebut selepas diskaun, dalam asas enam.
In conjunction with the school holidays, Noah has organised a sale at his bookstore. He offers a 20% discount on every book purchase. Given that the original price of an encyclopaedia is $RM21001_3$. Calculate the price of the encyclopaedia after the discount, in base six.

[4 markah/marks]

Jawapan/Answer:

- 3 Gaji bulanan Ramasamy pada tahun 2023 dan tahun 2024 masing-masing ialah $\text{RM}22452_6$ dan $\text{RM}25012_6$. Hitung peratusan kenaikan gajinya.

The monthly salary of Ramasamy in the year 2023 and 2024 were $\text{RM}22452_6$ and $\text{RM}25012_6$ respectively. Calculate the percentage of increase of his salary.

[3 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 4 Diberi $1100_2 < p \leq 121_3$, dengan keadaan p ialah nombor dalam asas sepuluh. Nyatakan semua nilai yang mungkin bagi p .

Given $1100_2 < p \leq 121_3$, where p is a number in base ten. State all the possible values of p .

[3 markah/marks]

Jawapan/Answer:

- 5 Ungkapkan $7^4 + 2(7) + 4^0$ sebagai suatu nombor dalam asas tujuh dan seterusnya, dalam asas lapan.

Express $7^4 + 2(7) + 4^0$ as a number in base seven and hence, in base eight.

[3 markah/marks]

Jawapan/Answer:

- 6 Rajah 2 menunjukkan empat keping kad nombor.
Diagram 2 shows four number cards.

82_{10}	148_{10}	19_{10}	53_{10}
-----------	------------	-----------	-----------

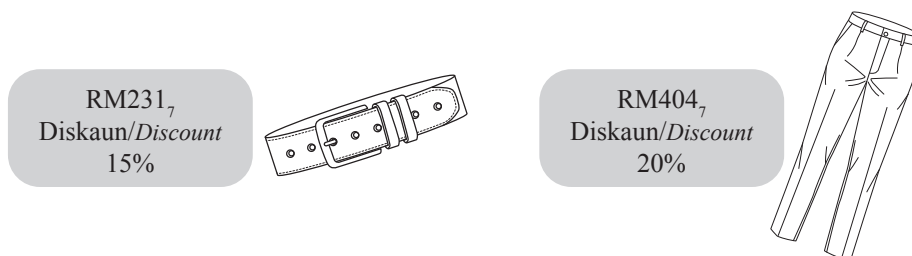
Rajah 2 / Diagram 2

- (a) Cari hasil tambah dua nombor yang terbesar. Berikan jawapan dalam asas lima.
Find the sum of the two largest numbers. Give the answer in base five.
- (b) Cari beza antara nombor terbesar dengan nombor terkecil. Berikan jawapan dalam asas empat.
Find the difference between the largest number and the smallest number. Give the answer in base four. [4 markah/marks]

Jawapan/Answer:

- (a) (b)

- 7 Rajah 3 menunjukkan harga tali pinggang dan seluar dalam asas tujuh serta diskaun yang ditawarkan di sebuah pasar raya.
Diagram 3 shows the price of a belt and a trouser in base seven for and the discounts given at a supermarket.



Rajah 3 / Diagram 3

Khairul membeli sehelai seluar dan seutas tali pinggang. Dia memberikan RM300 kepada juruwang itu. Berapakah baki wang yang diterimanya?
Khairul bought a trouser and a belt. He gave RM300 to the cashier. How much change did he receive?

[4 markah/marks]

Jawapan/Answer:

- 8 Harga bagi 5 kg durian ialah RM3130₄. Azlan mempunyai RM330 dan dia membeli 7 kg durian. Berapakah baki wangnya dalam asas tiga?

The price of 5 kg durians is RM3130₄. Azlan has RM330 and bought 7 kg of durians. How much is his money left in base three?

[5 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 9 Jadual 1 menunjukkan markah ujian Matematik bagi tiga orang murid.

Table 1 shows the mathematics marks for three students.

Nama murid Students' name	Aira	Ali	Affan
Markah Marks	kurang 28 daripada markah Affan 28 less than Affan's marks	2 kali markah Aira 2 times Aira's marks	301 ₅

Jadual 1 / Table 1

Cari markah Ali, dan berikan jawapan dalam asas tujuh.

Find Ali's marks, and give the answer in base seven.

[5 markah/marks]

Jawapan/Answer:



BAB 3

Penaakulan Logik Logical Reasoning



VIDEO
PEMBELAJARAN

NOTA EFEKTIF

Pernyataan Statement

Pernyataan ialah suatu ayat yang dapat ditentukan nilai kebenarannya, iaitu sama ada **benar** atau **palsu**, tetapi **bukan kedua-duanya**.

A statement is a sentence of which the truth can be determined, that is either **true** or **false**, but **not both**.

Nilai Kebenaran Truth Value

p	q	p dan/ and q	p atau/ or q
Benar True	Benar True	Benar True	Benar True
Benar True	Palsu False	Palsu False	Benar True
Palsu False	Benar True	Palsu False	Benar True
Palsu False	Palsu False	Palsu False	Palsu False

Implikasi Implication

Pernyataan : Jika p , maka q
Statement : If p , then q
Akas : Jika q , maka p
Converse : If q , then p
Songsangan : Jika $\sim p$, maka $\sim q$
Inverse : If $\sim p$, then $\sim q$
Kontrapositif : Jika $\sim q$, maka $\sim p$
Contrapositive : If $\sim q$, then $\sim p$

p : antejadian
antecedent
 q : akibat
consequent

Hujah Deduktif Deductive Argument

	Bentuk I Form I	Bentuk II Form II	Bentuk III Form III
Premis 1 Premise 1	Semua A ialah B All A is B	Jika p , maka q If p , then q	Jika p , maka q If p , then q
Premis 2 Premise 2	C ialah A C is A	p adalah benar p is true	Bukan q adalah benar Not q is true
Kesimpulan Conclusion	C ialah B C is B	q adalah benar q is true	Bukan p adalah benar Not p is true

Hujah Deduktif Deductive Argument

Sah/Valid

mematuhi bentuk hujah
comply the argument forms

Tidak sah/Invalid

tidak mematuhi
bentuk hujah
not comply the
argument forms

Munasabah
Sound

semua premis dan
kesimpulan benar
all premises and
conclusion true

Tidak munasabah
Unsound

premis atau
kesimpulan palsu
premises or conclusion
false

Tidak munasabah
Unsound

Hujah Induktif Inductive Argument

Kuat/Strong

kesimpulan benar
true conclusion

Meyakinkan
Cogent

semua premis
benar
all premises true

Tidak meyakinkan
Not cogent

ada premis palsu
there are false premises

Lemah/Weak

kesimpulan palsu
false conclusion

Tidak meyakinkan
Not cogent



LATIHAN INTENSIF

Soalan Objektif

Jawab semua soalan.

- 1 Antara berikut, yang manakah ialah satu pernyataan?

Which of the following is a statement?

- A $(-3) \times (-8)$
- B $n - 4 = -12$
- C $(-2)^2 = -4$
- D $ax^2 + bx + c$

- 2 Antara berikut, yang manakah merupakan pernyataan majmuk yang **palsu**?

Which of the following is a false statement?

- A $3^5 = 125$ atau/ $5^3 = 125$
- B $3x^2 + 2x - 5$ ialah persamaan kuadratik dan 9 ialah nombor perdana.
 $3x^2 + 2x - 5$ is a equation and 9 is a prime number.
- C 30 ialah gandaan bagi 6 dan $\subset \{5, 10, 15\}$
30 is a multiple of 6 and $\subset \{5, 10, 15\}$
- D Semua oktagon mempunyai 8 sisi atau 343 ialah nombor kuasa dua sempurna.
All octagons have 8 sides or 343 is a perfect square number.

- 3 Antara berikut, yang manakah hujah yang sah dan munasabah?

Which of the following is a valid and reasonable argument?

- A Premis 1: Semua gandaan 4 ialah gandaan 8.
Premise 1: All multiples of 4 are multiples of 8.
Premis 2: 28 ialah gandaan 4.
Premise 2: 28 is a multiple of 4.
Kesimpulan: 28 ialah gandaan 8.
Conclusion: 28 is a multiple of 8.
- B Premis 1: Semua segi empat sama bersudut tepat.
Premise 1: All squares are right angled.
Premis 2: PQRS ialah segi empat sama.
Premise 2: PQRS is a square.
Kesimpulan: PQRS bersudut tepat.
Conclusion: PQRS is a right angled.
- C Premis 1: Jika $x = 7$, maka $3x - 4 = 17$.
Premise 1: If $x = 7$, then $3x - 4 = 17$.
Premis 2: $3x - 4 = 17$.
Premise 2: $3x - 4 = 17$.
Kesimpulan: $x = 7$.
Conclusion: $x = 7$.

- D Premis 1: Jika x ialah nombor ganjil, maka $9x$ ialah nombor ganjil.

Premise 1: If x is an odd number, then $9x$ is an odd number.

Premis 2: $9x$ ialah nombor ganjil.

Premise 2: $9x$ is an odd number.

Kesimpulan: x bukan nombor ganjil.

Conclusion: x is not an odd number.

- 4 Tentukan songsangan bagi implikasi berikut.

Determine the inverse for the following implication.

Jika 23 ialah nombor ganjil, maka 23 tidak boleh dibahagi tepat dengan 2.

If 23 is an odd number, then 23 is not divisible by 2.

- A Jika 23 tidak boleh dibahagi tepat dengan 2, maka 23 ialah nombor ganjil.
If 23 is not divisible by 2, then 23 is an odd number.
- B Jika 23 ialah nombor genap, maka 23 boleh dibahagi tepat dengan 2.
If 23 is an even number, then 23 is divisible by 2.
- C Jika 23 boleh dibahagi tepat dengan 2, maka 23 ialah nombor genap.
If 23 is divisible by 2, then 23 is an even number.
- D Jika 23 ialah nombor ganjil, maka 23 boleh dibahagi tepat dengan 2.
If 23 is an odd number, then 23 is divisible by 2.

- 5 Rajah 1 menunjukkan suatu maklumat.

Diagram 1 shows information.

Pernyataan: Jika $k = 7$, maka $2k - 11 = 3$

Statement: If $k = 7$, then $2k - 11 = 3$

: Jika $2k - 11 \neq 3$, maka $k \neq 7$

: If $2k - 11 \neq 3$, then $k \neq 7$

Rajah 1 / Diagram 1

Antara berikut, yang manakah perlu diisi di petak kosong?

Which of the following must be filled in the box?

- A Premis/Premise
- B Akas/Converse
- C Songsangan/Inverse
- D Kontrapositif/Contrapositive

Soalan Subjektif

Jawab semua soalan.

- 1 (a) Tentukan sama ada pernyataan berikut merupakan pernyataan atau bukan pernyataan.
Determine whether the following sentence is a statement or not a statement.

$$m - 7 = 4$$

- (b) Lengkapkan hujah berikut:

Complete the following argument:

Premis 1: Jika $3m > 15$, maka $m > 5$.

Premise 1: If $3m > 15$ then $m > 5$.

Premis/ *Premise 2:*

Kesimpulan: $3m \leq 15$

Conclusion: $3m \leq 15$

- (c) Bentukkan suatu hujah induktif berdasarkan jujukan nombor 3, 8, 17, 30,

Form an inductive argument based on the sequence number 3, 8, 17, 30,

$$3 = 3(1) + 2(0)^2$$

$$8 = 3(2) + 2(1)^2$$

$$17 = 3(3) + 2(2)^2$$

$$30 = 3(4) + 2(3)^2$$

$$\dots = \dots$$

[4 markah/marks]

Jawapan/Answer:

(a)

(b)

(c)



Tingkatan 4

- 2 (a) Tulis akas dan kontrapositif bagi implikasi berikut:

Write the converse and contrapositive of the following implication:

$$\text{Jika } x = 5, \text{ maka } 2x - 3 = 7$$

$$\text{If } x = 5, \text{ then } 2x - 3 = 7$$

- (b) Buat satu kesimpulan umum secara aruhan bagi urutan nombor 4, 25, 60, 109, ... yang mengikut pola berikut:

Make a general conclusion by induction for the number sequence 4, 25, 60, 109, ... which follows the following pattern:

$$4 = 7(1)^2 - 3$$

$$25 = 7(2)^2 - 3$$

$$60 = 7(3)^2 - 3$$

$$109 = 7(4)^2 - 3$$

$$\dots = \dots$$

[4 markah/marks]

Jawapan/Answer:

(a)

(b)

- 3 (a) Nyatakan sama ada pernyataan berikut adalah benar atau palsu.
State whether the following statement is true or false.

-7 lebih kecil daripada 8 dan $(-8)^2 = 16$
 -7 is smaller than 8 and $(-8)^2 = 16$

- (b) Lengkapkan hujah berikut:

Complete the following argument:

Premis 1: Semua nombor perdana mempunyai dua faktor sahaja.

Premise 1: All prime numbers have two factors only.

Premis/Premise 2:

Kesimpulan: 19 mempunyai dua faktor sahaja.

Conclusion: 19 has two factors only.

[3 markah/marks]

Jawapan/Answer:

(a)

(b)

Tingkatan 4

- 4 (a) Tentukan sama ada hujah yang berikut adalah kuat atau lemah serta meyakinkan atau tidak meyakinkan.
Determine whether the following argument is strong or weak and cogent or not cogent. Give your justification.

Premis 1: 3 ialah faktor bagi 60.
Premise 1: 3 is a factor of 60.
 Premis 2: 5 ialah faktor bagi 60.
Premise 2: 5 is a factor of 60.
 Kesimpulan: Semua faktor 60 ialah nombor ganjil.
Conclusion: All the factors of 60 are odd numbers.

- (b) Berikut ialah satu hujah yang tidak lengkap.

The following is an incomplete argument.

Premis 1: Jika m ialah gandaan 6, maka m ialah gandaan 3.

Premise 1: If m is a multiple of 6, then m is multiple of 3.

Premis 2: 21 bukan gandaan 3.

Premise 2: 21 is not a multiple of 3.

Kesimpulan/Conclusion:

- (i) Lengkapkan kesimpulan dalam hujah tersebut.

Complete the conclusion in the argument.

- (ii) Tentukan hujah tersebut sah atau tidak sah serta munasabah atau tidak munasabah. Berikan justifikasi anda.

Determine whether the argument is valid or invalid, and sound or unsound. Provide your justification.

[4 markah/marks]

Jawapan/Answer:

(a)

(b) (i)

(ii)

- 5 (a) Tulis kontrapositif bagi implikasi berikut, dan tentukan nilai kebenarannya.
Write the contrapositive of the following implication and determine its truth value.

Jika 6 ialah faktor bagi 30, maka 30 boleh dibahagi tepat dengan 6.
If 6 is a factor of 30, then 30 is divisible by 6.

- (b) Gabungkan dua pernyataan berikut supaya menjadi satu pernyataan yang benar.
Combine the two following statements to form a true statement.

Pernyataan/Statement I: $(-3)^3 = 27$
Pernyataan/Statement II: $(-5)^2 = 25$

- (c) Lengkapkan ayat berikut dengan pengkuantiti “semua” atau “sebilangan” supaya menjadi suatu pernyataan palsu.
Complete the following statement with the quantifier “all” or “some” so that it will become a false statement.

_____ nombor perdana adalah nombor ganjil.
_____ *prime numbers are odd numbers.*

- (d) Berikut ialah satu hujah yang tidak lengkap.
The following is an incomplete argument.

Premis 1: Jika k ialah faktor bagi 36, maka 36 boleh dibahagi tepat dengan k .
Premise 1: If k is a factor of 36, then 36 is divisible by k .
Premis/Premise 2:
Kesimpulan: 3 bukan faktor bagi 36.
Conclusion: 3 is not a factor of 36.

- (i) Lengkapkan Premis 2 dalam hujah di atas.
Complete the Premise 2 in the argument.
(ii) Tentukan sama ada hujah tersebut sah atau tidak sah serta munasabah atau tidak munasabah.
Berikan justifikasi anda.
Determine whether the argument is valid or invalid, and sound or unsound. Give your justification.
- (e) Diberi bahawa jumlah sudut pedalaman sebuah poligon dengan n sisi ialah $(n - 2) \times 180^\circ$. Beri satu kesimpulan secara deduksi tentang jumlah sudut pedalaman sebuah heptagon.
It is given that the sum of the interior angles of a polygon of n sides is $(n - 2) \times 180^\circ$. Make one conclusion by deduction on the sum of the interior angles of heptagon.

[9 markah/marks]

Jawapan/Answer:

- (a)
- (b)
- (c)
- (d) (i) Premis/Premise 2:
(ii)
- (e)

BAB 4

Operasi Set Operations on Sets

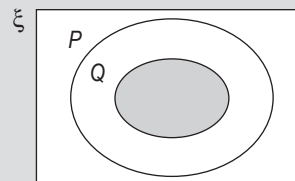
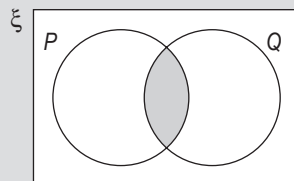


NOTA EFEKTIF

Persilangan Set Intersection of Sets

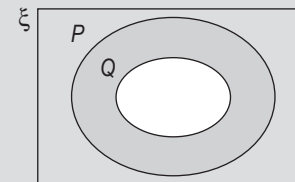
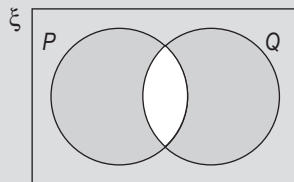
- 1 **Persilangan** set bagi set P dan set Q ialah set yang mengandungi unsur-unsur sepunya bagi kedua-dua set P dan set Q , $P \cap Q$.

The **intersection** of set P and set Q is a set that contains the common elements of both set P and set Q , $P \cap Q$.



- 2 **Pelengkap** bagi **persilangan** set P dan set Q ialah semua unsur dalam set semesta yang tidak terdapat dalam persilangan set P dan set Q , $(P \cap Q)'$.

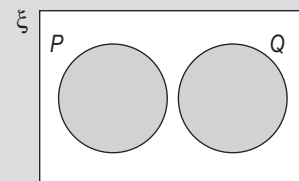
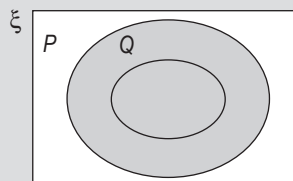
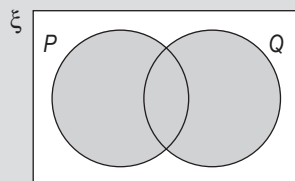
The **complement** of the **intersection** of set P and set Q is all the elements in the universal set that are not in the intersection of set P and set Q , $(P \cap Q)'$.



Kesatuan Set Union of Sets

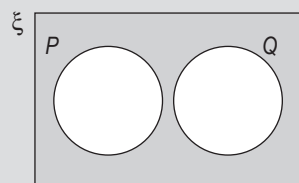
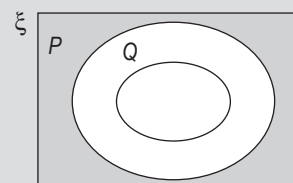
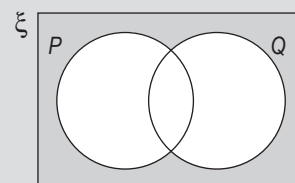
- 1 **Kesatuan** set bagi set P dan set Q ialah set yang mengandungi semua unsur dalam set P dan set Q , $P \cup Q$.

The **union** of set P and set Q is a set that contains all the elements in set P and set Q , $P \cup Q$.



- 2 **Pelengkap** bagi **kesatuan** set P dan set Q ialah semua unsur dalam set semesta yang tidak terdapat dalam kesatuan set P dan set Q , $(P \cup Q)'$.

The **complement** of the **union** of set P and set Q is all the elements in the universal set that are not in the union of set P and set Q , $(P \cup Q)'$.





LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 Rajah 1 menunjukkan maklumat mengenai set K dan set L .

Diagram 1 shows information of set K and set L .

$$\begin{aligned}\xi &= K \cup L \\ K &= \{g, h, i\} \\ L &= \{f, g, h, i, j, k, l\}\end{aligned}$$

Rajah 1 / Diagram 1

Berdasarkan maklumat yang diberi, pernyataan manakah yang **benar**?

Based on the information given, which of the following statements is **true**?

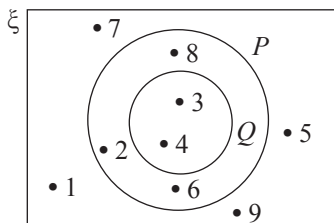
- A $n(K \cap L)' = 3$
B $n(K) = n(L)$
C $K \subset L$
D $K \cap L = \{f, g, h, i\}$
- 2 Diberi bahawa set semesta, $\xi = \{x : 20 < x < 32, x \text{ ialah integer}\}$ dan set $P = \{x : x \text{ ialah nombor dengan keadaan hasil tambah digit-digitnya ialah nombor genap}\}$. Cari set P .

It is given that universal set, $\xi = \{x : 20 < x < 32, x \text{ is an integer}\}$ and set $P = \{x : x \text{ is a number which the sum of its digits is an even number}\}$. Find set P .

- A $\{20, 22, 24, 26, 28, 31\}$
B $\{22, 24, 26, 28, 30, 32\}$
C $\{22, 24, 26, 28, 31\}$
D $\{20, 22, 24, 26, 28\}$

- 3 Rajah 2 ialah sebuah gambar rajah Venn yang menunjukkan unsur-unsur set semesta ξ , set P dan set Q .

Diagram 2 is a Venn diagram which shows the universal set ξ , set P and set Q .



Rajah 2 / Diagram 2

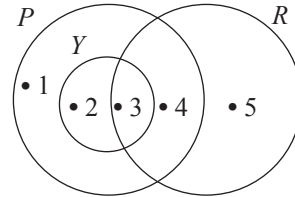
Cari nilai bagi $n(Q')$.

Find the value of $n(Q')$.

- A 2
B 5
C 7
D 9

- 4 Rajah 3 menunjukkan gambar rajah Venn dengan set semesta, $\xi = X \cup Y \cup Z$.

Diagram 3 shows a Venn diagram with the universal set, $\xi = X \cup Y \cup Z$.



Rajah 3 / Diagram 3

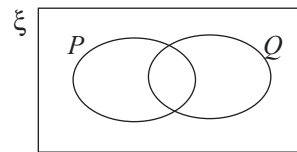
Senaraikan semua elemen bagi set Y' .

List all the elements of set Y' .

- A $\{1, 4\}$ C $\{5\}$
B $\{1, 4, 3, 4\}$ D $\{1, 4, 5\}$

- 5 Rajah 4 ialah sebuah gambar rajah Venn yang menunjukkan set semesta, ξ , set P dan set Q .

Diagram 4 is a Venn diagram showing the universal set, ξ , set P and set Q .



Rajah 4 / Diagram 4

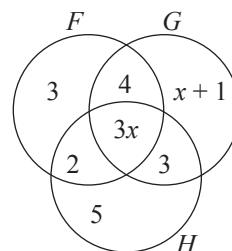
Jika $n(\xi) = 50$, $n(P) = 16$, $n(Q) = 18$ dan $n(P \cap Q) = 7$, cari nilai bagi $n(P \cup Q)'$.

If $n(\xi) = 50$, $n(P) = 15$, $n(Q) = 18$ and $(P \cap Q) = 7$, find the value of $n(P \cup Q)'$.

- A 16 C 23
B 18 D 27

- 6 Rajah 5 menunjukkan gambar rajah Venn dengan set semesta, $\xi = F \cup G \cup H$.

Diagram 5 shows a Venn diagram with the universal set, $\xi = F \cup G \cup H$.



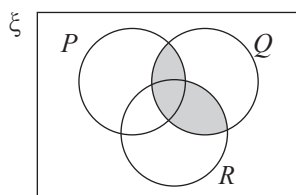
Rajah 5 / Diagram 5

Diberi $n(F \cap G) = n(H')$, cari nilai x .

Given $n(F \cap G) = n(H')$, find the value of x .

- A 2 C 6
B 4 D 8

- 7 Rajah 6 menunjukkan sebuah gambar rajah Venn.
Diagram 6 shows a Venn diagram.



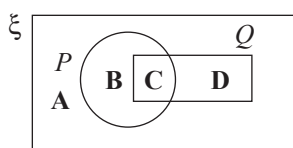
Rajah 6 / Diagram 6

Nyatakan set yang diwakili oleh kawasan berlorek.

State the set which is represented by the shaded region.

- A $(P \cup R) \cap Q$ C $(P \cap Q) \cup R$
B $(P \cap R) \cup Q$ D $(P \cup Q) \cap R$

- 8 Rajah 7 menunjukkan sebuah gambar rajah Venn.
Diagram 7 shows a Venn diagram.



Rajah 7 / Diagram 7

Antara kawasan A, B, C dan D, yang manakah mewakili set $P \cap Q$?

Which of the regions, A, B, C or D, represents the set $P \cap Q$?

- 9 Diberi bahawa set semesta, $\xi = \{x : 15 \leq x \leq 30, x \text{ ialah integer}\}$ dan set $N = \{x : x \text{ ialah nombor perdana}\}$.

It is given that universal set, $\xi = \{x : 15 \leq x \leq 30, x \text{ is an integer and set } N = \{x : x \text{ is a prime number}\}$.

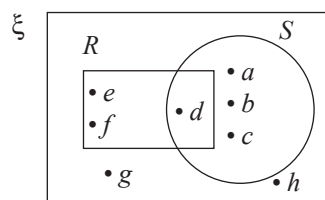
Senaraikan semua unsur bagi set N.

List all the elements of set N.

- A $\{15, 17, 19, 23\}$ C $\{15, 17, 21, 23, 29\}$
B $\{17, 19, 23, 29\}$ D $\{17, 19, 21, 23, 29\}$

- 10 Gambar rajah Venn dalam Rajah 8 menunjukkan set semesta, ξ , set R dan set S.

The Venn diagram in Diagram 8 shows the universal set, ξ , set R and set S.



Rajah 8 / Diagram 8

Senaraikan semua unsur bagi set $(R \cup S)'$.

List all the elements of set $(R \cup S)'$.

- A $\{g, h\}$
B $\{a, b, c\}$
C $\{e, f, g, h\}$
D $\{a, b, c, d, e, f\}$

Soalan Subjektif

Jawab semua soalan.

- 1 (a) Rajah 1 menunjukkan set P.

Diagram 1 shows set P.

Senaraikan subset bagi set P.

List the subsets of set P.

$$P = \{k, m, n\}$$

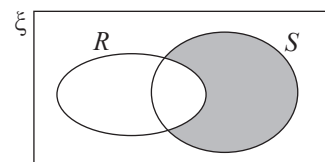
Rajah 1 / Diagram 1

- (b) Rajah 2 ialah sebuah gambar rajah Venn yang menunjukkan set semesta, ξ , set R dan set S.

Diagram 2 is a Venn diagram that shows the universal set, ξ , set R and set S.

Tentukan set yang diwakili oleh kawasan berlorek.

Determine the set that represents the shaded region.



Rajah 2 / Diagram 2

[4 markah/marks]

Jawapan/Answer:

(a)

(b)



- 2 Diberi set semesta, $\xi = \{x : 20 \leq x \leq 30, x \text{ ialah satu integer}\}$, set $R = \{x : x \text{ ialah satu nombor perdana}\}$, set $S = \{x : x \text{ mempunyai digit 1 atau 3}\}$, dan set $T = \{x : x \text{ ialah satu nombor dengan keadaan hasil tambah digit-digitnya ialah 3}\}$.

Given the universal set, $\xi = \{x : 20 \leq x \leq 30, x \text{ is an integer}\}$, set $R = \{x : x \text{ is a prime number}\}$, set $S = \{x : x \text{ has a digit 1 or 3}\}$, and set $T = \{x : x \text{ is a number such that the sum of its digits is 3}\}$.

- (a) Senaraikan semua unsur-unsur bagi set

List all the elements of set

(i) R

(ii) S

- (b) Cari $n(S \cup R \cap T')$.

Find $n(S \cup R \cap T')$.

[4 markah/marks]

Jawapan/Answer:

(a) (i)

(ii)

(b)

- 3 Diberi bahawa set $K = \{x : 37 \leq x < 50, x \text{ ialah integer}\}$, set $L = \{x : x \text{ ialah gandaan 3}\}$ dan set $M = \{x : x \text{ ialah nombor dengan keadaan hasil tambah digit-digitnya adalah lebih besar daripada 7}\}$.

$K = \{x : 37 \leq x < 50, x \text{ is an integer}\}$, $L = \{x : x \text{ is a multiple of 3}\}$ and set $M = \{x : x \text{ is a number such that the sum of its digits is greater than 7}\}$.

- (a) Senaraikan unsur bagi set L dan set M dengan menggunakan tatatanda set.

List the elements of sets L and M by using the set notation.

- (b) Seterusnya, lukis satu gambar rajah Venn untuk mewakili set semesta, set K , set L dan set M .

Hence, draw a Venn diagram to represent the universal set, set K , set L and set M .

[5 markah/marks]

Jawapan/Answer:

(a)

(b)

- 4 Seramai 200 orang murid terlibat dalam satu kajian mengenai sukan permainan kegemaran mereka. Hasil dapatan kajian adalah seperti dalam Jadual 1.

A total of 200 students involve in a survey about their favourite food. The results of the survey as shown in Table 1.

Sukan permainan <i>Sports games</i>	Bilangan murid <i>Number of students</i>
Bola sepak (S) <i>Soccer</i>	100
Badminton (B) <i>Badminton</i>	125
Hoki (H) <i>Hockey</i>	95
Bola sepak dan badminton <i>Soccer and badminton</i>	60
Badminton dan hoki <i>Badminton and hockey</i>	50
Bola sepak dan hoki sahaja <i>Soccer and hockey only</i>	10
Bola sepak, badminton dan hoki <i>Soccer, badminton and hockey</i>	35

Jadual 1 / Table 1

Berdasarkan maklumat dalam Jadual 1, hitung

Based on the information in Table 1, calculate

- (a) bilangan murid yang menggemari dua sukan permainan sahaja,
the number of students who like two sports games only,
- (b) bilangan murid yang menggemari bola sepak atau badminton tetapi tidak menggemari hoki.
the number of students who like soccer or badminton but do not like hockey.

[5 markah/marks]

Jawapan/Answer:

(a)

(b)

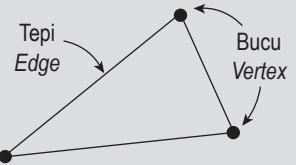
BAB 5

Rangkaian dalam Teori Graf Network in Graph Theory


 VIDEO
PEMBELAJARAN


NOTA EFEKTIF

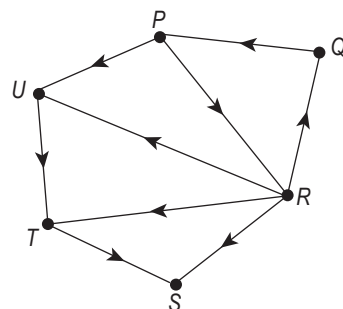
Bucu atau bintang, V Vertex or dot, V	Tepi atau garis, E Edge or line, E	Darjah, d Degree, d
$V = \{v_1, v_2, v_3, \dots, v_n\}$	$E = \{e_1, e_2, e_3, \dots, e_n\}$	$\sum d(V) = 2E$



Graf mudah Simple graph	- Tidak mempunyai gelung./Does not have loops. - Tidak mempunyai berbilang tepi./Does not have multiple edges. Bilangan darjah = $2 \times$ tepi Number of edges = $2 \times$ edges	
Graf gelung dan berbilang tepi Graph with loops and multiple edges	Berbilang tepi/Multiples edges: - Melibatkan dua bucu./Involve two vertices. - Dua bucu dihubungkan dengan lebih daripada satu tepi. Two vertices are connected by more than two edges. - Bilangan darjah ialah dua kali bilangan tepi. The number of degrees is twice the number of edges. Gelung/Loops: - Melibatkan satu bucu./Involve one vertex. - Tepi berbentuk lengkung atau bulatan yang berbalik kepada bucu asal. The edge is in the form of an arc that starts and ends at the same vertex. - Bilangan darjah setiap gelung ialah dua. The number of degrees in each loop is two.	
Graf terarah Directed graph	- Graf dengan keadaan tepi yang mengaitkan dua bucu ditandai dengan arah kaitan. A graph which a direction is assigned to the edges connecting two vertices. - Berdasarkan arah anak panah: Based on the directions of the arrows: - Tepi AB: A ialah bucu awal dan B ialah bucu akhir. Edge AB: A is the initial vertex and B is the terminal vertex. - Semua bucu dikaitkan dengan satu arah sahaja. All vertices are connected in one direction only.	
Graf tak terarah Undirected graph	Graf mudah atau graf yang mempunyai gelung dan berbilang tepi yang dilukis tanpa penandaan arah. A simple graph or a graph with loops and multiple edges drawn without any direction being assigned.	
Graf berpemberat Weighted graph	- Tepi menunjukkan nilai atau pemberat. Edges show a value or a weight. - Melibatkan graf terarah dan graf tak terarah. Involves directed graph and undirected graph. - Tepi mewakili jarak antara dua tempat, masa pergerakan, nilai arus litar elektrik, kos dan sebagainya. The edges represent the distance between two places, travelling time, the current in an electrical circuit, cost and etcetera.	

**Graf tak
berpemberat**
Unweighted graph

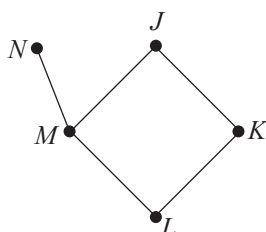
- Tepi tanpa nilai atau pemberat.
Edges without value or a weight
- Melibatkan graf terarah dan graf tak terarah.
Involves directed graph and undirected graph.
- Tepi mengaitkan maklumat seperti hierarki jawatan dalam carta organisasi, peta alir, peta pokok dan peta buih.
The edge relates information like job hierarchy in an organization chart, flow map, tree map, and bubble map.



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

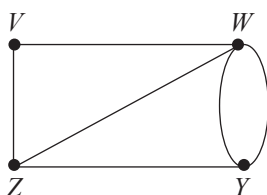
- 1 Rajah 1 menunjukkan suatu graf.
Diagram 1 shows a graph.



Rajah 1 / Diagram 1

Nyatakan set bucu.
State the set of vertices.

- A $\{J, N\}$
B $\{J, M, N\}$
C $\{J, K, L, M\}$
D $\{J, K, L, M, N\}$
- 2 Rajah 2 menunjukkan suatu graf yang mempunyai gelung dan berbilang tepi.
Diagram 2 shows a graph that has a loop and multiple edges.

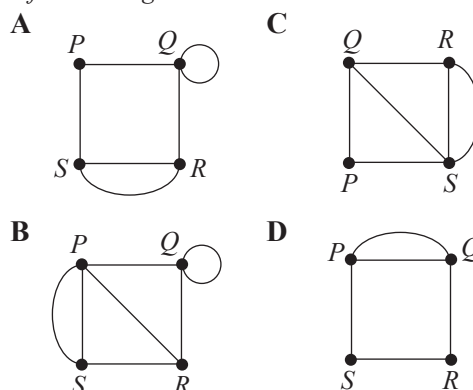


Rajah 2 / Diagram 2

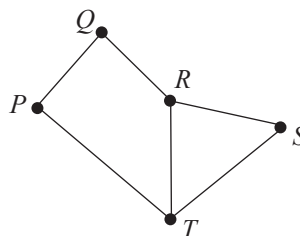
Hitung $n(V)$.
Find $n(V)$.

- A 4
B 5
C 6
D 7

- 3 Diberi $E = \{(P, Q), (P, S), (P, S), (P, R), (Q, Q), (Q, R), (R, S)\}$.
Given $E = \{(P, Q), (P, S), (P, S), (P, R), (Q, Q), (Q, R), (R, S)\}$.
Antara graf berikut, yang manakah mewakili maklumat yang diberikan?
Which of the following graphs represents the information given?



- 4 Rajah 3 menunjukkan suatu graf.
Diagram 3 shows a graph.



Rajah 3 / Diagram 3

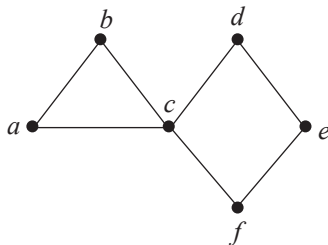
Cari jumlah darjah graf itu.
Find the total degree of the graph.

- A 5
B 6
C 10
D 12

- 5 Antara berikut, yang manakah bilangan darjah suatu graf?
Which of the following is the number of degrees of a graph?
- A 1, 1, 2, 2, 3
B 1, 2, 2, 3, 3
C 2, 2, 3, 3, 4
D 2, 2, 3, 4, 4

- 6 Satu pokok mempunyai bucu P , Q , R dan S . Antara berikut, yang manakah mungkin set tepinya?
A tree has vertices P , Q , R and S . Which of the following is a possible set of edges?
- A $\{(P, Q), (P, R), (Q, R)\}$
B $\{(P, Q), (P, R), (R, S)\}$
C $\{(P, Q), (S, P), (Q, Q)\}$
D $\{(P, Q), (Q, R), (Q, S)\}$

- 7 Rajah 4 menunjukkan suatu graf.
Diagram 4 shows a graph.

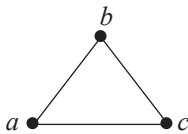


Rajah 4 / Diagram 4

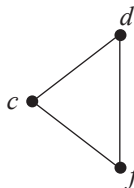
Antara berikut, yang manakah **bukan** subgraf bagi graf itu?

*Which of the following is **not** a subgraph of the graph?*

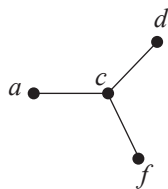
A



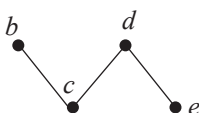
B



C

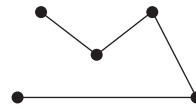


D

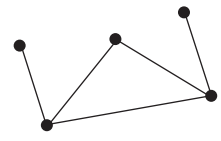


- 8 Antara berikut, yang manakah suatu pokok?
Which of the following is a tree?

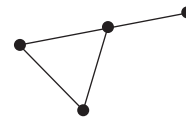
A



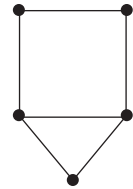
C



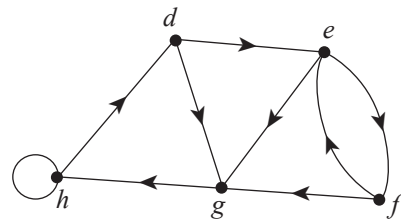
B



D



- 9 Rajah 5 menunjukkan suatu graf terarah.
Diagram 5 shows a directed graph.



Rajah 5 / Diagram 5

Antara berikut, yang manakah benar mengenai graf tersebut?

Which of the following is true about the graph?

A $d_{in}(g) = 2, d_{out}(d) = 1$

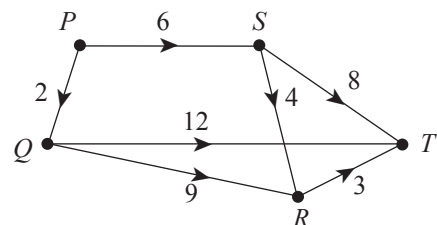
B $d_{in}(e) = 2, d_{out}(g) = 1$

C $d_{in}(f) = 3, d_{out}(e) = 2$

D $d_{in}(d) = 3, d_{out}(h) = 2$

- 10 Rajah 6 menunjukkan suatu graf terarah dan berpemberat yang menghubungkan lima tempat di sebuah bandar.

Diagram 6 shows a directed and weighted graph connecting five places in a town.



Rajah 6 / Diagram 6

Antara berikut, laluan manakah yang paling optimum untuk bergerak dari P ke T ?

Which of the following is the most optimal route to travel from P to T ?

A $P \rightarrow Q \rightarrow T$

B $P \rightarrow S \rightarrow T$

C $P \rightarrow S \rightarrow R \rightarrow T$

D $P \rightarrow Q \rightarrow R \rightarrow T$

Soalan Subjektif

Jawab semua soalan.

1 Rajah 1 menunjukkan sebuah graf.

Diagram 1 show a graph.

Nyatakan bilangan

State the number of

(a) bucu,
vertices,

(b) tepi,
edges,

(c) darjah.
degrees.

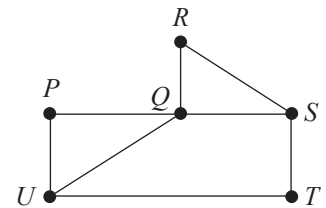
[4 markah/marks]

Jawapan/Answer:

(a)

(b)

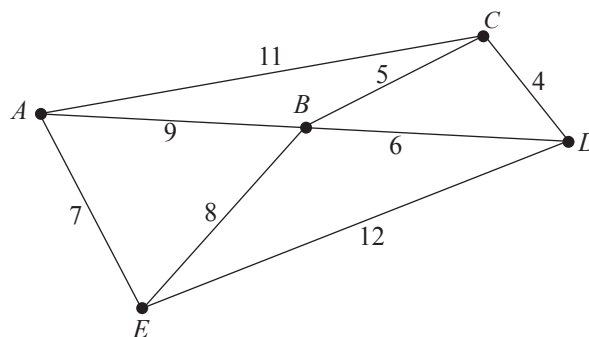
(c)



Rajah 1 / Diagram 1

2 Rajah 2 menunjukkan rangkaian kedudukan lima buah rumah yang dihubungkan oleh jalan raya antara satu sama lain. Masa yang diambil, dalam minit, untuk berjalan dari satu rumah ke rumah yang lain diwakili oleh nilai yang ditunjukkan pada setiap tepi. Azmi bertolak dari rumah A untuk menghantar kad jemputan perkahwinannya ke setiap rumah dan kembali ke rumah A dengan purata laju 1.15 meter per saat.

Diagram 2 shows a network of position of five houses connected by roads to each other. The time taken, in minutes, to walk from a house to another house is represented by the value shown at the edges. Azmi departed from house A to send his wedding invitation cards to each house and return to house A with an average speed of 1.15 metre per second.



Rajah 2 / Diagram 2

(a) Cari masa terpendek, dalam minit, bagi perjalanan Azmi.

Find the shortest time, in minutes, of Azmi's journey.

(b) Cari jarak terpendek, dalam m, perjalanan Azmi.

Find the shortest distance, in m, of Azmi's journey.

[4 markah/marks]

Jawapan/Answer:

(a)

(b)



- 3 Jadual 1 menunjukkan jarak yang menghubungkan enam buah bandar iaitu Bandar A , B , C , D , E dan F .
 Table 1 shows the distance connecting six cities, namely City A , B , C , D , E and F .

Pasangan bucu Vertex pairs	Jarak (km) Distance (km)
A dan/ <i>and</i> B	5.5
A dan/ <i>and</i> E	12.6
A dan/ <i>and</i> F	8.2
B dan/ <i>and</i> C	7.8
B dan/ <i>and</i> F	4.6
C dan/ <i>and</i> D	5.2
C dan/ <i>and</i> F	4.5
F dan/ <i>and</i> D	3.2
E dan/ <i>and</i> D	4.3
F dan/ <i>and</i> E	5.0

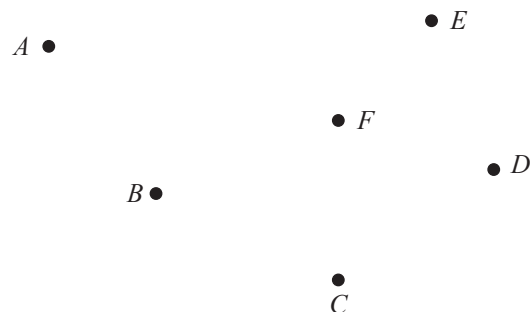
Jadual 1 / Table 1

- (a) Lengkapkan graf tak terarah dan berpemberat di ruang jawapan untuk mewakili maklumat dalam jadual di atas.
 Complete an undirected and weighted graph in the answer space to represent the information in the table above.
- (b) (i) Lukis satu pokok berpemberat minimum dengan keadaan setiap bandar dilalui sekali sahaja.
 Draw a tree with a minimum total weight which shows every city being visited once only.
- (ii) Hitung jarak minimum pokok itu berdasarkan jawapan di (b)(i).
 Calculate the minimum distance of the tree based on the answer in (b)(i).

[6 markah/marks]

Jawapan/Answer:

(a)



(b) (i)

(ii)



BAB 6

Ketaksamaan Linear dalam Dua Pemboleh Ubah

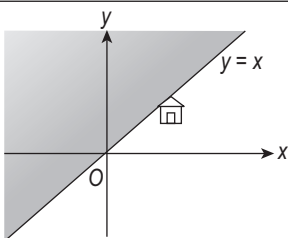
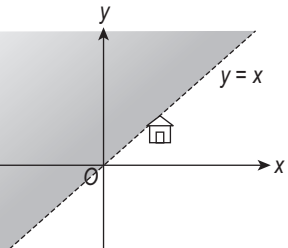
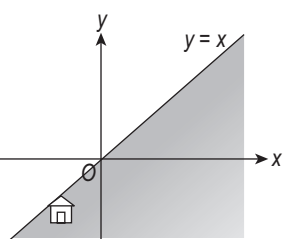
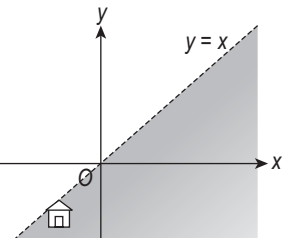
Linear Inequalities in Two Variables



VIDEO
PEMBELAJARAN

NOTA EFEKTIF

1	Contoh situasi <i>Example of situation</i>	Ketaksamaan linear <i>Linear inequality</i>	Contoh situasi <i>Example of situation</i>	Ketaksamaan linear <i>Linear inequality</i>
	y lebih besar daripada x <i>y greater than x</i>	$y > x$	y kurang daripada x <i>y less than x</i>	$y < x$
	y tidak kurang daripada x <i>y is not less than x</i>	$y \geq x$	y tidak lebih daripada x <i>y is not more than x</i>	$y \leq x$
	y sekurang-kurangnya k kali ganda x <i>y is at least k times x</i>	$y \geq kx$	y selebih-lebihnya k kali ganda x <i>y is at most k times x</i>	$y \leq kx$
	Minimum y ialah k <i>Minimum of y is k</i>	$y \geq k$	Maksimum y ialah k <i>Maximum of y is k</i>	$y \leq k$
	Jumlah x dan y tidak kurang daripada k <i>Total x and y is not less than k</i>	$x + y \geq k$	Beza x dan y tidak lebih daripada k <i>Different x and y not more than k</i>	$x - y \leq k$
	y melebihi x sekurang-kurangnya k <i>y is more than x by at least k</i>	$y - x \geq k$	x melebihi y selebih-lebihnya k <i>x is more than y by at most k</i>	$x - y \leq k$

2	Ketaksamaan <i>Inequality</i>	Jenis garisan <i>Type of lines</i>	Contoh rantau berlorek <i>Example of shaded region</i>
	$y \geq x$	Garis padu <i>Solid line</i>	
	$y > x$	Garis sempang <i>Dashed line</i>	
	$y \leq x$	Garis padu <i>Solid line</i>	
	$y < x$	Garis sempang <i>Dashed line</i>	

Rantau atas dilorek
Region above shaded

Rantau bawah dilorek
Region below shaded



LATIHAN INTENSIF

Soalan Objektif

Jawab semua soalan.

- 1 Penyelesaian bagi $6 - \frac{5}{2}x \geq 5x$ ialah

The solution for $6 - \frac{5}{2}x \geq 5x$ is

- A $x \leq -3$ C $x \leq \frac{4}{5}$
B $x \leq -\frac{3}{2}$ D $x \geq \frac{4}{5}$

- 2 Antara ketaksamaan berikut, yang manakah memuakan ketaksamaan linear serentak $3x - 6 < x$ dan $9 + 4x \geq x$?

Which of the following inequalities satisfies the simultaneous linear inequalities $3x - 6 < x$ and $9 + 4x \geq x$?

- A $3 \leq x < -3$ C $-3 < x \leq 3$
B $-3 \leq x < 3$ D $3 < x \leq -3$

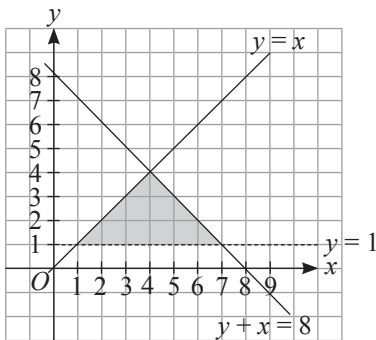
- 3 Antara berikut, titik yang manakah memuakan ketaksamaan linear $y \leq \frac{1}{2}x + 7$?

Which of the following point satisfies the linear inequality $y \leq \frac{1}{2}x + 7$?

- A $(-2, 6)$ C $(2, 9)$
B $(-4, 6)$ D $(4, 10)$

- 4 Rajah 1 menunjukkan rantau berlorek yang dibatasi oleh tiga garis lurus.

Diagram 1 shows the shaded region bounded by three straight lines.



Rajah 1 / Diagram 1

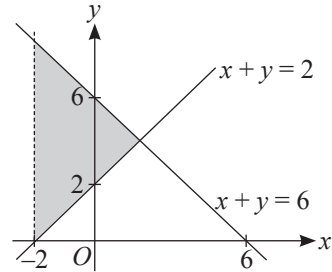
Antara berikut, yang manakah sistem ketaksamaan linear yang mewakili rantau berlorek di atas?

Which of the following is the system of linear inequalities that represents the shaded region above?

- A $y \leq x, y + x \leq 8, y > 1$
B $y \leq x, y + x \leq 8, y \geq 1$
C $y \geq x, y + x \geq 8, y > 1$
D $y \leq x, y + x \leq 8, y \leq 1$

- 5 Rajah 2 menunjukkan sebuah graf yang mewakili suatu sistem ketaksamaan linear.

Diagram 2 shows a graph representing a system of linear inequalities.



Rajah 2 / Diagram 2

Antara berikut, titik yang manakah **tidak** memuakan rantau berlorek?

Which of the following points does **not** satisfy the shaded region?

- A $(0, 3)$
B $(-1, 5)$
C $(1, 4)$
D $(-2, 6)$

- 6 Penyelesaian $3 - \frac{r}{2} \leq 5 - r$ ialah

The solution for $3 - \frac{r}{2} \leq 5 - r$ is

- A $r \leq -4$ C $r \leq 4$
B $r \geq -4$ D $r \geq 7$

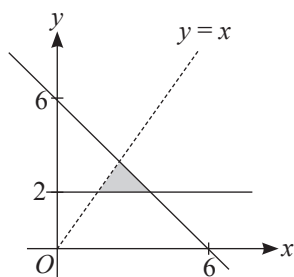
- 7 Sebuah kedai buku ingin menempah x buah novel dan y buah buku cerita. Harga bagi sebuah novel dan sebuah buku cerita masing-masing ialah RM19.90 dan RM8.90. Bilangan buku cerita yang ditempah melebihi bilangan novel sekurang-kurangnya sebanyak 15 buah. Jumlah wang yang diperuntukkan tidak melebihi RM500. Ungkapkan situasi yang diberikan dalam bentuk ketaksamaan.

A bookstore wants to order x units of novels and y units of storybooks. The price of a novel and a storybook is RM19.90 and RM8.90 respectively. The number of storybooks ordered is more than the number of novels by at least 15. The amount of money allocated is not exceed than RM500. Express the given situation in the form of an inequality.

- A $19.9x + 8.9y < 500, x - y \geq 15$
B $19.9x + 8.9y \leq 500, y - x \geq 15$
C $19.9x + 8.9y > 500, y - x < 15$
D $19.9x + 8.9y \geq 500, y - x > 15$

- 8 Rajah 3 menunjukkan rantau berlorek yang memuaskn tiga ketaksamaan yang diwakili oleh tiga garis lurus.

Diagram 3 shows the shaded region that satisfying three inequalities represents by three straight lines.



Rajah 3 / Diagram 3

Tiga ketaksamaan itu ialah

The three inequalities are

- A $y > 2, 6x \leq 6y, y \leq x$
 B $y > 2, y \geq 6 - x, y < x$
 C $y \geq 2, y + x \leq 6 + x, x < y$
 D $y \geq 2, y \leq 6 - x, y < x$

Tingkatan 4

Soalan Subjektif

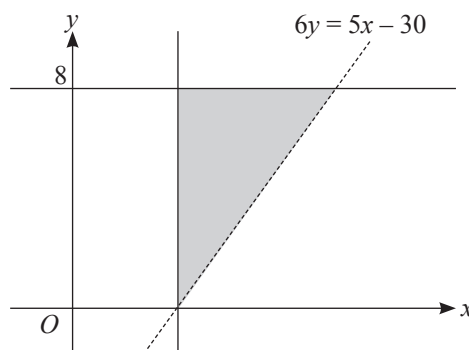
Jawab semua soalan.

- 1 Tuliskan tiga ketaksamaan yang memuaskn rantau berlorek.

Write three inequalities that satisfy the shaded region.

Jawapan/Answer:

- (a)
 (b)
 (c)



[3 markah/marks]

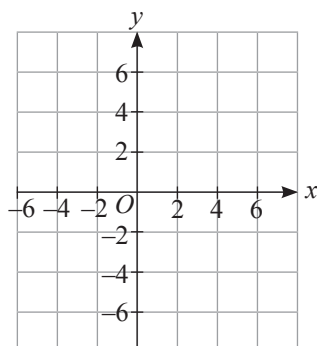
- 2 Lukis graf dan lorek rantau yang memuaskn ketaksamaan linear yang berikut.

Draw a graph and shade the region that satisfies the following linear inequalities.

$$x - y - 4 \leq 0, x + y > 0, x \leq 4$$

[4 markah/marks]

Jawapan/Answer:



- 3 Syarikat *QR Care* ingin mengadakan hari keluarga. Mereka bercadang untuk menempah baju untuk orang dewasa dan kanak-kanak. Tempahan sebanyak x helai kemeja-T dewasa dan y helai kemeja-T kanak-kanak. Tempahan kemeja-T berdasarkan maklumat berikut:
- QR Care Company plans to hold a family day. They intend to order T-shirts for adults and children. The order consists of x adult T-shirts and y children's T-shirts. The T-shirt order is based on the following information:*
- Jumlah tempahan kedua-dua jenis kemeja-T adalah kurang daripada 80 helai.
The total number of both types of T-shirts is less than 80 pieces.
 - Tempahan baju kemeja-T dewasa adalah sekurang-kurangnya separuh daripada bilangan kemeja-T kanak-kanak.
The number of adult T-shirts ordered is at least half of the number of children's T-shirts.
 - Tempahan minimum untuk kemeja-T kanak-kanak adalah 20 helai.
The minimum order for children's T-shirts is 20 pieces.
- (a) Berdasarkan maklumat yang diberi, tulis tiga ketaksamaan linear, selain $x \geq 0$ dan $y \geq 0$.
Based on the information given, write three linear inequalities, other than $x \geq 0$ and $y \geq 0$.
- (b) Menggunakan skala 2 cm kepada 10 helai kemeja-T pada kedua-dua paksi, lukis dan lorekkan kawasan yang memuaskan sistem ketaksamaan linear itu.
Using a scale of 2 cm to 10 pieces of T-shirt on both axes, draw and shade the regions that satisfy the system of linear inequalities.
- (c) Daripada graf,
From the graph,
- tentukan bilangan maksimum kemeja-T kanak-kanak jika kemeja-T dewasa yang dibeli ialah 20 helai,
determine the maximum number of children's T-shirts if 20 adult's T-shirts are purchased,
 - berapakah jumlah harga maksimum yang perlu dibayar sekiranya harga sehelai kemeja-T dewasa dan sehelai kemeja-T kanak-kanak masing-masing ialah RM20 dan RM10?
what is the maximum total price to be paid if the price of an adult T-shirt and a children's T-shirt is RM20 and RM10 respectively?

[10 markah/marks]

Jawapan/Answer:

(a)

(b) Rujuk graf.

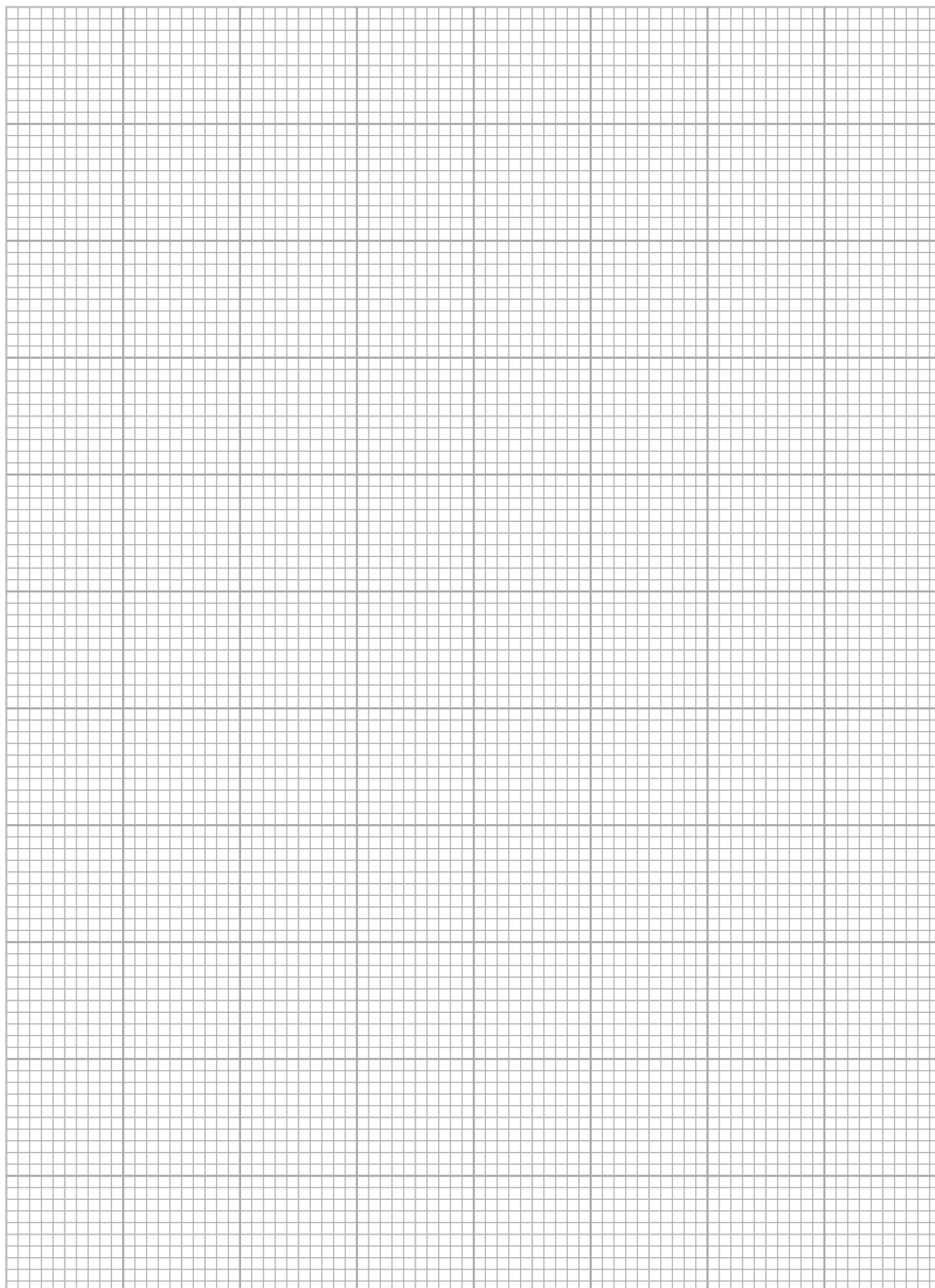
Refer to the graph.

(c) (i)

(ii)

Graf untuk Soalan 3
Graph for Question 3

Tingkatan 4



- 4 Chuah merancang untuk membeli beg dan rantai kunci untuk cenderahati sempena majlis sambutan hari lahirnya. Jadual 1 menunjukkan bilangan cenderahati serta harga bagi setiap jenis.

Chuah plans to buy bags and keychains as souvenirs for her birthday celebration. Table 1 shows the number of souvenirs and the price for each type.

Jenis cenderahati <i>Type of souvenir</i>	Bilangan cenderahati <i>Number of souvenirs</i>	Harga per unit <i>Price per unit</i>
Beg <i>Bag</i>	x	RM3
Rantai kunci <i>Keychains</i>	y	RM10

Jadual 1 / Table 1

Syarat-syarat pembelian cenderahati adalah seperti berikut:

The conditions for purchasing the souvenirs are as follows:

- I: Bilangan beg yang dibeli tidak melebihi 50.
The number of bags purchased does not exceed 50.
- II: Bilangan rantai kunci selebih-lebihnya dua kali bilangan beg.
The number of keychains is at most twice the number of the bags.
- III: Jumlah harga pembelian melebihi RM350.
The purchase amount does exceed RM350.

- (a) Tulis tiga ketaksamaan linear, selain $x \geq 0$ dan $y \geq 0$, yang memuaskan semua syarat-syarat di atas.
Write three linear inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the conditions above.
- (b) Dengan menggunakan skala 2 cm kepada 10 unit pada setiap paksi, lukis dan lorek rantau yang memuaskan sistem ketaksamaan linear di atas.
By using a scale of 2 cm to 10 units on each axis, draw and shade the region that satisfy the above linear inequalities system.
- (c) Menggunakan graf di (b),
Using the graph in (b),
 - (i) cari jumlah harga maksimum bagi kedua-dua cenderahati itu,
find the total maximum price for both souvenirs,
 - (ii) 15 buah beg dan 70 rantai kunci telah dibeli. Adakah penjualan ini memuaskan sistem ketaksamaan linear yang anda bina? Berikan justifikasi anda.
15 bags and 70 keychains were purchased. Does this purchase satisfy the system of linear inequalities you constructed? Give your justification.

[12 markah/marks]

Jawapan/Answer:

(a)

(b) Rujuk graf.
Refer to the graph.

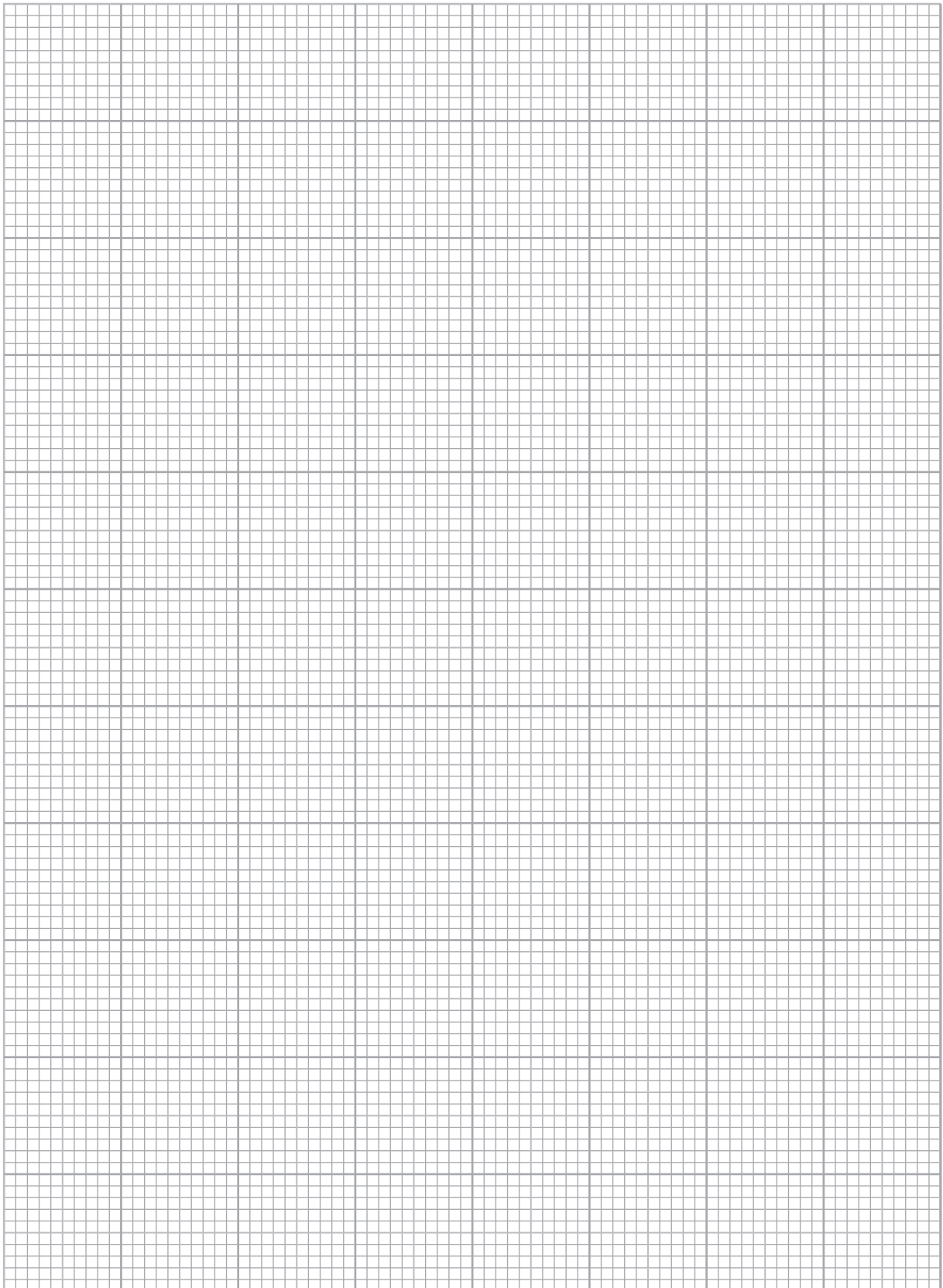
(c) (i)

(ii)



Graf untuk Soalan 4
Graph for Question 4

Tingkatan 4



BAB 7

Graf Gerakan Graphs of Motion


 VIDEO
PEMBELAJARAN

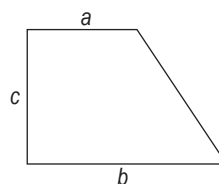

NOTA EFEKTIF

Jenis graf Type of graphs Item Items	Graf Jarak-Masa Distance-Time Graphs	Graf Laju-Masa Speed-Time Graphs	
	Jarak Distance	Nilai dibaca daripada graf The value read from the graph	Luas di bawah graf The area under the graph
	Laju/Kadar perubahan jarak Speed/Rate of change of distance	Kecerunan graf The gradient of the graph Laju = $\frac{\text{Jarak}}{\text{Masa}}$ Speed = $\frac{\text{Distance}}{\text{Time}}$	Nilai dibaca daripada graf The value read from the graph
	Laju purata Average speed	Laju purata = $\frac{\text{Jumlah jarak}}{\text{Jumlah masa}}$ Average speed = $\frac{\text{Total distance}}{\text{Total time}}$	
	Pecutan/Kadar perubahan laju Acceleration/Rate of change of speed	Kecerunan graf The gradient of the graph	

TIP

 Luas trapezium
Area of trapezium

$$= \frac{1}{2} \times (a + b) \times c$$





LATIHAN INTENSIF

Soalan Objektif

Jawab semua soalan.

- 1 Jadual 1 menunjukkan rekod perjalanan Dinar dari sekolah ke rumahnya.

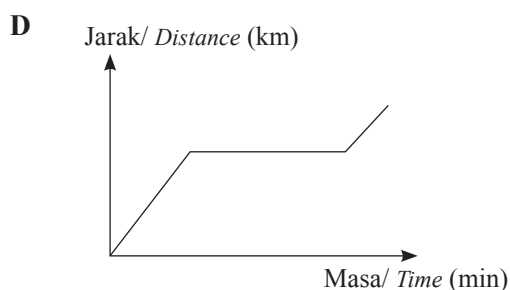
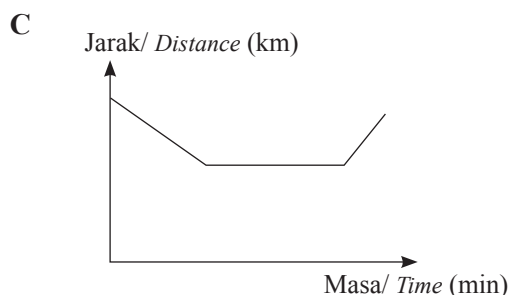
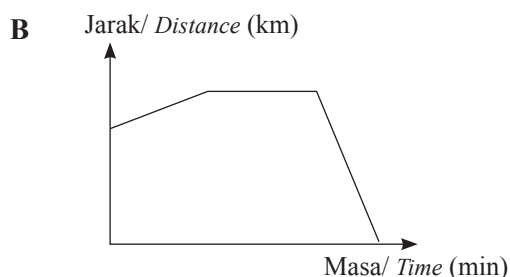
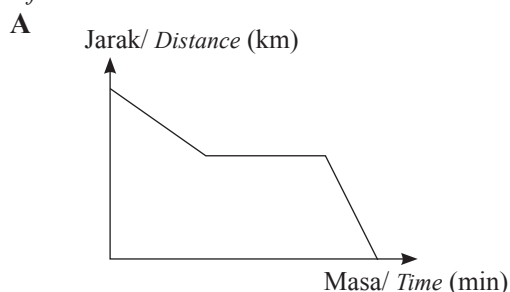
Table 1 shows the record of Dinar's journey from school to her home.

Masa (minit) Time (minutes)	0	1	3	7	9	15
Jarak (km) Distance (km)	5.0	4.0	3.0	3.0	1.8	0

Jadual 1 / Table 1

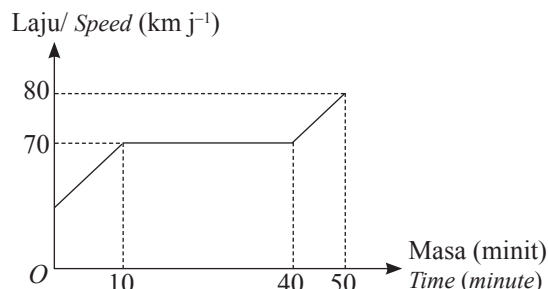
Antara berikut, graf yang manakah mewakili maklumat itu?

Which of the following graphs represents the information?



- 2 Rajah 1 menunjukkan graf laju-masa motosikal Jerry untuk tempoh masa 50 minit.

Diagram 1 shows the speed-time graph of Jerry's motorcycle for a duration of 50 minutes.



Rajah 1 / Diagram 1

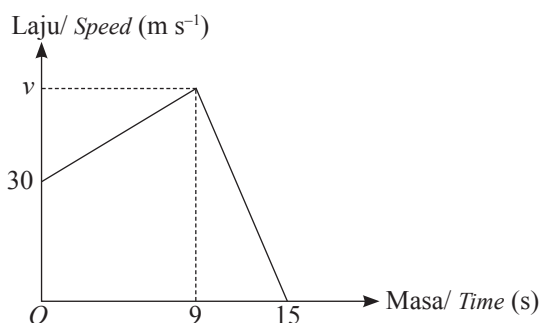
Nyatakan laju seragam, dalam km j^{-1} , motosikal itu.

State the uniform speed, in km h^{-1} , of the motorcycle.

- A 40
B 70
C 50
D 80

- 3 Rajah 2 menunjukkan graf laju-masa bagi sebuah kereta dalam tempoh 15 saat.

Diagram 2 shows a speed-time graph of a car in a period of 15 seconds.



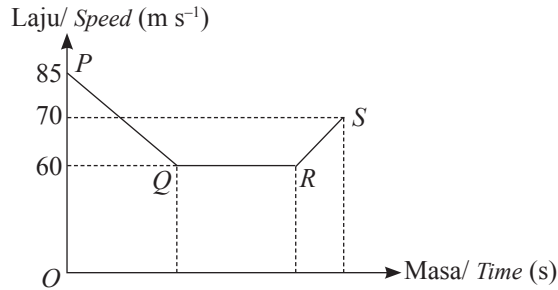
Rajah 2 / Diagram 2

Diberi bahawa kadar perubahan laju dalam tempoh 6 saat yang terakhir ialah 7.5 m s^{-2} , cari nilai v .

Given that the rate of change of speed during the last 6 seconds is 7.5 m s^{-2} , find the value of v .

- A 40
B 5
C 45
D 0

- 4 Rajah 3 menunjukkan graf laju-masa bagi gerakan sebuah motosikal dari bandar P ke bandar S melalui bandar Q dan bandar R .
Diagram 3 shows the speed-time graph for the motion of a motorcycle from town P to town S through towns Q and R .



Rajah 3 / Diagram 3

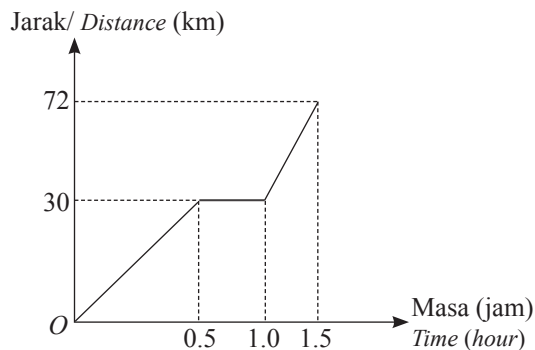
Antara pernyataan berikut, yang manakah betul tentang gerakan motosikal itu?

Which of the following statements is correct about the motion of the motorcycle?

- A PQ : Kelajuan semakin bertambah
The speed is increasing
- B QR : Motosikal berhenti
The motorcycle stops
- C QR : Motosikal bergerak dengan kelajuan seragam
The motorcycle moves at a uniform speed
- D RS : Kelajuan semakin berkurang
The speed is decreasing

- 5 Rajah 4 menunjukkan graf jarak-masa bagi perjalanan sebuah kereta.

Diagram 4 shows the distance-time graph for the journey of a car.



Rajah 4 / Diagram 4

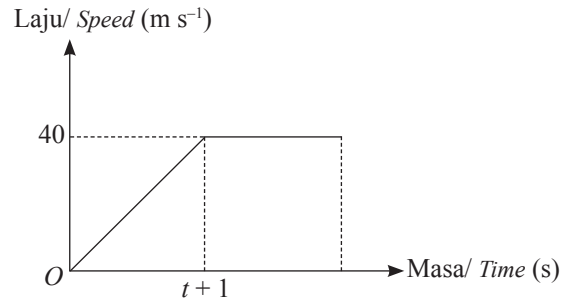
Hitung laju purata, dalam km j^{-1} , bagi keseluruhan perjalanan kereta tersebut.

Calculate the average speed, in km h^{-1} , for the car's entire journey.

- A 72
B 30
C 60
D 48

- 6 Rajah 5 menunjukkan graf laju-masa gerakan suatu zarah.

Diagram 5 shows the speed-time graph for the motion of a particle.



Rajah 5 / Diagram 5

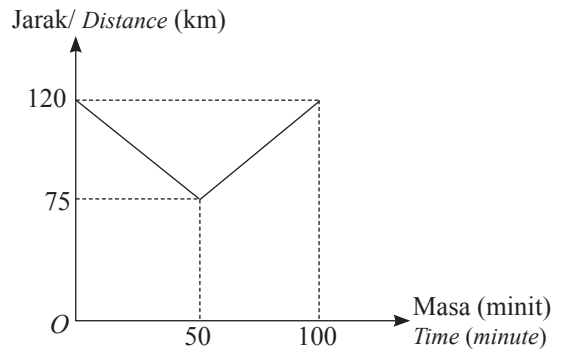
Jika kadar perubahan laju seragam sebelum laju seragam ialah 4 m s^{-2} , cari nilai t .

If the uniform rate of change of speed before the uniform speed is 4 m s^{-2} , find the value of t .

- A 8
B 9
C 10
D 11

- 7 Rajah 6 menunjukkan graf jarak-masa bagi pergerakan Danish dari Tanjung Malim ke Shah Alam.

Diagram 6 shows the distance-time graph of Danish's journey from Tanjung Malim to Shah Alam.



Rajah 6 / Diagram 6

Berapakah kelajuan seragam antara minit 50 hingga minit 100?

What is the uniform speed between minute 50 to minute 100?

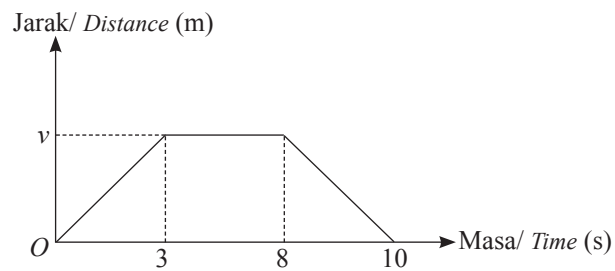
- A 0.75 km/min^{-1}
B 0.9 km/min^{-1}
C 0.45 km/min^{-1}
D 0.3 km/min^{-1}

Soalan Subjektif

Jawab semua soalan.

- 1 Rajah 1 menunjukkan pergerakan suatu zarah dalam tempoh masa 10 saat.

Diagram 1 shows the motion of a particle over a period of 10 seconds.



Rajah 1 / Diagram 1

- (a) Tentukan tempoh masa, dalam saat, zarah itu berada dalam keadaan pegun.
Determine the duration, in seconds, that the particle is stationary.
- (b) Hitung nilai v , jika laju zarah bagi 3 saat yang pertama ialah 100 m s^{-1} .
Calculate the value of v , if the speed of the particle for the first 3 seconds is 100 m s^{-1} .
- (c) Hitung kadar perubahan jarak, dalam m s^{-1} , untuk tempoh 2 saat terakhir.
Calculate the rate of change of distance, in m s^{-1} , for the last 2 seconds.

[1 markah/mark]

[2 markah/marks]

[2 markah/marks]

Jawapan/Answer:

(a)

(b)

(c)

- 2 Jadual 1 menunjukkan rekod pergerakan sebuah meteor yang sedang menghampiri Bumi.
 Table 1 shows the record of the movement of a meteor approaching the Earth.

Masa (saat) Time (seconds)	0	10	20	30	40	50
Jarak (km) Distance (km)	500	400	300	200	100	0

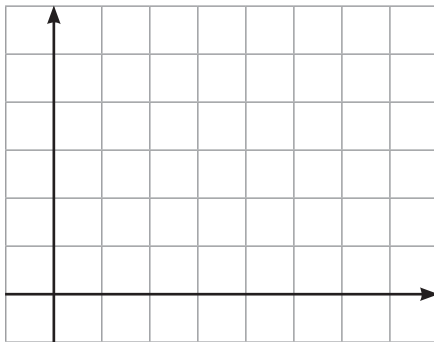
Jadual 1 / Table 1

- (a) Lukis graf jarak-masa berdasarkan maklumat yang diberi.
 Draw a distance-time graph based on the given information.
- (b) Berdasarkan graf, nyatakan
 Based on the graph, state
- (i) jarak awal meteor dari Bumi pada saat ke-0,
 the initial distance of the meteor from the Earth at time 0 seconds,
- (ii) masa yang diambil meteor untuk sampai ke permukaan Bumi.
 the time taken by the meteor to reach the Earth's surface.
- (c) Hitung kelajuan seragam meteor sepanjang pergerakannya.
 Calculate the uniform speed of the meteor throughout its motion.

[6 markah/marks]

Jawapan/Answer:

(a)

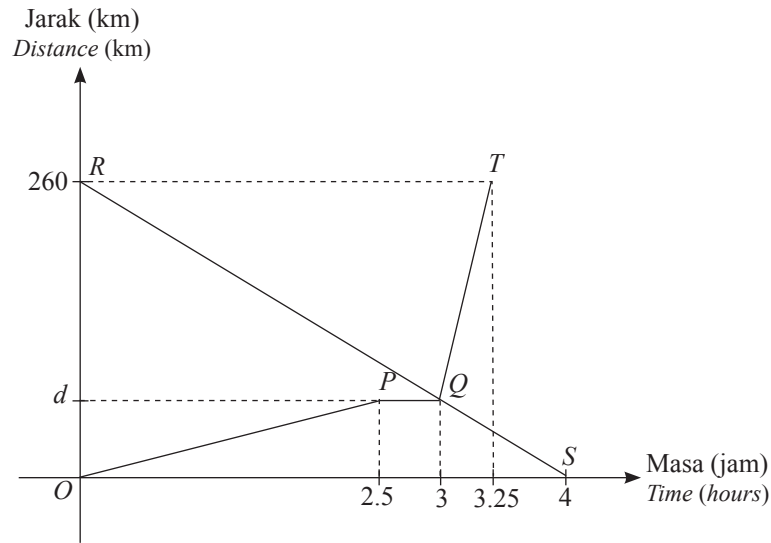


(b) (i)

(ii)

(c)

- 3 Rajah 2 ialah graf jarak-masa yang menunjukkan perjalanan sebuah kereta dan sebuah bas. Graf $OPQT$ ialah pergerakan kereta dari X ke Y manakala graf RQS ialah pergerakan bas dari Y ke X .
 Diagram 2 is a distance-time graph showing the journey of a car and a bus. The graph of $OPQT$ is the movement of the car from X to Y while the graph of RQS is the movement of the bus from Y to X .



Rajah 2 / Diagram 2

- (a) Nyatakan tempoh masa, dalam minit, kereta itu berada dalam keadaan pegun.
 State the length of time, in minutes, the car was stationary. [1 markah/mark]
- (b) Hitung nilai d .
 Calculate the value of d . [2 markah/marks]
- (c) Hitung jarak yang dilalui oleh bas dari Y , ketika kedua-dua kenderaan itu berselisih.
 Calculate the distance travelled by the bus from Y , when the two vehicles crossed one another. [2 markah/marks]

Jawapan/Answer:

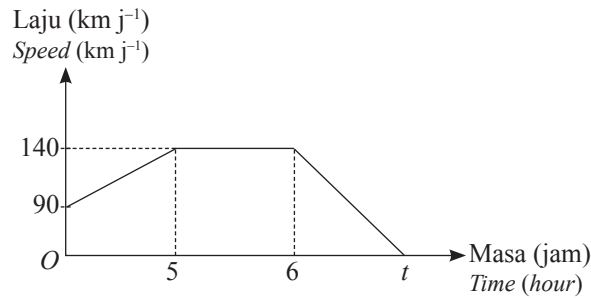
(a)

(b)

(c)



- 4 Rajah 3 menunjukkan graf laju-masa bagi pergerakan sebuah kereta dalam tempoh t jam.
Diagram 3 shows a speed-time graph for the movement of a car within t hours.



Rajah 3 / Diagram 3

- (a) Nyatakan tempoh masa, dalam minit, ketika kereta itu bergerak dengan laju seragam.
State the duration, in minutes, when the car was moving at a uniform speed.

[2 markah/marks]

- (b) Hitung kadar perubahan laju, dalam km j^{-2} , kereta itu bagi 5 jam yang pertama.
Calculate the rate of change of speed, in km h^{-2} , of the car in the first 5 hours.

[2 markah/marks]

- (c) Hitung nilai t , dalam jam, jika jarak seluruh pergerakan kereta itu ialah 785 km.
Calculate the value of t , in hours, if the distance of whole journey of the car is 785 km.

[3 markah/marks]

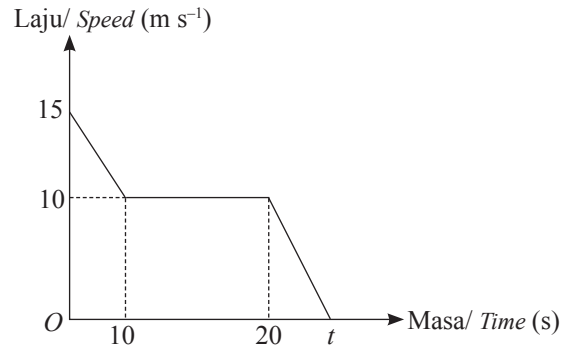
Jawapan/Answer:

(a)

(b)

(c)

- 5 Rajah 4 menunjukkan graf laju-masa bagi pergerakan sebuah van dalam tempoh t saat.
 Diagram 4 shows a speed-time graph for the movement of a van over a period of t seconds.



Rajah 4 / Diagram 4

- (a) Hitung nyahpecutan pergerakan van tersebut, dalam m s^{-2} , bagi 10 saat yang pertama.
 Calculate the deceleration of the van's motion, in m s^{-2} , for the first 10 seconds.

[2 markah/marks]

- (b) Hitung nilai t jika jumlah jarak yang dilalui oleh van itu ialah 265 m.
 Calculate the value of t if the total distance travelled by the van is 265 m.

[3 markah/marks]

Jawapan/Answer:

(a)

(b)



BAB 8

Sukatan Serakan Data Tak Terkumpul

Measures of Dispersion for Grouped Data



VIDEO
PEMBELAJARAN



NOTA EFEKTIF

Topik Topic	Penerangan Explanation
Serakan <i>Dispersion</i>	- Sukatan serakan: julat, julat antara kuartil, varians, sisihan piawai. <i>Measures of dispersion: range, interquartile range, variance, standard deviation.</i> - Julat kecil → serakan kecil <i>Small range → small dispersion</i>
Plot batang-dan-daun <i>Stem-and-leaf plot</i>	- Menunjukkan taburan data secara visual. <i>Displays data distribution visually.</i> - Kenal pasti nilai lazim dan nilai luar. <i>Identifies frequent and rare values.</i>
Plot titik <i>Dot plot</i>	- Carta dengan titik pada skala seragam. <i>Chart with dots on a uniform scale.</i> - Setiap titik = satu cerapan. <i>Each dot = one observation.</i> - Cerapan ialah data daripada pemerhatian. <i>Observation is data from measurement.</i>

Menentukan Julat Antara Kuartil, Min, Varians dan Sisihan Piawai

Determine the Interquartile Range, Mean, Variance and Standard Deviation

- 1 Julat antara kuartil = Kuartil ketiga, Q_3 – Kuartil pertama, Q_1
Interquartile range = Third quartile, Q_3 – First quartile, Q_1

2 Min/Mean, $\bar{x} = \frac{\sum x}{N}$

3 Min/Mean, $\bar{x} = \frac{\sum fx}{f}$

4 Varians / Variance, $\sigma^2 = \frac{\sum (x - \bar{x})^2}{N} = \frac{\sum x^2}{N} - \bar{x}^2$

5 Varians / Variance, $\sigma^2 = \frac{\sum f(x - \bar{x})^2}{\sum f} = \frac{\sum fx^2}{\sum f} - \bar{x}^2$

- 6 Sisihan piawai / Standard deviation,

$$\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{N}} = \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$$

- 7 Sisihan piawai / Standard deviation,

$$\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$$

Apakah kesan perubahan sukatan apabila setiap nilai dalam suatu set data didarab atau dibahagikan dengan suatu pemalar?

What are the effects on the measures of dispersion when each value of a set of data is multiplied or divided by a constant?

Sukatan Measure	Ditambah dengan pemalar, k Added by a constant, k	Didarab dengan pemalar, k Multiplied by a constant, k	Dibahagi dengan pemalar, k Divided by a constant, k
Julat Range	Tidak berubah No change	$= k \times$ julat asal $k \times$ original range	$=$ julat asal original range
Julat antara kuartil Interquartile range	Tidak berubah No change	$= k \times$ julat antara kuartil asal $k \times$ original interquartile range	$=$ julat antara kuartil asal original interquartile range
Sisihan piawai Standard deviation	Tidak berubah No change	$= k \times$ sisihan piawai asal $k \times$ original standard deviation	$=$ sisihan piawai asal original standard deviation
Varians Variance	Tidak berubah No change	$= k^2 \times$ varians asal $k^2 \times$ original variance	$=$ varians asal original variance



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 Rajah 1 menunjukkan markah ujian Matematik bagi 15 orang murid kelas 4 Adil.
Diagram 1 shows the Mathematics test scores of 15 students from class 4 Adil.

80	75	82	66	52
60	68	83	64	69
71	57	74	80	77

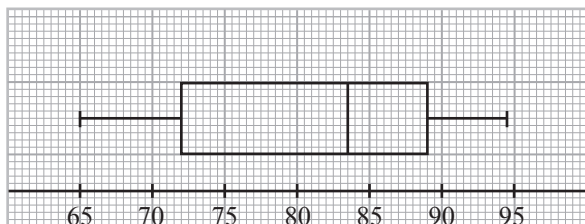
Rajah 1 / Diagram 1

Hitung julat dan julat antara kuartil bagi markah ujian Matematik tersebut.

Calculate the range and the interquartile range for the marks of the Science test.

- A Julat/Range = 31
Julat antara kuartil/ Interquartile range = 14
B Julat/Range = 31
Julat antara kuartil/ Interquartile range = 16
C Julat/Range = 33
Julat antara kuartil/ Interquartile range = 14
D Julat/Range = 33
Julat antara kuartil/ Interquartile range = 16

- 2 Rajah 2 menunjukkan suatu plot kotak.
Diagram 2 shows a box-plot.



Rajah 2 / Diagram 2

Berdasarkan plot kotak, tentukan julat antara kuartil.

Based on the box plot, determine the interquartile range.

- A 17
B 29
C 83
D 86
3 Hitung sisihan piawai bagi data berikut.
Calculate the standard deviation for the following data.

−5, 3, 4, 6, 7, 8, 10, 12, 13, 15

- A 29.7
B 8.62
C 6.67
D 5.51

- 4 Cikgu Harun, guru Matematik Kelas 5 Azam, ingin menganalisis pencapaian muridnya dalam ujian topikal. Beliau telah merekodkan markah penuh bagi setiap 25 murid dalam bentuk plot batang-dan-daun seperti dalam Rajah 3.

Mr. Harun, the Mathematics teacher of Class 5 Azam, wants to analyse his students' performance in the topical test. He has recorded the full marks of all 25 students in the form of a stem-and-leaf plot as shown in Diagram 3.

Batang Stem	Daun Leaf
3	5
4	3 6 7
5	1 1 2 3
6	0 2 3 4 5 9
7	0 2 2 3 4 4 5 9
8	0 2 5

Kekunci: 3 | 5 bermakna 35 markah
Key: 3 | 5 means 35 marks

Rajah 3 / Diagram 3

Murid yang mendapat kurang daripada 60 markah perlu menghadiri kelas pemulihan. Hitung peratus murid yang **tidak** perlu menghadiri kelas pemulihan.

*Students who achieve less than 60 marks need to attend the remedial class. Calculate the percentage of the students who **do not** need to attend the remedial class.*

- A 24%
B 32%
C 40%
D 68%

- 5 Jadual 1 menunjukkan bilangan anak bagi 50 buah keluarga di Taman Angsana.
Table 1 shows the number of children for 50 families in Taman Angsana.

Bilangan anak Number of children	0	1	2	3	4
Bilangan keluarga Number of families	6	12	10	12	10

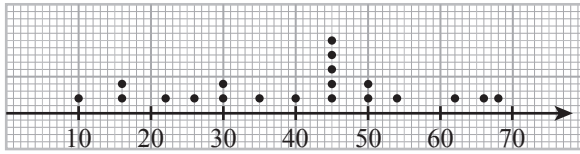
Jadual 1 / Table 1

Hitung sisihan piawai bagi data yang diberi.
Calculate the standard deviation of the data given.

- A 1.12
B 1.24
C 1.32
D 1.44

- 6 Rajah 4 menunjukkan data umur pelancong yang mengunungi sebuah pameran.

Diagram 4 shows the data on the ages of tourists who visited an exhibition.



Rajah 4 / Diagram 4

Tentukan nilai min umur pelancong tersebut.

Determine the mean age of the tourists.

- A 35 tahun/years C 40 tahun/years
B 38 tahun/years D 42 tahun/years

- 7 Rajah 5 menunjukkan jisim badan (kg) bagi dua pasukan bola keranjang sekolah yang direkodkan selepas menjalani ujian kecergasan.

Diagram 5 shows the body mass (kg) of two school basketball teams recorded after undergoing a fitness test.

Kumpulan Infiniti Infiniti Group					Kumpulan Alfa Alfa Group				
39	63	47	85	53	76	51	74	38	92
67	72	58	77	41	37	62	36	45	53

Rajah 5 / Diagram 5

Jika jurulatih ingin memilih pasukan yang mempunyai jisim ahli yang lebih konsisten untuk mewakili sekolah, pasukan manakah yang lebih sesuai?

If the coach wants to select the team with more consistent body mass to represent the school, which team is more suitable?

- A Kumpulan Infiniti
Infiniti Group
B Kumpulan Alfa
Alfa Group
C Kedua-dua kumpulan sama sesuai
Both groups are equally suitable
D Tidak dapat ditentukan
Cannot be determined

- 8 Data berikut menunjukkan masa (dalam minit) yang diambil oleh 9 orang murid untuk menyiapkan satu latihan Matematik.

The following data shows the time (in minutes) taken by 9 students to complete a Mathematics exercise.

12, 15, 18, 20, 22, 25, 28, 30, 35

Apakah nilai julat antara kuartil bagi data tersebut?

What is the interquartile range value for the data?

- A 12.5
B 16.5
C 22
D 29

- 9 Dua kumpulan murid, P dan Q , mempunyai min markah yang sama iaitu 70. Data markah adalah seperti berikut:

Two groups of students, P and Q , have the same mean score of 70. The score data is as follows:

Kumpulan/Group P:
65, 68, 70, 72, 75

Kumpulan/Group Q:
50, 60, 70, 80, 90

Antara berikut, pernyataan manakah yang benar?

Which of the following statements is true?

- A Sisihan piawai kumpulan P lebih besar berbanding kumpulan Q .
The standard deviation of group P is larger than that of group Q .
B Julat kumpulan P lebih besar daripada kumpulan Q .
The range of group P is larger than group Q .
C Kumpulan Q mempunyai serakan data yang lebih besar berbanding kumpulan P .
Group Q has a larger data dispersion than group P .
D Kedua-dua kumpulan mempunyai serakan yang sama.
Both groups have the same dispersion

Soalan Subjektif
Jawab semua soalan.

- 1 Bina plot batang-dan-daun, plot kotak dan plot titik bagi data berikut pada ruang jawapan yang disediakan.
Construct a stem-and-leaf plot, a box plot, and a dot plot for the following data in the answer space provided.

5, 7, 8, 9, 10, 10, 11, 12, 12, 13, 13, 14, 15, 15, 16, 17, 18, 20, 22, 25

Rajah 1 / Diagram 1

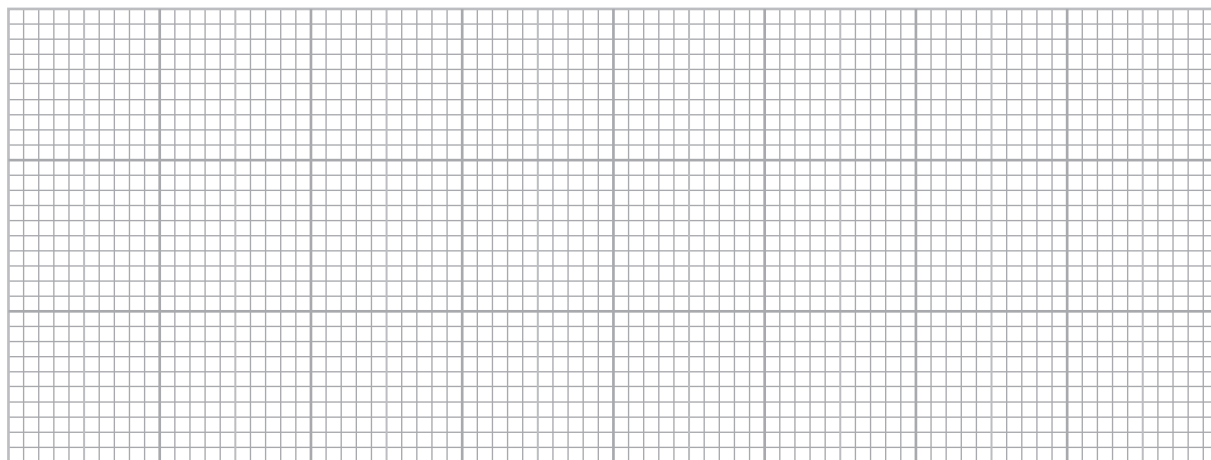
[6 markah/marks]

Jawapan/Answer:

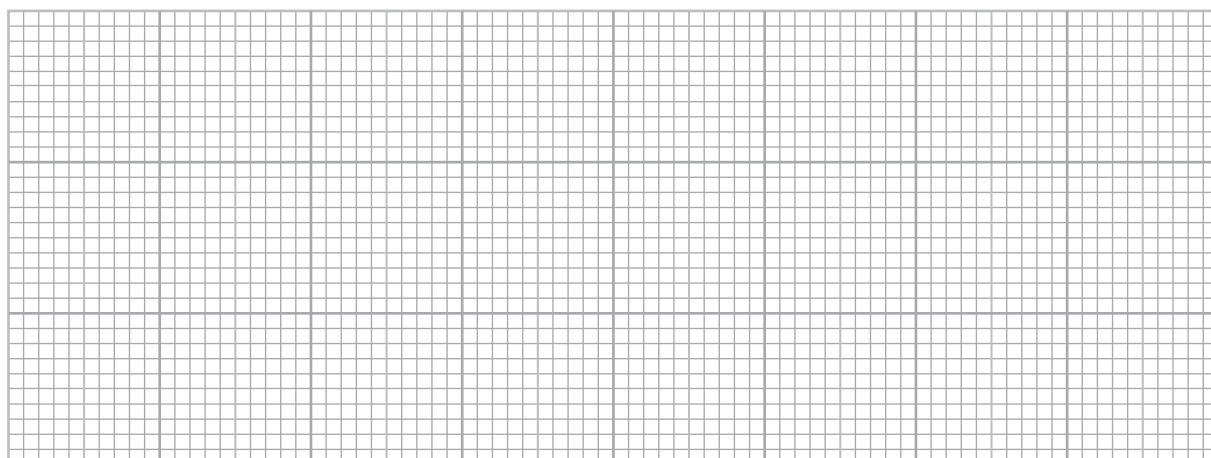
- (a) Plot batang-dan-daun/*Stem-and-leaf plot*

Tingkatan 4

- (b) Plot kotak/*Box plot*



- (c) Plot titik/*Dot plot*



- 2 Jadual 1 menunjukkan markah bagi 50 orang murid SMK Hebat dalam suatu ujian topikal Matematik.
Table 1 shows the scores for 50 students of SMK Hebat in a Mathematics topical test.

Skor <i>Score</i>	Kekerapan <i>Frequency</i>
80	3
75	7
70	13
65	12
60	9
55	6

Jadual 1 / Table 1

Hitung mod, median dan min bagi data dalam Jadual 1.
Calculate the mode, median and mean for the data in Table 1.

[4 markah/marks]

Jawapan/Answer:

- 3 Rajah 2 ialah data yang menunjukkan berat badan, dalam kg, bagi sekumpulan 12 orang murid Kelas 5 Alif.
Diagram 2 is data shows the weight, in kg, of a group of 12 students from Class 5 Alif.

50	52	54	56	58	60	62	64	66	68	70	72
----	----	----	----	----	----	----	----	----	----	----	----

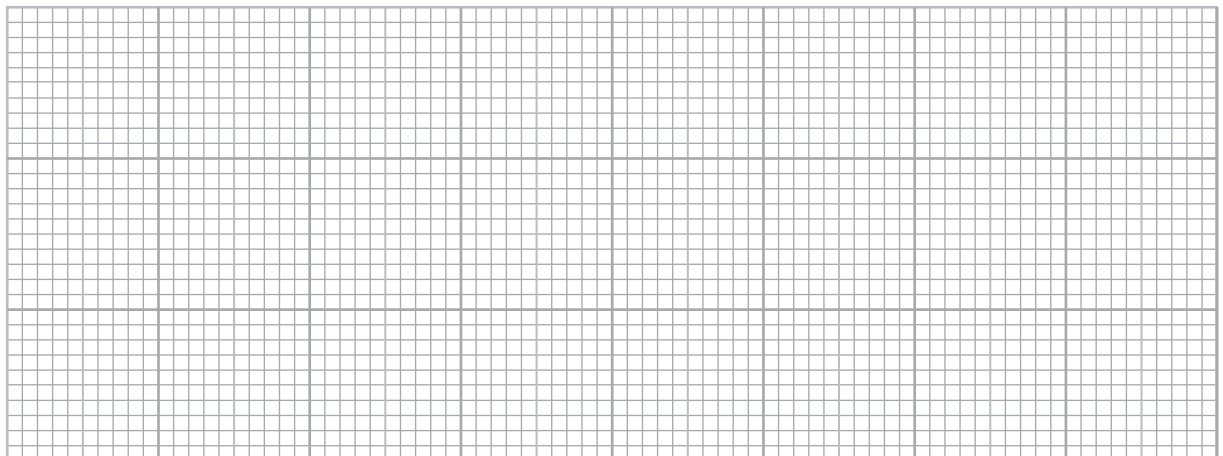
Rajah 2 / Diagram 2

- (a) Berdasarkan maklumat di atas, bina satu plot kotak.
Based on the information above, construct a box plot.
- (b) Daripada plot kotak di (a), nyatakan bentuk plot kotak itu.
From the box plot in (a), state the shape of the box plot.

[4 markah/marks]

Jawapan/Answer:

(a)



(b)

- 4 Diberi satu set data yang mengandungi 15 nilai dengan $\sum x = 330$ dan $\sum x^2 = 8\,924$.
A set of data contains 15 values with $\sum x = 330$ and $\sum x^2 = 8\,924$.

Hitung/Calculate:

- (a) min, $\bar{x}$,
 the mean, $\bar{x}$,
 (b) sisihan piawai, σ .
 the standard deviation, σ .

[4 markah/marks]

Jawapan/Answer:

- (a) (b)

- 5 Jadual 2 menunjukkan jisim, dalam kg, tujuh orang peserta pertandingan angkat berat. Jisim peserta disusun dalam tertib menaik. Diberi bahawa mod jisim ialah 92 kg.
Table 2 shows the mass, in kg, of seven participants in a weightlifting competition. The participant's masses are arranged in ascending order. Given the mode of the masses is 92 kg.

Peserta Participant	J	K	L	M	N	O	P
Jisim (kg) Mass (kg)	79	x	92	99	111	118	y

Jadual 2 / Table 2

- (a) Tentukan nilai x dan y jika min jisim peserta ialah 104 kg.
Find the values of x and y if the mean mass of the participants is 104 kg.
 (b) Seterusnya, tentukan nilai sisihan piawai bagi jisim peserta itu.
Hence, calculate the standard deviation of the mass of the participants.

[4 markah/marks]

Jawapan/Answer:

- (a) (b)

- 6 Jadual 3 menunjukkan catatan jarak lontaran peluru, dalam meter, bagi dua orang atlet yang berpotensi mewakili sekolah dalam lima ujian prestasi.

Table 3 shows the shot put throwing distances, in metres, of two athletes who are potential school representatives in five performance trials.

Ujian Trial Peserta Athlete	1	2	3	4	5
Farid	9.8	10.2	9.9	10.1	10.0
Armin	8.7	11.5	9.2	10.8	11.0

Jadual 3 / Table 3

- (a) Sebagai seorang jurulatih, tentukan sukatan serakan yang sesuai untuk digunakan dalam membuat pemilihan antara dua orang atlet tersebut.

As a coach, determine the measure of dispersion that is most suitable to be used in selecting between the two athletes.

- (b) Seterusnya, nyatakan atlet pilihan anda dan tunjukkan pengiraan bagi menjustifikasikan pemilihan tersebut.

Next, state your chosen athlete and show the calculations to justify your selection.

[8 markah/marks]

Jawapan/Answer:

(a)

(b)

BAB 9

Kebarangkalian Peristiwa Bergabung

Probability of Combined Events



VIDEO
PEMBELAJARAN

NOTA EFEKTIF

Ruang Sampel

Sample Space

- Set semua kesudahan yang mungkin bagi satu peristiwa bergabung.
The set of all possible outcomes for a combined event.
- Contoh/Example:
Melambung dadu dan duit syiling.
Rolling a die and flipping a coin.
 $S = \{(1, A), (1, G), (2, A), (2, G), (3, A), (3, G), (4, A), (4, G), (5, A), (5, G), (6, A), (6, G)\}$

$$n(S) = 12$$

TIP

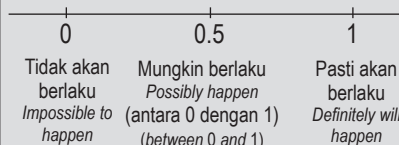
Kebarangkalian boleh ditulis dalam bentuk pecahan, peratus atau nombor perpuluhan.
Probability can be written as a fraction, a percentage, or a decimal number.

Rumus Kebarangkalian

Formula of Probability

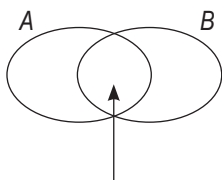
$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A') = 1 - P(A)$$



Hukum Pendaraban Kebarangkalian

Multiplication Rule of Probability

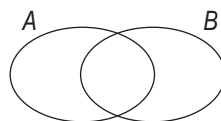


$$P(A \text{ dan/ and } B) = P(A \cap B) = P(A) \times P(B)$$

Hukum Penambahan Kebarangkalian

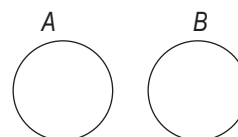
Addition Rule of Probability

Peristiwa tidak saling eksklusif
Non-mutually exclusive events



$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

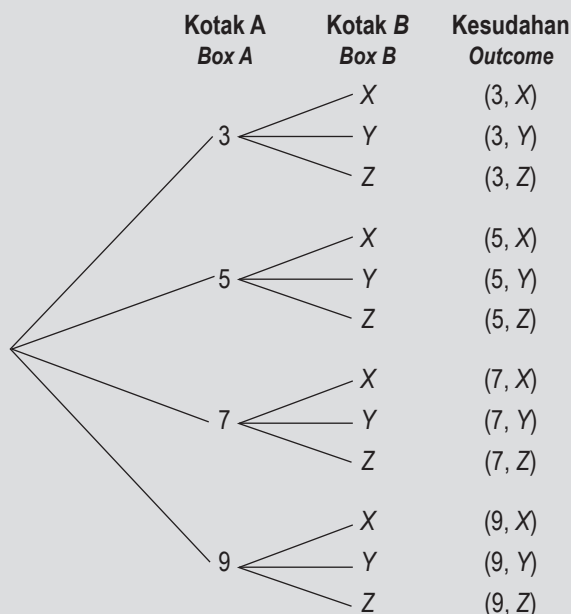
Peristiwa saling eksklusif
Mutually exclusive events



$$P(A \cup B) = P(A) + P(B)$$

Gambar Rajah Pokok

Tree Diagram



Jadual Table

Kesudahan Outcome

Kotak A Box A \ Kotak B Box B	X	Y	Z
3	(3, X)	(3, Y)	(3, Z)
5	(5, X)	(5, Y)	(5, Z)
7	(7, X)	(7, Y)	(7, Z)
9	(9, X)	(9, Y)	(9, Z)



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 Dua keping duit syiling adil dilambung. G mewakili gambar dan A mewakili angka. Antara berikut, ruang sampel yang manakah betul?
Two fair coins are tossed. G represents a head and A represents a tail. Which of the following sample spaces is correct?
- A $\{(A, A), (G, G)\}$
B $\{(G, A), (A, G)\}$
C $\{(G, G), (A, A), (G, A), (A, G)\}$
D $\{(G, G), (A, A), (G, A)\}$
- 2 Antara peristiwa berikut, yang manakah ialah peristiwa bersandar?
Which of the following events is dependent event?
- A Mendapat nombor 4 apabila dadu adil dilambung dan mendapat angka apabila duit syiling adil dilambung.
Getting number 4 when a fair dice is rolled and getting a tail when a fair coin is tossed.
- B Faizah menjarangkan dua gol dalam perlawanan bola jaring.
Faizah scores two goals in two netball matches.
- C Memilih sebiji bola daripada sebuah kotak dan memilih sebiji guli daripada sebuah beg.
Choosing a ball from a box and choosing a marble from a bag.
- D Cikgu Rashid memilih seorang ketua kelas dan seorang penolong ketua kelas daripada 30 orang murid.
Cikgu Rashid selects a class monitor and an assistant class monitor from 30 students.
- 3 Sebuah kotak mengandungi 5 batang pensel, 4 batang pen merah dan 7 batang pen biru. Sebatang pensel atau pen dipilih secara rawak daripada kotak itu. Cari kebarangkalian memilih sebatang pensel atau sebatang pen biru.
A box contains 5 pencils, 4 red pens and 7 blue pens. A pencil or a pen is chosen at random from the box. Find the probability of choosing a pencil or a blue pen.
- A $\frac{1}{2}$
B $\frac{3}{4}$
C $\frac{7}{16}$
D $\frac{11}{16}$
- 4 Kebarangkalian Azlan menang dalam pertandingan memanah ialah $\frac{2}{3}$. Tentukan kebarangkalian bahawa dia menang dua pertandingan memanah secara berturutan.
The probability of Azlan winning in an archery competition is $\frac{2}{3}$. Determine the probability that he wins two archery competition in a row.
- A $\frac{1}{3}$
B $\frac{1}{9}$
C $\frac{4}{9}$
D $\frac{5}{9}$
- 5 Kebarangkalian Nurul lulus dalam ujian Sains dan Matematik masing-masing ialah 0.65 dan 0.7. Apakah kebarangkalian Nurul lulus dalam ujian Sains tetapi gagal dalam ujian Matematik itu?
The probabilities of Nurul passing in the Science and Mathematics tests were 0.65 and 0.7 respectively. What is the probability that Nurul passes the Science test but fails the Mathematic test?
- A 0.105
B 0.195
C 0.245
D 0.455
- 6 Dua batang pen dipilih secara rawak daripada tujuh batang pen yang terdiri daripada empat batang pen hitam dan tiga batang pen biru. Hitung kebarangkalian kedua-dua pen yang dipilih adalah daripada warna yang sama.
Two pens are chosen at random from seven pens, where four of them are black pens and three of them are blue pens. Calculate the probability that both pens chosen are the same colour.
- A $\frac{3}{7}$
B $\frac{16}{49}$
C $\frac{12}{49}$
D $\frac{9}{49}$
- 7 Terdapat 5 biji epal hijau dan 4 biji epal merah di dalam sebuah bakul. Dua biji epal dipilih secara rawak daripada bakul itu, satu demi satu tanpa pengembalian. Cari kebarangkalian bahawa kedua-dua epal berbeza warna.
There are 5 green apples and 4 red apples in a basket. Two apples are chosen at random from the basket, one after another without replacement. Find the probability that both apples selected are in the different colour.
- A $\frac{20}{81}$
B $\frac{5}{18}$
C $\frac{5}{9}$
D $\frac{13}{18}$
- 8 Kajian tentang jantina anak terhadap 20 000 buah keluarga yang mempunyai dua orang anak telah dijalankan. Anggarkan bilangan keluarga yang mempunyai sekurang-kurangnya seorang anak lelaki dalam kajian tersebut.
A study is carried out on the gender of the children from 20 000 families with two children. Estimate the number of families with at least one son in that study.
- A 18 000
B 15 000
C 10 000
D 5 000

Soalan Subjektif

Jawab semua soalan.

- 1 Jadual 1 menunjukkan bilangan ahli Kadet Bomba di SMK USJ 25.

Table 1 shows the number of fire cadets in SMK USJ 25.

Sesi <i>Session</i>	Bilangan ahli <i>Number of members</i>	
	Lelaki <i>Male</i>	Perempuan <i>Female</i>
Pagi <i>Morning</i>	170	75
Petang <i>Afternoon</i>	68	52

Jadual 1/ *Table 1*

- (a) Dua orang ahli dipilih secara rawak daripada sesi petang. Hitung kebarangkalian bahawa kedua-dua orang ahli yang dipilih ialah murid lelaki.
Two members are selected randomly from the afternoon session. Calculate the probability that both members chosen are male.
- (b) Dua orang ahli dipilih secara rawak daripada ahli perempuan. Hitung kebarangkalian kedua-dua orang ahli dipilih adalah dari sesi pagi.
Two members are selected randomly from the female members. Calculate the probability that both members chosen are from the morning session.

[4 markah/marks]

Jawapan/Answer:

- (a) (b)

- 2 Dua orang murid dipilih secara rawak daripada tujuh orang murid Tingkatan 4 dan lima orang murid Tingkatan 5. Hitung kebarangkalian bahawa kedua-dua orang murid yang dipilih adalah daripada tingkatan yang sama.

Two students are chosen at random from seven Form 4 students and five Form 5 students. Calculate the probability that both chosen students are in the same form.

[3 markah/marks]

Jawapan/Answer:

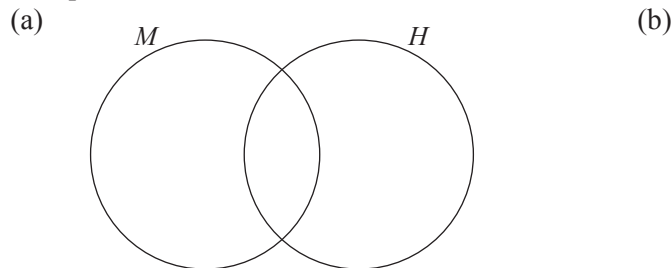
- 3 Kebarangkalian Farish dilantik sebagai pengerusi Kelab Matematik (M) dan ketua rumah sukan hijau (H) masing-masing ialah $\frac{6}{7}$ dan $\frac{2}{9}$.

The probability of appointing Farish as the chairman of the Mathematics Club (M) and the head of the green sports house (H) are $\frac{6}{7}$ and $\frac{2}{9}$ respectively.

- (a) Lengkapkan gambar rajah Venn di ruang jawapan untuk mewakili hubungan kebarangkalian Farish dilantik sebagai pengerusi Kelab Matematik dan ketua rumah sukan hijau.
Complete the Venn diagram in the answer space to represent the relationship between the probabilities of appointing Farish as the chairman of the Mathematics Club and the head of the green sports house.
- (b) Seterusnya, hitung kebarangkalian Farish tidak dilantik sebagai pengerusi Kelab Matematik atau ketua rumah sukan hijau.
Hence, calculate the probability of not appointing Farish as the chairman of the Mathematics Club or the head of the green sports house.

[4 markah/marks]

Jawapan/Answer:



- 4 Jadual 2 menunjukkan bilangan atlet mengikut jantina di dua kelas yang berbeza. Bilangan atlet lelaki kelas Theta tidak ditunjukkan.

Table 2 shows the number of athletes by gender in two different classes. The number of boy athletes in Theta class is not shown.

Kelas Class	Lelaki Male	Perempuan Female
Theta	x	6
Epsilon	7	5

Jadual 2/ Table 2

- (a) Seorang atlet dipilih secara rawak dari setiap kelas. Cari nilai x jika kebarangkalian kedua-dua atlet yang diilih adalah jantina yang sama dari kelas yang berbeza ialah $\frac{31}{60}$.
An athlete is randomly selected from each class. Find the value of x if the probability that both selected athletes are same genders from different classes is $\frac{31}{60}$.
- (b) Dua orang atlet dipilih secara rawak, seorang dari setiap kelas. Cari kebarangkalian sekurang-kurangnya seorang atlet perempuan dipilih.
Two athletes are randomly selected, one from each class. Find the probability that at least one female athlete is selected.

[5 markah/marks]

Jawapan/Answer:

- (a) (b)

- 5 Encik Khaer merupakan seorang jurulatih bola baling. Dia melatih pasukan sekolahnya yang terdiri daripada pasukan lelaki dan pasukan perempuan bagi suatu pertandingan. Pada hari pertandingan, kedua-dua pasukan sekolah Encik Khaer akan menentang dua buah sekolah pada peringkat kumpulan. Jadual 3 menunjukkan kebarangkalian kedua-dua pasukan memenangi perlawanan ke atas sekolah M dan sekolah N .

Encik Khaer is a handball coach. He is coaching his school teams which consist of a boy team and a girl team for a tournament. On the day of tournament, both Encik Khaer's school teams will play against two schools at the group level. Table 3 shows the probability of winning the match against school M and school N for both teams.

Pasukan <i>Team</i>	Kebarangkalian menang ke atas <i>Probability of winning against</i>	
	Sekolah M <i>School M</i>	Sekolah N <i>School N</i>
Lelaki <i>Boy</i>	$\frac{7}{15}$	$\frac{2}{5}$
Perempuan <i>Girl</i>	$\frac{4}{7}$	$\frac{3}{8}$

Jadual 3/ Table 3

Jika kebarangkalian memenangi sekurang-kurangnya satu perlawanan melebihi $\frac{3}{5}$, maka pasukan itu berpeluang ke peringkat seterusnya. Adakah pasukan lelaki atau pasukan perempuan yang akan mendapat peluang itu? Justifikasikan jawapan anda.

If the probability of winning at least one match is more than $\frac{3}{5}$, then the team will have the chance to the next level.

Will the boy team or the girl team get the chance? Justify your answer.

[4 markah/marks]

Jawapan/Answer:

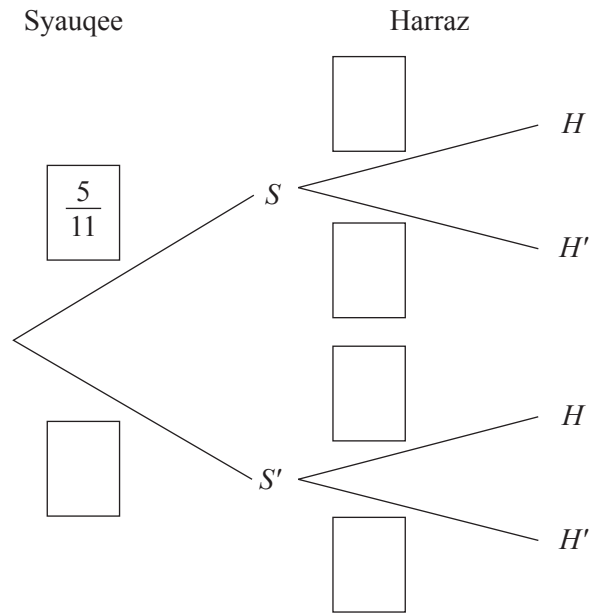
- 6 Persatuan Sains SMK Chanis mengadakan lawatan ke Muzium Sultan Alam Shah. Kebarangkalian Syauqee dan Harraz menyertai lawatan itu masing-masing ialah $\frac{5}{11}$ dan $\frac{3}{7}$.

Lengkapkan gambar rajah pokok di ruang jawapan. Seterusnya, hitung kebarangkalian bahawa hanya seorang daripada mereka yang menyertai lawatan itu.

The Science Society of SMK Chanis organises a tour to Sultan Alam Shah Museum. The probability of Syauqee and Harraz joining that tour is $\frac{5}{11}$ and $\frac{3}{7}$ respectively.

Complete the tree diagram in the answer space. Hence, calculate the probability of only one of them joining the tour.
[3 markah/marks]

Jawapan/Answer:



BAB 10

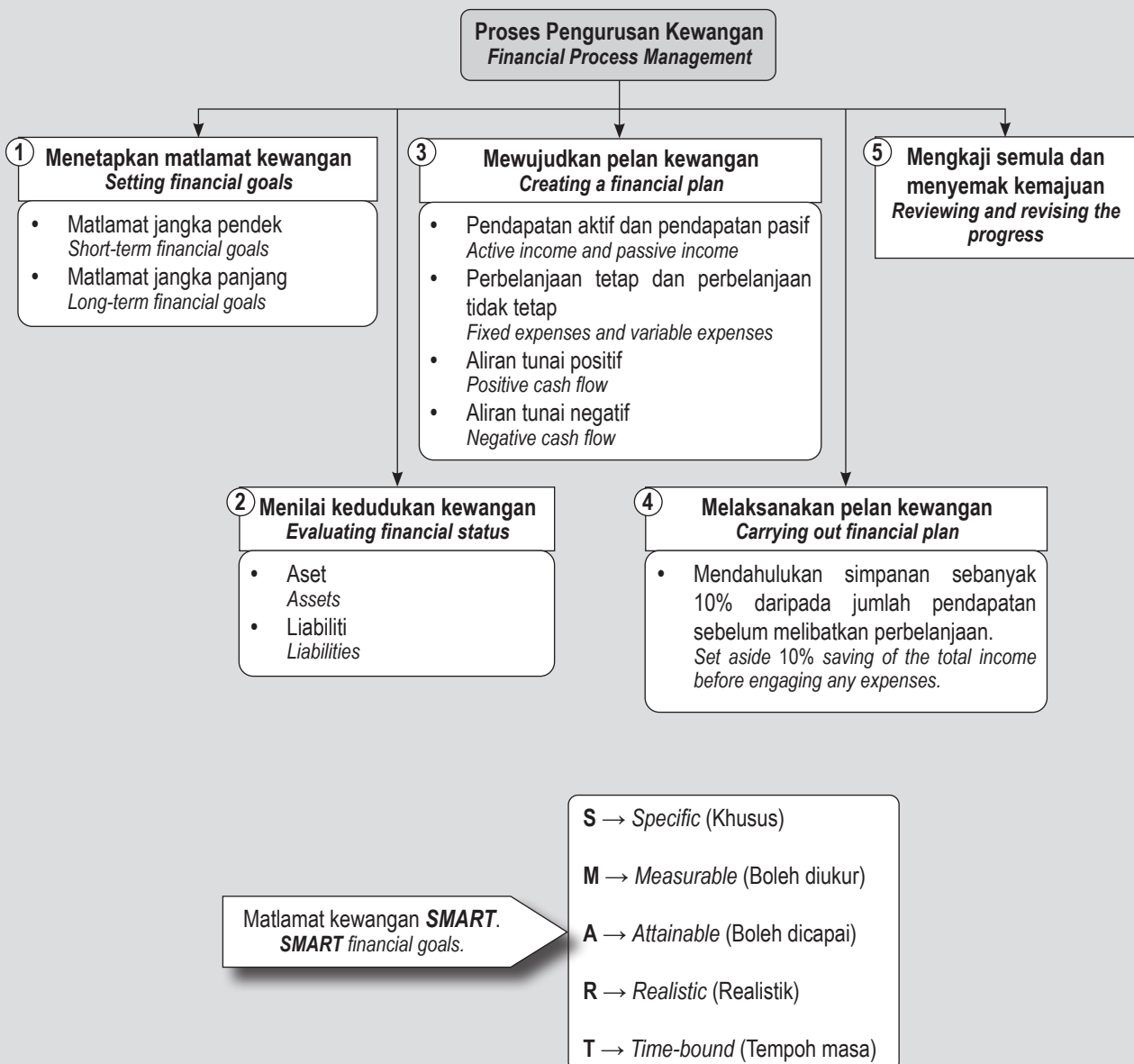
Matematik Pengguna: Pengurusan Kewangan *Consumer Mathematics: Financial Management*



NOTA EFEKTIF

Proses pengurusan kewangan merupakan suatu proses yang melibatkan pengurusan wang daripada sumber pendapatan terhadap simpanan, perbelanjaan, perlindungan dan pelaburan.

Financial management is a proses that involves managing money from sources of income into savings, expenses, protections and investment.





LATIHAN INTENSIF

Soalan Objektif

Jawab semua soalan.

- 1 Dr. Darmesh merupakan seorang pensyarah junior dan menerima pendapatan bulanan satu per tiga berbanding pensyarah kanan yang menerima pendapatan bulanan sebanyak RM14 100. Dr. Darmesh juga menjalankan kelas tuisyen pada hujung minggu. Pada bulan November, Dr. Darmesh mempunyai perbelanjaan tetap dan tidak tetap sebanyak RM4 500. Jika Dr. Darmesh mempunyai aliran tunai positif sebanyak RM2 700 pada bulan tersebut, hitung pendapatan yang diperoleh daripada kelas tuisyen.
- Dr. Darmesh is a junior lecturer and receives a monthly income of one-third of a senior lecturer, who earns a monthly income of RM14 100. Dr. Darmesh also conducts tuition classes on weekends. In the month of November, Dr. Darmesh had fixed and variable expenses amounting to RM4 500. If Dr. Darmesh has a positive cash flow of RM2 700 for that month, calculate the income earned from the tuition classes.*

[3 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 2 Natasha mula bekerja pada tahun 2024 dengan gaji permulaan sebanyak RM1 950. Dia telah memiliki sebuah kereta dengan bayaran ansuran bulanan sebanyak RM550. Dia juga mempunyai perbelanjaan bulanan sebanyak RM1 000.
- Natasha starts working in year 2024 with a starting salary of RM1 950. She already owns a car with monthly instalments of RM550. She also has a monthly expenditure of RM1 000.*
- (a) Hitung aliran tunai bulanan Natasha. Jelaskan jawapan anda.
Calculate Natasha's monthly cash flow. Explain your answer.
- (b) Jelaskan aliran tunai Natasha jika kenaikan gaji pada tahun 2025 adalah sebanyak 10% dan perbelanjaan meningkat sebanyak 30%.
Explain Natasha's cash flow if her salary increases by 10% in 2025 and her expenditure increases by 30%.

[7 markah/marks]

Jawapan/Answer:

(a)

(b)

- 3 Encik Cheong menerima pendapatan bulanan sebanyak RM5 000. Beliau juga menyewakan rumahnya sebanyak RM950 sebulan. Beliau mempunyai perbelanjaan tetap dan perbelanjaan tidak tetap masing-masing sebanyak RM2 000 dan RM1 050 sebulan. Hitung aliran tunai bulanan Encik Cheong. Jelaskan jawapan anda.

Mr. Cheong receives a monthly income of RM5 000. He also rents out her house for RM950 a month. He has fixed expenses and variable expenses of RM2 000 and RM1 050 respectively per month. Calculate Mr. Cheong's monthly cash flow. Explain your answer.

[3 markah/marks]

Jawapan/Answer:

Tingkatan 4

- 4 Farah bekerja sebagai seorang juruteknik makmal. Pendapatan bulanannya ialah RM4 200 manakala jumlah perbelanjaan bulanannya ialah RM2 950. Farah bercadang untuk membeli sebuah motosikal berharga RM18 000 secara tunai dalam tempoh 15 bulan.

Farah works as a laboratory technician. Her monthly income is RM4 200 while her monthly expenditure is RM2 950. Farah plans to purchase a motorcycle priced at RM18 000 in cash within 15 months.

- Hitung jumlah simpanan maksimum yang boleh dibuat dalam tempoh tersebut.
Calculate the maximum amount of savings that can be made within that period.
- Tentukan sama ada Farah mampu mencapai matlamat kewangannya.
Determine whether Farah is able to achieve her financial goal.
- Jelaskan satu langkah yang boleh diambil oleh Farah sekiranya matlamat tersebut tidak dapat dicapai.
Explain one action that Farah can take if the goal cannot be achieved.

[8 markah/marks]

Jawapan/Answer:

(a)

(b)

(c)



BAB 1

Ubahan Variation


 VIDEO
PEMBELAJARAN


NOTA EFEKTIF

Pernyataan Statement	Hubungan Relation Menggunakan simbol ' $\propto$ ' Using symbol ' $\propto$ '	Persamaan dengan k sebagai pemalar bagi ubahan Equation with k as constant of variation
y berubah secara langsung dengan x <i>y varies directly as x</i>	$y \propto x$	$y = kx$
y berubah secara songsang dengan x <i>y varies inversely as x</i>	$y \propto \frac{1}{x}$	$y = \frac{k}{x}$
y berubah secara langsung dengan x dan z <i>y varies directly as x and z</i>	$y \propto xz$	$y = kxz$
y berubah secara songsang dengan x dan z <i>y varies inversely as x and z</i>	$y \propto \frac{1}{xz}$	$y = \frac{k}{xz}$
y berubah secara langsung dengan x dan secara songsang dengan z <i>y varies directly as x and varies inversely as z</i>	$y \propto \frac{x}{z}$	$y = \frac{kx}{z}$

Contoh/Example:

Sebuah kilang menghasilkan barangan mengikut bilangan pekerja. Diberi bahawa bilangan barang yang dihasilkan, B , berkadar langsung dengan bilangan pekerja, P . Jika 8 orang pekerja dapat menghasilkan 240 unit barang,

A factory produces goods according to the number of workers. Given that the number of goods produced, B , is directly proportional to the number of workers, P . If 8 workers can produce 240 units of goods,

- ungkapkan bagi B dalam sebutan P ,
expression for B in terms of P ,
- tentukan bilangan barang yang dihasilkan jika terdapat 12 orang pekerja,
determine the number of goods produced if there are 12 workers,
- tentukan bilangan pekerja yang diperlukan untuk menghasilkan 450 unit barang.
determine the number of workers required to produce 450 units of goods.

Penyelesaian:

$$\begin{aligned}
 \text{(a)} \quad B &\propto P \\
 B &= kP \\
 240 &= k(8) \\
 k &= 30 \\
 B &= 30P
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad B &= 30(12) \\
 &= 360
 \end{aligned}$$

Maka, jika terdapat 12 orang pekerja, sebanyak **360 unit barang** akan dihasilkan.
Hence, 360 units of goods can be produced if there are 12 workers.

$$\begin{aligned}
 \text{(c)} \quad 450 &= 30P \\
 P &= 15
 \end{aligned}$$

Maka, seramai **15 orang pekerja** diperlukan untuk menghasilkan 450 unit barangan.
Hence, 15 workers are required to produce 450 units of goods.



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 M berubah secara langsung dengan punca kuasa dua h . Carikan hubungan antara M dan h .
 M varies directly as the square root of h . Find the relation between M and h .

- A $M \propto h^{\frac{1}{2}}$
B $M \propto \frac{1}{h^{\frac{1}{2}}}$
C $M \propto h^2$
D $M \propto \frac{1}{h^2}$

- 2 Diberi bahawa p berubah secara songsang dengan kuasa dua q dan $p = 4$ apabila $q = 5$.
Ungkapkan p dalam sebutan q .
It is given that p varies inversely as the square of q and $p = 4$ when $q = 5$. Express p in terms of q .

- A $p = \frac{9}{q}$
B $p = \frac{20}{q}$
C $p = \frac{100}{q^2}$
D $p = \frac{4}{25q^2}$

- 3 Hubungan antara H , g dan j ialah H berubah secara langsung dengan punca kuasa dua g dan secara songsang dengan j . Diberi bahawa $H = 10$ apabila $g = 9$ dan $j = 3$. Hitung nilai g apabila $H = 20$ dan $j = 2$.

The relation between H , g and j is H varies directly as the square root of g and varies inversely as j . It is given that $H = 10$ when $g = 9$ and $j = 3$. Calculate the value of g when $H = 20$ and $j = 2$.

- A 5
B 10
C 16
D 24

- 4 Masa yang diambil untuk menyiapkan 100 helai tudung, t jam, adalah berubah secara langsung dengan bilangan pekerja, w . Jika 4 orang pekerja mengambil masa 10 jam, ungkapkan t dalam sebutan w .

The time taken to prepare 100 headscarves, t hours, varies directly as the number of workers, w . If 4 workers take 10 hours, express t in terms of w .

- A $t = 40w$
B $t = \frac{5w}{2}$
C $t = \frac{2w}{5}$
D $t = \frac{w}{40}$

- 5 Diberi P berubah secara langsung dengan Q dan secara songsang dengan kuasa dua R . Diberi $P = 6$ apabila $Q = 9$ dan $R = 3$. Cari nilai R apabila $P = \frac{3}{2}$ dan $Q = 16$.

Given P varies directly as Q and inversely as the square of R . Given $P = 6$ when $Q = 9$ and $R = 3$. Find the value of R when $P = \frac{3}{2}$ and $Q = 16$.

- A 24
B 18
C 8
D 6

- 6 Jadual 1 menunjukkan nilai-nilai bagi L , M dan N .

Table 1 shows values of L , M and N .

L	9	3
M	6	6
N	4	r

Jadual 1 / Table 1

Diberi bahawa L berubah secara langsung dengan M dan berubah secara songsang dengan N . Cari nilai r .

It is given that L varies directly as M and varies inversely as N . Find the value of r .

- A 36
B 12
C 9
D 4

- 7 Jadual 2 menunjukkan nilai-nilai bagi pemboleh ubah P dan Q .

Table 2 shows the values of variables P and Q .

P	x	z
Q	y	18

Jadual 2 / Table 2

Diberi Q berubah secara songsang dengan P dan nilai $xy = 9$. Hitung nilai z .

Given that Q varies inversely as P and the value of $xy = 9$. Calculate the value of z .

- A 2
B $\frac{1}{2}$
C $-\frac{1}{2}$
D -2

Soalan Subjektif

Jawab semua soalan.

- 1 Jadual 1 menunjukkan nilai-nilai bagi pemboleh ubah p , q dan r .

Table 1 shows the values of variables p , q and r :

p	q	r
5	25	x
12	4	x^2

Jadual 1/ Table 1

Diberi bahawa p berubah secara langsung dengan punca kuasa dua q dan secara songsang dengan r .
Ungkapkan p dalam sebutan q dan r .

Given that p varies directly as the square root of q and inversely as r . Express p in terms of q and r .

[4 markah/marks]

Jawapan/Answer:

- 2 Ziyad sedang mencuci akuariumnya. Air di dalam akuarium dikeluarkan menggunakan paip getah. Paras air, h cm, di dalam akuarium berubah secara songsang dengan masa, t jam. Selepas 20 minit, paras air di dalam akuarium ialah 60 cm. Hitung paras air, h dalam cm, selepas $\frac{2}{3}$ jam.

Ziyad is washing his aquarium. Water from the aquarium is removed using a rubber pipe. The water level, h cm, in the aquarium varies inversely as time, t hours. After 20 minutes, the water level in the aquarium is 60 cm. Calculate the water level, h in cm, after $\frac{2}{3}$ hour.

[4 markah/marks]

Jawapan/Answer:

- 3 Encik Faris memiliki sebuah kedai percetakan. Dia perlu mencetak sejumlah buku setiap hari. Jadual 2 menunjukkan bilangan mesin yang beroperasi, X , dan masa yang diperlukan, T , untuk mencetak buku-buku tersebut. Diberi T berubah secara songsang dengan X .

Encik Faris owns a printing shop. He needs to print a number of books everyday. Table 2 shows the number of operating machines, X , and the time taken, T , to print the books. It is given that T varies inversely as X .

X	9	6
T	8	n

Jadual 2 / Table 2

- (a) Ungkapkan T dalam sebutan X .

Express T in terms of X .

- (b) Tentukan nilai n .

Determine the value of n .

[4 markah/marks]

Jawapan/Answer:

(a)

(b)

- 4 Iskandar mengenakan upah pemasangan jubin lantai mengikut luas lantai. Diberi bahawa bayaran upah, RM x , berubah secara langsung dengan luas lantai. Jika lantai tersebut mempunyai lebar, $l = 8$ m dan panjang, $p = 6$ m, bayaran upah yang dikenakan ialah RM400.
- Iskandar charges a fee for installing tiles based on the area of the floor. Given the fee, RM x varies directly as the area of the floor. If the floor has the width, $l = 8$ m and length, $p = 6$ m, the total fee is RM400.*
- (a) Tuliskan hubungan antara x , l dan p .
Write the relation between x , l and p .
- (b) Berapakah bayaran yang diterima Iskandar jika lantai rumah pelanggannya berkeluasan 165 m^2 ?
How much will Iskandar get if the area of his customer's house floor is 165 m^2 ?

[4 markah/marks]

Jawapan/Answer:

(a)

(b)



Tingkatan 5

- 5 Jadual 3 menunjukkan nilai pemboleh ubah r , s dan t . Diberi r berubah secara langsung dengan s dan secara songsang dengan kuasa tiga t .
- Table 3 shows the values of variables r , s and t . It is given that r varies directly as s and inversely as the cube of t .*

r	6	3
s	4	m
t	2	8

Jadual 3 / Table 3

Hitung nilai m .

Calculate the value of m .

[3 markah/marks]

Jawapan/Answer:

- 6 x berubah secara langsung dengan kuasa dua y dan secara songsang dengan z . Diberi bahawa $x = 18$ apabila $y = 3$ dan $z = 2$. Cari nilai z apabila $x = 10$ dan $y = 4$.
 x varies directly as the square of y and inversely as z . It is given that $x = 18$ when $y = 3$ and $z = 2$. Find the value of z when $x = 10$ and $y = 4$.

[4 markah/marks]

Jawapan/Answer:

- 7 Bank Captor menawarkan satu pelan simpanan dengan kadar faedah yang tetap. Jumlah faedah, I , yang diperoleh berubah secara langsung dengan jumlah, P , dan tempoh masa, t bulan, wang yang dilaburkan. Jika Ainul memperoleh faedah sebanyak RM192 apabila dia melabur sebanyak RM1 000 selama 2 tahun dalam pelan simpanan tersebut, berapakah jumlah yang perlu dilabur pada permulaan sekiranya dia ingin memperoleh faedah sebanyak RM480 dalam masa setengah tahun?

Captor Bank offers a saving plan with a fixed interest rate. The total interest, I , obtained varies directly as the amount, P , and duration, t months, of the principal is invested. If Ainul invests RM1 000 for 2 years in the saving plan, how much does she need to invest initially in the saving plan if she wants to obtain an interest of RM480 in half a year duration?

[4 markah/marks]

Jawapan/Answer:

BAB 2

Matriks Matrices


 VIDEO
PEMBELAJARAN

NOTA EFEKTIF

Peringkat Matriks Order of Matrix

$$\begin{array}{l} \text{Baris/Row 1} \rightarrow \begin{bmatrix} -1 & 8 & 10 \end{bmatrix} \\ \text{Baris/Row 2} \rightarrow \begin{bmatrix} 5 & 7 & -3 \end{bmatrix} \\ \text{Baris/Row 3} \rightarrow \begin{bmatrix} 2 & 4 & 1 \end{bmatrix} \end{array}$$

$\uparrow \quad \quad \uparrow \quad \quad \uparrow$
 Lajur/Column 1 Lajur/Column 2 Lajur/Column 3

Peringkat matriks/Order of matrix:

$$m \times n = 3 \times 3$$

m = bilangan baris
number of rows
 n = bilangan lajur
number of columns

Matriks Sama Equal Matrices

$$A = \begin{bmatrix} 16 & 4 \\ -5 & 10 \\ 8 & -7 \end{bmatrix} \quad B = \begin{bmatrix} 16 & 4 \\ -5 & 10 \\ 8 & -7 \end{bmatrix}$$

$A = B$

- Sama peringkat/Same order
- Unsur sepadan yang sama
Same of the corresponding elements

Unsur/Elements:

$$a_{21} = -5 \quad b_{32} = -7$$

baris/row 2 lajur/column 1
 baris/row 3 lajur/column 2

Operasi Matriks/Operation on Matrices

Menambah dan Menolak Matriks Add and Subtract Matrices

 Boleh tambah/tolak jika matriks **sama peringkat**
 Can add/subtract if the matrices have **the same order**

$$\begin{bmatrix} 4 \\ -1 \\ 6 \end{bmatrix} + \begin{bmatrix} 6 \\ 13 \\ 9 \end{bmatrix} = \begin{bmatrix} 4 + (-6) \\ -1 + 13 \\ 6 + 9 \end{bmatrix}$$

$$= \begin{bmatrix} -2 \\ 12 \\ 15 \end{bmatrix}$$

Matriks Songsang, A^{-1} Inverse Matrix

- (i) wujud apabila $ad - bc \neq 0$
 exist when $ad - bc \neq 0$

$$\text{Jika } A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \text{ maka } A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}.$$

$$\text{If } A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \text{ so } A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}.$$

 tukar kedudukan
change the positions

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \rightarrow A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

 tukar simbol
change the symbols

$$AA^{-1} = A^{-1}A = I$$

- (ii) tidak wujud apabila $ad - bc = 0$
 not exist when $ad - bc = 0$

 I = Matrik identiti
Identity matrix

Mendarab Matriks dengan Suatu Nombor Multiply a Matrix by a Number

$$(-4) \begin{bmatrix} 4 \\ -1 \\ 6 \end{bmatrix} = \begin{bmatrix} (-4)(4) \\ (-4)(-1) \\ (-4)(6) \end{bmatrix} = \begin{bmatrix} -16 \\ 4 \\ -24 \end{bmatrix}$$

Mendarab Dua Matriks/Multiply Two Matrices

$$\begin{bmatrix} -4 & -3 \\ -6 & 2 \end{bmatrix} \begin{bmatrix} 45 \\ 44 \end{bmatrix}$$

 Peringkat/Order: $(2 \times 2)(2 \times 1)$ sama - boleh darab
 same - can multiply

$$\begin{bmatrix} -4 & -3 \\ -6 & 2 \end{bmatrix} \begin{bmatrix} 45 \\ 44 \end{bmatrix} = \begin{bmatrix} (-4)(45) + (-3)(44) \\ (-6)(45) + (2)(44) \end{bmatrix}$$

$$= \begin{bmatrix} -312 \\ -182 \end{bmatrix}$$

Persamaan Linear Serentak Simultaneous Linear Equation

$$\begin{array}{l} 2x + 3y = 45 \\ 6x - 4y = 44 \end{array}$$

Tukar kepada bentuk matriks
Change to the matrix form

$$\begin{bmatrix} 2 & 3 \\ 6 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 45 \\ 44 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{(2)(-4) - (3)(6)} \begin{bmatrix} -4 & -3 \\ -6 & 2 \end{bmatrix} \begin{bmatrix} 45 \\ 44 \end{bmatrix}$$

$$= \frac{1}{-26} \begin{bmatrix} -312 \\ -182 \end{bmatrix}$$

$$= \begin{bmatrix} 12 \\ 7 \end{bmatrix}$$

 Jawapan/Answer: $x = 12, y = 7$



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

1 $\begin{bmatrix} 6 & 0 \\ 8 & -7 \end{bmatrix} + 4 \begin{bmatrix} 1 & -1 \\ 2 & 6 \end{bmatrix} =$

- A $\begin{bmatrix} 7 & -1 \\ 10 & -1 \end{bmatrix}$ C $\begin{bmatrix} 10 & -4 \\ 32 & 17 \end{bmatrix}$
B $\begin{bmatrix} 10 & 4 \\ 16 & 17 \end{bmatrix}$ D $\begin{bmatrix} 10 & -4 \\ 16 & 17 \end{bmatrix}$

2 $\begin{bmatrix} -7 & 4 \\ 0 & 8 \end{bmatrix} + 2 \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix} - 3 \begin{bmatrix} -1 & -2 \\ 1 & 5 \end{bmatrix}$

- A $\begin{bmatrix} -1 & 6 \\ 1 & 5 \end{bmatrix}$ C $\begin{bmatrix} 0 & 12 \\ 1 & -1 \end{bmatrix}$
B $\begin{bmatrix} 0 & 4 \\ 2 & 7 \end{bmatrix}$ D $\begin{bmatrix} 2 & 6 \\ 0 & 4 \end{bmatrix}$

2 Jika $P = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$, $Q = \begin{bmatrix} 4 & -1 \\ 0 & 2 \end{bmatrix}$. Hitung $P + Q$.

If $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$, $Q = \begin{bmatrix} 4 & -1 \\ 0 & 2 \end{bmatrix}$, Calculate $P + Q$.

- A $\begin{pmatrix} 5 & 2 \\ 2 & 7 \end{pmatrix}$ C $\begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix}$
B $\begin{pmatrix} 5 & 4 \\ 2 & 10 \end{pmatrix}$ D $\begin{pmatrix} 4 & 2 \\ 0 & 7 \end{pmatrix}$

4 Diberi bahawa matriks $H = \begin{bmatrix} -1 & 6 & 0 \\ 2 & 3 & 7 \end{bmatrix}$.

It is given that matrix $H = \begin{bmatrix} -1 & 6 & 0 \\ 2 & 3 & 7 \end{bmatrix}$.

Antara maklumat berikut, yang manakah benar tentang matriks H ?

Which of the following information is true about the H matrix?

	Peringkat matriks Order of matrix	Unsur H_{21} Element H_{21}
A	3×2	2
B	3×2	6
C	2×3	2
D	2×3	6

5 Diberi bahawa matriks $A = \begin{bmatrix} 2x-5 \\ 7 \\ y+3 \end{bmatrix}$ dan matriks $B = \begin{bmatrix} 9 \\ 7 \\ 11 \end{bmatrix}$. Cari nilai x dan nilai y jika $A = B$.

It is given that matrix $A = \begin{bmatrix} 2x-5 \\ 7 \\ y+3 \end{bmatrix}$ and matrix $B = \begin{bmatrix} 9 \\ 7 \\ 11 \end{bmatrix}$. Find the value of x and the value of y if $A = B$.

- A $x = 2, y = 8$ C $x = 7, y = 14$
B $x = 7, y = 8$ D $x = 2, y = 14$

6 Diberi persamaan matriks:
Given the matrix equation:

$$6(2p \quad -5) + q(-3 \quad 2) = (45 \quad -24)$$

Cari nilai $2p + q$.

Find the value of $2p + q$.

- A 7 C 11
B 9 D 12

7 Diberi bahawa $\begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 4 \\ 2 \end{bmatrix} = \frac{1}{x} \begin{bmatrix} 10 \\ 8 \end{bmatrix}$. Hitung nilai x .

It is given that $\begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 4 \\ 2 \end{bmatrix} = \frac{1}{x} \begin{bmatrix} 10 \\ 8 \end{bmatrix}$. Calculate the value of x .

- A 1 C 4
B 2 D 8

8 Diberi matriks $P = \begin{bmatrix} -3 & 3 \\ m & 5 \end{bmatrix}$. Cari nilai m jika matriks P tiada songsangan.

Given a matrix $P = \begin{bmatrix} -3 & 3 \\ m & 5 \end{bmatrix}$. Find the value of m if the matrix P has no inverse.

- A -3 C -5
B -4 D -6

9 Diberi M ialah matriks 2×2 dan

$$M^{-1} = \frac{1}{4(2) - r(5)} \begin{bmatrix} s & 5 \\ 1 & 4 \end{bmatrix}$$

Tentukan nilai bagi s dan r .

Given that M is a 2×2 matrix and

$$M^{-1} = \frac{1}{4(2) - r(5)} \begin{bmatrix} s & 5 \\ 1 & 4 \end{bmatrix}$$

Determine the values of s and r .

- A $r = -1, s = 0$ C $r = 1, s = 0$
B $r = -1, s = 2$ D $r = 1, s = 2$

10 Diberi bahawa $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 1 \\ -x \end{bmatrix} = \begin{bmatrix} 2+x \\ -5 \end{bmatrix}$. Hitung nilai x .

It is given that $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 1 \\ -x \end{bmatrix} = \begin{bmatrix} 2+x \\ -5 \end{bmatrix}$. Calculate the value of x .

- A -1 C 1
B 0 D 2

Soalan Subjektif

Jawab semua soalan.

- 1 (a) Diberi $P = \begin{bmatrix} 8 & -6 \\ -4 & m \end{bmatrix}$. Cari nilai m jika P tiada songsangan.

Given $P = \begin{bmatrix} 8 & -6 \\ -4 & m \end{bmatrix}$. Find the value of m if P has no inverse.

- (b) Jadual 1 menunjukkan markah bagi dua orang peserta akhir kuiz yang diadakan sempena Minggu Sains dan Matematik. Jumlah markah Zakwan tidak ditunjukkan.

Table 1 shows the marks of two finalists in the quiz held in conjunction with Science and Mathematics Week. Zakwan's total marks are not shown in the table.

Peserta Participant	Sains Science	Matematik Mathematics	Jumlah markah Total marks
Arman	110	80	870
Zakwan	120	50	

Jadual 1 / Table 1

Dalam pertandingan itu, Arman muncul sebagai pemenang setelah memperoleh lebih 70 markah berbanding Zakwan. Menggunakan kaedah matriks, cari nilai markah bagi satu soalan matematik dan satu soalan sains.

In the competition, Arman became the winner after obtaining 70 marks more than Zakwan. Using the matrix method, find the marks for one math question and one science question.

[7 markah/marks]

Jawapan/Answer:

(a)

(b)

- 2 (a) Diberi bahawa matriks $G = \begin{bmatrix} 3 \\ 7 \end{bmatrix}$ dan matriks $H = \begin{bmatrix} 2 & -6 \end{bmatrix}$. Hitung GH . Seterusnya, nyatakan peringkat hasil darab itu.
It is given that matrix $G = \begin{bmatrix} 3 \\ 7 \end{bmatrix}$ and matrix $H = \begin{bmatrix} 2 & -6 \end{bmatrix}$. Calculate GH . Hence, state the order of the product of the matrix.
- (b) Kelab sukan menempah 60 botol air mineral dan 40 pekete sandwich tuna untuk mesyuarat agung tahunan daripada Kedai Kek Sara. Manakala, kelab bahasa pula menempah 20 botol air mineral dan 50 pekete sandwich tuna untuk program debat daripada kedai yang sama. Pihak kedai menerima bayaran sebanyak RM260 daripada kelab sukan dan RM270 daripada kelab bahasa. Menggunakan kaedah matriks, hitung harga bagi sebotol air mineral dan sepekete sandwich tuna.
A sports club ordered 60 bottles of mineral water and 40 packets of tuna sandwiches for the annual general meeting from Sara Cake Shop. Meanwhile, a language club ordered 20 bottles of mineral water and 50 boxes of tuna sandwiches for a debate programme from the same shop. The shop received payment of RM260 from the sports club and RM270 from the language club. Using the matrix method, calculate the price of a bottle of mineral water and a packet of tuna sandwiches.

[6 markah/marks]

Jawapan/Answer:

(a)

(b)

- 3 Encik Kumar memasukkan sejumlah RM10 000 ke dalam dua bank yang berbeza iaitu bank P dan bank Q . Bank P membayar dividen sebanyak 8% setahun dan bank Q membayar dividen sebanyak 12% setahun. Selepas setahun, jumlah dividen yang diperoleh Encik Kumar daripada kedua-dua bank itu ialah RM960. Dengan menggunakan kaedah matriks, nyatakan nisbah jumlah wang yang dimasukkan ke dalam bank P kepada bank Q .

Mr. Kumar deposited a total of RM10 000 into two different banks, P and Q . Bank P pays an annual dividend of 8%, while bank Q pays an annual dividend of 12%. After one year, the total dividend Mr. Kumar earned from both banks was RM960. Using the matrix method, determine the ratio of the amount of money deposited in bank Q to the amount deposited in bank P .

[5 markah/marks]

Jawapan/Answer:



4 (a) Diberi bahawa matriks $Q = \begin{bmatrix} -12 & 1 \\ 4 & 6 \\ -3 & 8 \end{bmatrix}$.

It is given that matrix $Q = \begin{bmatrix} -12 & 1 \\ 4 & 6 \\ -3 & 8 \end{bmatrix}$.

- (i) Nyatakan peringkat matriks

State the order of matrix

- (ii) Nyatakan nilai $3Q_{23}$.

State the value of $3Q_{23}$.

- (b) Semasa jualan koperasi, Aiman membeli 2 pen penanda premium dan 3 pembaris edisi khas. Bella pula membeli 4 pen penanda premium dan 1 pembaris edisi khas. Aiman membayar RM21, manakala Bella membayar RM26. Menggunakan kaedah matriks, hitung harga bagi satu pen penanda premium dan satu pembaris edisi khas.

During the cooperative sale, Aiman bought 2 premium marker pens and 3 special edition rulers. Bella bought 4 premium marker pens and 1 special edition ruler. Aiman paid RM21, while Bella paid RM26. Using the matrix method, calculate the price of one premium marker pen and one special edition ruler.

- (c) Pada hari jualan amal, setiap pen penanda premium diberi diskaun sebanyak 30%, manakala setiap pembaris edisi khas diberi diskaun sebanyak 20%. Aiman ingin membeli 3 batang pen penanda premium dan 2 batang pembaris edisi khas. Dia mempunyai RM20. Tentukan sama ada Aiman mempunyai wang yang mencukupi untuk membeli barangan tersebut pada harga diskaun. Justifikasikan jawapan anda dengan menggunakan pendaraban matriks.

On the charity sale day, each premium marker pen is discounted by 30%, while each special edition ruler is discounted by 20%. Aiman wants to buy 3 premium marker pens and 2 special edition rulers. He has RM20. Determine whether Aiman has enough money to buy the items at the discounted price. Justify your answer using matrix multiplication.

[10 markah/marks]

Jawapan/Answer:

- (a) (i)

- (ii)

- (b)

- (c)

BAB 3

Matematik Pengguna: Insurans Consumer Mathematics: Insurance



NOTA EFEKTIF

Premium Asas Polisi Komprehensif/Basic Premium of the Comprehensive Policy

- | | |
|---|--|
| <p>(a) Bagi Semenanjung Malaysia, premium asas
= Kadar bagi RM1 000 yang pertama + RM26 bagi setiap RM1 000 atau sebahagian daripada itu bagi nilai yang melebihi RM1 000
<i>For Peninsular Malaysia, the basic premium</i>
= Rate for the first RM1 000 + RM26 for every RM1 000 or part thereof on value exceeding RM1 000</p> | <p>(b) Bagi Sabah dan Sarawak, premium asas
= Kadar bagi RM1 000 yang pertama + RM20.30 bagi setiap RM1 000 atau sebahagian daripada itu bagi nilai yang melebihi RM1 000
<i>For Sabah and Sarawak, the basic premium</i>
= Rate for the first RM1 000 + RM20.30 for every RM1 000 or part thereof on value exceeding RM1 000</p> |
|---|--|

Deduktibel/Deductible

Deduktibel ialah suatu jumlah yang perlu ditanggung oleh pemegang polisi sebelum layak membuat tuntutan daripada syarikat insurans.

A deductible is an amount that must be borne by the policyholder before they are eligible to make a claim from the insurance company.

Ko-insurans/Co-insurance

Ko-insurans ialah perkongsian bersama kerugian antara syarikat insurans dengan pemegang polisi.

Co-insurance is a joint sharing of loss between the insurance company and the policyholder.

Insurans Harta/Property Insurance

- (a) **Jika nilai yang diinsuranskan = jumlah insurans yang harus dibeli**
Bayaran pampasan = Jumlah kerugian – Deduktibel
dengan keadaan jumlah kerugian $\leq$ jumlah insurans yang telah dibeli

If the insured value = amount of required insurance

*Compensation payment = Total loss – Deductible
where the amount of loss $\leq$ the amount of required insurance*

- (b) **Jika nilai yang diinsuranskan < jumlah insurans yang harus dibeli**
If the insured value < amount of required insurance

$$\text{Bayaran pampasan} = \left(\frac{\text{Jumlah insurans yang telah dibeli}}{\text{Jumlah insurans yang harus dibeli}} \right) \times (\text{Jumlah kerugian/Total loss}) - \text{Deduktibel/Deductible}$$

Compensation payment

- (c) **Mengalami kerugian menyeluruh**

Bayaran pampasan = Jumlah insurans yang telah dibeli – Deduktibel

Suffered a total loss

Compensation payment = Amount of insurance purchased – Deductible

- (d) **Penalti ko-insurans**

$$= \text{Jumlah kerugian} - \left(\frac{\text{Jumlah insurans yang telah dibeli}}{\text{Jumlah insurans yang harus dibeli}} \times \text{Jumlah kerugian} \right)$$

Co-insurance penalty

$$= \text{Total loss} - \left(\frac{\text{Amount of insurance purchased}}{\text{Amount of required insurance}} \times \text{Total loss} \right)$$

Insurans Hayat/Life Insurance

$$\text{Premium} = \frac{\text{Nilai muka polisi/Face value of policy}}{\text{RMx}} \times (\text{Kadar premium per RMx/Premium rate per RMx})$$



LATIHAN INTENSIF

Soalan Objektif Jawab semua soalan.

- Apakah maksud prinsip indemniti dalam insurans?
What is the meaning of the principle of indemnity in insurance?
 - Pampasan melebihi nilai kerugian sebenar.
Compensation exceeds the actual value of the loss.
 - Pampasan bersamaan dengan nilai kerugian sebenar.
Compensation is equal to the actual value of the loss.
 - Pampasan dibayar tanpa mengira nilai kerugian.
Compensation is paid regardless of the value of the loss.
 - Pampasan diberi hanya jika berlaku kematian.
Compensation is given only in the event of death.
- Insurans motor bagi kereta Puan Amiera mempunyai peruntukan deduktibel. Dalam satu kemalangan, kerugian yang dialami ialah RM950 dan pampasan yang diterima ialah RM670. Berapakah nilai deduktibel dalam polisi insurans tersebut?
The motor insurance for Puan Amiera's car has a deductible provision. In an accident, the loss incurred was RM950 and the compensation received was RM670. What is the value of the deductible in the insurance policy?
 - RM180
 - RM250
 - RM280
 - RM320
- Maklumat berikut adalah berkaitan dengan insurans kebakaran bagi rumah Pak Along.
The following information is related to the fire insurance for Pak Along's house.

- Nilai boleh insurans ialah RM550 000
Insurance value is RM550 000
- Deduktibel RM4 000
Deductible RM4 000
- Peruntukan ko-insurans 80% daripada nilai boleh insurans
Co-insurance provision of 80% of insurable value

Hitung jumlah insurans yang harus dibeli oleh Pak Along.

Calculate the amount of insurance that Pak Along should purchase.

- RM400 000
- RM420 000
- RM440 000
- RM460 000

- Encik Erli dan Encik Mazlan membeli insurans kesihatan dengan polisi yang sama daripada syarikat insurans yang sama. Jadual 1 menunjukkan maklumat Encik Erli dan Encik Mazlan.

Encik Erli and Encik Mazlan buy a health insurance with the same policies from the same insurance company. Table 1 shows the information of Encik Erli and Encik Mazlan.

Nama <i>Name</i>	Encik Erli	Encik Mazlan
Umur <i>Age</i>	21 tahun/ years old	60 tahun/ years old
Aktiviti fizikal <i>Physical activity</i>	Aktif bersukan <i>Physically active</i> Sihat dan cergas <i>Healthy and fit</i>	Tidak aktif <i>Inactive</i>
Sejarah perubatan <i>Medical history</i>	Tiada <i>None</i>	Tiada <i>None</i>
Premium (sebulan) <i>Premium (per month)</i>	RM80	RM500

Jadual 1 / Table 1

Apakah faktor utama yang diambil kira oleh syarikat insurans menyebabkan premium Encik Mazlan lebih tinggi?

What is the main factor considered by the insurance company that causes Encik Mazlan's premium to be higher?

- Umur yang lebih meningkat dan gaya hidup kurang aktif meningkatkan risiko kesihatan.
Older age and a less physically active lifestyle increase health risks.
- Tempoh perlindungan insurans Encik Mazlan adalah lebih lama.
Encik Mazlan has a longer insurance coverage period.
- Encik Mazlan membuat tuntutan insurans yang lebih kerap.
Encik Mazlan makes insurance claims more frequently.
- Encik Erli mendapat diskaun khas daripada syarikat insurans.
Encik Erli receives a special discount from the insurance company.

- 5 Puan Halifah menerima rawatan di hospital swasta dengan bil perubatannya sebanyak RM3 500. Dia telah mendapatkan insurans perubatan dan kesihatan dengan deduktibel sebanyak RM700 dan ko-insurans 20%. Hitung jumlah bayaran yang perlu ditanggung oleh Puan Halifah untuk rawatan perubatannya.

Puan Halifah received treatment at a private hospital with a medical bill of RM3 500. She has obtained medical and health insurance with a deductible of RM700 and 20% co-insurance. Calculate the amount of payment borne by Puan Halifah for her medical treatment.

- A RM1 260 C RM2 800
B RM1 400 D RM3 500

- 6 Jadual 2 menunjukkan sebahagian daripada kadar premium bagi polisi motor yang digunakan di Malaysia.

Table 2 shows a part of premium rate for the motor policy that is used in Malaysia.

Kapasiti enjin tidak melebihi (cc) <i>Engine capacity not exceeding (cc)</i>	Polisi pihak ketiga (RM) <i>Third party policy (RM)</i>	
	Semenanjung Malaysia <i>Peninsular Malaysia</i>	Sabah dan Sarawak <i>Sabah and Sarawak</i>
1 650	135.00	75.60
2 200	151.20	85.20

Jadual 2 / Table 2

Encik Tze Tan bekerja dan menetap di Johor. Dia ingin membeli polisi insurans kereta dengan kapasiti enjin 1 600 cc dan jumlah yang ingin diinsuranskan ialah RM45 000. Nilai Diskaun Tanpa Tuntutan (NCD) pada tahun tersebut ialah 30%. Hitung premium kasar bagi kereta itu untuk polisi ketiga, kebakaran dan kecurian.

Mr. Tze Tan works and stays in Johor. He wants to purchase a motor insurance policy for a car with an engine capacity of 1 600 cc and a sum insured of RM45 000. No Claim Discount (NCD) for that year is 30%. Calculate the gross premium for the car under the third party, fire and theft policy.

- A RM1 279.00 C RM959.25
B RM1 144.00 D RM671.50

- 7 Encik Farid memiliki sebuah bangunan kedai dengan nilai pasaran RM400 000. Bangunan tersebut diinsuranskan di bawah polisi insurans kebakaran dengan jumlah perlindungan RM300 000. Polisi tersebut mempunyai klausa ko-insurans 80%. Jika berlaku kebakaran dan kerugian yang dianggarkan sebanyak RM120 000, berapakah jumlah pampasan yang akan dibayar oleh syarikat insurans?

Mr. Farid owns a shop building with a market value of RM400 000. The building is insured under a fire insurance policy with a sum insured of RM300 000. The policy includes an 80% co-insurance clause. If a fire occurs and the loss is estimated at RM120 000, what is the amount of compensation that will be paid by the insurance company?

- A RM90 000 C RM112 500
B RM100 000 D RM120 000

Soalan Subjektif

Jawab semua soalan.

- 1 Sebuah kilang milik Syarikat Jaya Sdn. Bhd. mempunyai nilai pasaran RM1 000 000. Kilang tersebut diinsuranskan oleh syarikatnya dengan jumlah perlindungan RM600 000 di bawah polisi kebakaran yang mempunyai ko-insurans 90%. Jika kebakaran menyebabkan kerugian bernilai RM250 000, berapakah jumlah pampasan yang layak diterima oleh syarikat tersebut?

A factory owned by Jaya Sdn. Bhd. Company has a market value of RM1 000 000. The factory is insured by the company with a sum insured of RM600 000 under a fire insurance policy that includes a 90% co-insurance clause. If a fire causes a loss amounting to RM250 000, what is the amount of compensation that the company is entitled to receive?

[3 markah/marks]

Jawapan/Answer:

- 2 Puan Mas mempunyai polisi insurans perubatan utama dengan peruntukan deduktibel sebanyak RM800 dan fasal penyertaan peratusan ko-insurans 80/20. Hitung bayaran kos perubatan yang ditanggung oleh Puan Mas sekiranya beliau menjalani pembedahan di sebuah hospital swasta dan dikenakan bil perubatan sebanyak RM40 000.

Puan Mas has a major medical insurance policy with a deductible of RM800 and an 80/20 co-insurance clause in her policy. Calculate the medical expenses to be borne by Puan Mas if she undergoes surgery at a private hospital and is charged a medical bill of RM40 000.

[4 markah/marks]

Jawapan/Answer:

- 3 Faranida membeli rumah berharga RM600 000 dan nilai boleh insurans bagi rumah tersebut ialah RM420 000. Dia telah membeli insurans kebakaran yang mempunyai peruntukan ko-insurans untuk menginsuranskan 80% daripada nilai boleh insurans rumahnya dan deduktibel RM3 000. Rumahnya telah mengalami kerugian sebanyak RM25 000. Hitung jumlah pampasan yang akan diterima oleh Faranida sekiranya dia menginsuranskan rumahnya dengan jumlah RM300 000.

Faranida purchased a house priced at RM600 000, and the insurable value of the house is RM420 000. She bought fire insurance that includes a co-insurance provision requiring 80% of the insurable value of the house to be insured, and a deductible of RM3 000. Her house suffered a loss of RM25 000. Calculate the amount of compensation that Faranida will receive if she insured her house for RM300 000.

[4 markah/marks]

Jawapan/Answer:

- 4 Jadual 1 menunjukkan kadar premium tahunan bagi setiap RM1 000 nilai muka insurans sementara boleh baharu yang ditawarkan oleh Syarikat Insurans Sihat.

Table 1 shows the annual premium rate schedule per RM1 000 face value of a yearly renewable term insurance offered by Sihat Insurance Company.

Umur Age	Perempuan Female	
	Bukan perokok Non-smoker	Perokok Smoker
32 – 36	1.50	1.84
37 – 42	1.56	1.93
43 – 47	1.63	2.03

Jadual 1 / Table 1

Puan Fei Fei berumur 38 tahun, seorang yang sihat dan merokok. Dia ingin membeli polisi insurans tersebut bernilai RM250 000 dan menambah polisi penyakit kritikal. Syarikat insurans tersebut menawarkan polisi penyakit kritikal dengan memberi perlindungan sebanyak 10% nilai muka asas dan kadar premium bagi setiap RM1 000 ialah RM2.00 mengikut umur dan status kesihatan Puan Fei Fei. Hitung premium tahunan Puan Fei Fei.

Puan Fei Fei is 38 years old, healthy and a smoker. She wants to buy the insurance policy worth RM250 000 and wants to add on a critical illness policy. That insurance company offers a critical illness policy with a coverage of 10% of basic face value and the premium rate is RM2.00 per RM1 000 based on Puan Fei Fei's age and health. Calculate Puan Fei Fei's annual premium.

[4 markah/marks]

Jawapan/Answer:

- 5 Taresh ingin membeli insurans untuk keretanya di Sabah. Rajah 1 menunjukkan maklumat bagi keretanya manakala Jadual 2 menunjukkan kadar premium bawah Tarif Motor bagi polisi motor yang dikeluarkan di Sabah dan Sarawak.

Taresh wants to buy the motor insurance for his car in Sabah. Diagram 1 shows the information of his car while Table 2 shows the premium rate under the Motor Tariff for motor policies issued in Sabah and Sarawak.

Model/Model	: Toyota
Usia kereta/Age of vehicle	: 3 tahun/years
Kapasiti enjin/Engine capacity	: 2 800 cc
NCD	: 35%
Jumlah nilai yang diinsuranskan/ Sum insured	: RM120 000

Rajah 1 / Diagram 1

Kapasiti enjin tidak melebihi <i>Engine capacity not exceeding</i> (cc)	Polisi komprehensif <i>Comprehensive policy</i> (RM)	Polisi pihak ketiga <i>Third party policy</i> (RM)
1 650	220.00	75.60
2 200	243.90	85.20
3 050	266.50	93.60
4 100	290.40	101.70

Jadual 2 / Table 2

- (a) Hitung premium kasar bagi kereta Taresh untuk polisi komprehensif.
Calculate the gross premium of Farish's car for comprehensive policy. [4 markah/marks]
- (b) Hitung premium kasar bagi kereta Taresh untuk polisi pihak ketiga selepas usia kereta mencapai 9 tahun dan NCD pada tahun tersebut ialah 55%.
Calculate the gross premium for Taresh's car under a third-party policy after the car reaches 9 years of age and the NCD for that year is 55%. [3 markah/marks]

Jawapan/Answer:

(a)

(b)

BAB 4

Matematik Pengguna: Percukaian Consumer Mathematics: Taxation



VIDEO
PEMBELAJARAN

NOTA EFEKTIF

Jenis-jenis Cukai

Types of Taxes

Cukai Tax	Pihak mengutip cukai Tax collecting authority	Cukai dikenakan terhadap Tax levied on	Pengiraan Calculation
Cukai Pendapatan Income Tax	Lembaga Hasil dalam Negeri (LHDN) Inland Revenue Board (IRB)	- Individu bergaji/Salaried individual - Keuntungan syarikat/Profitable company	Cukai dasar + cukai atas baki Base tax + tax on the next balance
Cukai Jalan Road Tax	Jabatan Pengangkutan Jalan (JPJ) Road Transport Department	Pemilik kenderaan/Vehicle owner	Kadar asas + kadar progresif Base rate + progressive rate
Cukai Pintu (Taksiran) Property Assessment Tax	Majlis perbandaran atau majlis daerah Municipal council or district council	- Rumah kediaman/Residential houses - Perindustrian/Industrial - Bangunan komersial Commercial buildings - Tanah kosong/Vacant land	Kadar $\times$ nilai tahunan Rate $\times$ annual value Nilai tahunan adalah anggaran sewa bulanan dalam setahun Annual value is the estimated monthly rent in a year
Cukai Tanah Quit Rent	Pejabat Tanah dan Galian State Land Office	- Tanah pertanian/Agricultural land - Tanah perusahaan/Corporate land - Tanah bangunan/Land with building	Kadar cukai tanah setiap unit keluasan $\times$ jumlah keluasan tanah Quit rent rate per unit area $\times$ total land area
Cukai Jualan dan Perkhidmatan Sales and Service Tax	Jabatan Kastam Diraja Malaysia (JKDM) Royal Malaysian Customs Department (RMCD)	- Perkhidmatan hotel/Hotel services - Insurans dan takaful Insurance and Takaful - Perkhidmatan makanan dan minuman Food and beverages - Telekomunikasi/Telecommunications - Kad kredit/Credit cards	Jumlah nilai barang/perkhidmatan $\times$ % cukai perkhidmatan Total value of goods/services $\times$ service tax %

Pengiraan pendapatan bercukai Calculation of chargeable income

=

Jumlah pendapatan tahunan
Annual total income

-

Pengecualian
Exemption

-

Pelepasan
Relief

Gaji individu/keuntungan syarikat
Individual salary/Company profits

Hadiah/derma/sumbangan
Gifts/donations/contributions

KWSP/rawatan perubatan/yuran pengajian
KWSP/medical treatment/education fees

Cukai pendapatan yang perlu dibayar Payable income tax

=

Cukai dasar
Base tax

+

Cukai atas baki
Tax on the next balance

-

Rebat cukai
Tax rebate

Zakat/tolak RM400 jika pendapatan bercukai $\leq$ RM35 000
Zakat/deduct RM400 if the chargeable income $\leq$ RM35 000



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 Amirul memiliki sebuah rumah dengan keluasan 200 m². Diberi bahawa kadar cukai yang dikenakan ialah RM0.65 setiap meter persegi. Cukai apakah yang perlu dibayar oleh Khairul setiap tahun?

Amirul owns a house with an area of 200 m². Given that the tax rate is RM0.65 per square meter. What type of tax does Khairul have to pay each year?

- A Cukai jalan/ Road tax
B Cukai perkhidmatan/ Service tax
C Cukai pintu/ Property assessment tax
D Cukai tanah/ Quit rent

- 2 Aina makan tengah hari di sebuah restoren. Apakah jenis cukai yang akan dikenakan ke atasnya?

Aina has a lunch at a restaurant. What is the type of tax imposed on her?

- A Cukai jalan/ Road tax
B Cukai pintu/ Property assessment rate
C Cukai pendapatan/ Income tax
D Cukai jualan dan perkhidmatan
Sale and service tax

- 3 Jadual 1 menunjukkan kadar cukai pintu yang perlu dibayar oleh penduduk di Taman Tua.

Table 1 shows the property assessment tax rate that needs to be paid by the residents in Taman Tua.

Nilai tahunan Annual value	Kadar cukai pintu Property assessment tax rate
RM6 420	5%

Jadual 1 / Table 1

Hitung cukai pintu yang perlu dibayar oleh seorang penduduk di Taman Tua.

Calculate the property assessment tax to be paid by a resident in Taman Tua.

- A RM160.50 C RM1 605.00
B RM321.00 D RM3 210.00

- 4 Liza telah 15 tahun bekerja sebagai seorang jururawat, dengan gaji bulanan adalah sebanyak RM7 890. Beliau telah memiliki sebuah pangsapuri dan sebuah kereta. Antara cukai berikut, yang manakah tidak dikenakan kepada Liza?

Liza has been working as a nurse for 15 years with a monthly salary of RM7 890. She owns an apartment and a car. Which of the following taxes not be levied on Liza?

- A Cukai tanah/Quit rent
B Cukai petak/Parcel tax
C Cukai jalan/Road tax
D Cukai pendapatan/Income tax

- 5 Asmah memiliki sebuah rumah di Tanjong Limau dengan nilai tahunannya RM4 860 dan mempunyai kadar cukai pintu sebanyak 4%. Jika kadar cukai pintu di Telok Durian adalah 1.5 kali kadar cukai pintu di Tanjong Limau bagi nilai tahunan yang sama, hitung cukai pintu tahunan yang perlu dibayar oleh seorang penduduk di Telok Durian.

Asmah owns a house in Tanjong Limau with an annual value of RM4 860 and a property assessment tax rate of 4%. If the property assessment tax rate in Telok Durian is 1.5 times the property assessment tax rate in Tanjong Limau for the same annual value, calculate the annual amount of property assessment tax to be paid by a resident in Telok Durian.

- A RM89.20 C RM186.30
B RM105.40 D RM291.60

- 6 Penyata gaji Puan Lela menunjukkan potongan cukai bulanan (PCB) sebanyak RM189.20 sebulan. Cukai yang dikenakan terhadapnya ialah RM2 013. Berapakah amaun yang akan dipulangkan oleh Lembaga Hasil dalam Negeri (LHDN) kepada Puan Lela?

Puan Lela's salary statement shows a monthly tax deduction of RM189.20 every month. The chargeable tax imposed on her is RM2 013. What is the amount that will be returned by Inland Revenue Board (IRB) to Puan Lela?

- A RM257.40 C RM2 202.20
B RM1 823.80 D RM2 270.40

- 7 Rajah 1 menunjukkan senarai perkara yang akan diambil kira dalam cukai pendapatan.

Diagram 1 shows the list of items that will be taken into account in income tax.

- Pemeriksaan perubatan ibu
Mother's medical checkup
- Yuran ijazah sarjana/Master's degree fees
- Potong KWSP/EPF

Rajah 1 / Diagram 1

Antara berikut, kategori yang manakah merujuk perkara di atas?

Which of the following category shows the items above?

- A Pendapatan bercukai/ Taxable income
B Rebat cukai/ Tax Rebate
C Pengecualian cukai/ Tax exemption
D Pelepasan cukai/ Tax relief

Soalan Subjektif
Jawab semua soalan.

- 1 Chen Li Jie bekerja di sebuah kilang. Gaji tahunannya pada tahun 2025 ialah RM49 500. Dia menderma sebanyak RM300 kepada MAKNA, organisasi yang diluluskan oleh kerajaan. Diberi bahawa jumlah pelepasan yang dituntut oleh Chen Li Jie ialah RM1 350.

Chen Li Jie works in a factory. His annual salary in the year 2025 was RM49 500. He donated RM300 to MAKNA, a government-approved organization. It is given that the total tax relief claimed was RM1 350.

Jadual Kadar Cukai Pendapatan Individu
Table of Individual Income Tax Rates

Banjaran Pendapatan Bercukai <i>Chargeable Income (RM)</i>	Pengiraan <i>Calculations (RM)</i>	Kadar <i>Rate (%)</i>	Cukai <i>Tax (RM)</i>
0 – 5 000	5 000 pertama <i>On the first 10 000</i>	0	0
5 001 – 20 000	5 000 pertama <i>On the first 5 000</i>		0
	15 000 berikutnya <i>Next 15 000</i>	1	150
20 001 – 35 000	20 000 pertama <i>On the first 20 000</i>		150
	15 000 berikutnya <i>Next 15 000</i>	3	450
35 001 – 50 000	35 000 pertama <i>On the first 35 000</i>		600
	15 000 berikutnya <i>Next 15 000</i>	8	1 200

Jadual 1 / Table 1

Hitung cukai pendapatan yang perlu dibayar oleh Chen Li Jie.
Calculate the income tax payable by Chen Li Jie.

[4 markah/marks]

Jawapan/Answer:

- 2 Puan Hannah memiliki sebidang tanah berkeluasan $11 \text{ m} \times 23.5 \text{ m}$. Kadar cukai tanah yang dikenakan ialah RM0.40 setiap meter persegi. Hitung cukai tanah yang perlu dibayar oleh Puan Hannah setiap tahun.
Puan Hannah owns a piece of land measuring $11 \text{ m} \times 23.5 \text{ m}$. The quit rent charged is RM0.40 per square meter. Calculate the quit rent that Puan Hannah must pay each year.

[2 markah/marks]

Jawapan/Answer:

- 3 Nilai tahunan rumah Asimah ialah RM30 000 pada tahun 2024. Kadar cukai pintu pada tahun itu ialah 6%. Hitung cukai pintu yang perlu dibayar oleh Asimah.
The annual value of Asimah's house was RM30 000 in 2024. The property assessment tax rate that year is 6%. Calculate the property assessment tax that Asimah must pay.

[2 markah/marks]

Jawapan/Answer:

- 4 Encik Raja ialah seorang jurutera yang memperoleh pendapatan sebanyak RM178 000 pada tahun 2023. Beliau menderma sebanyak RM10 000 kepada sebuah rumah kebajikan orang tua yang diluluskan oleh kerajaan. Beliau juga menerima pelepasan sebanyak RM12 500.
Encik Raja is an engineer earning an income of RM178 000 in year 2023. He donates RM10 000 to a government-approved elderly care charity. He also receives a tax relief of RM12 500.

Jadual Kadar Cukai Pendapatan Individu untuk Tahun Taksiran 2023

Table of Individual Income Tax Rates for the Assessment Year 2023

Banjaran Pendapatan Bercukai Chargeable Income (RM)	Pengiraan Calculations (RM)	Kadar Rate (%)	Cukai Tax (RM)
100 001 – 400 000	100 000 pertama On the first 10 000		9 400
	300 000 berikutnya Next 300 000	25	75 000

Jadual 2 / Table 2

Hitung/Calculate

- (a) pendapatan bercukai Encik Raja,
Encik Raja's chargeable income,
 (b) cukai pendapatan yang perlu dibayar oleh Encik Raja pada tahun tersebut.
the income tax payable by Encik Raja for that year.

[4 markah/marks]

Jawapan/Answer:

(a)

(b)



- 5 Puan Aisyah dan suaminya, memilih taksiran cukai bersama pada tahun 2025. Jumlah pendapatan bercukai mereka adalah sebanyak RM130 200. Mereka masing-masing membayar zakat sebanyak RM590 pada tahun tersebut. Jadual 3.1 menunjukkan pelepasan cukai yang dituntut oleh Puan Aisyah dan suaminya. Jadual 3.2 menunjukkan kadar cukai pendapatan individu.

Puan Aisyah and her husband, chose joint tax assessment in 2025. Their chargeable income is RM130 200. They have each paid zakat of RM590 in that year. Table 3.1 shows the tax reliefs to be claimed by Puan Aisyah and her husband. Table 3.2 shows the individual tax rates.

Perkara <i>Item</i>	Had <i>Limit</i>	Puan Aisyah	Suami <i>Husband</i>
Individu <i>Individual</i>	—	RM9 000	RM9 000
Perbelanjaan rawatan perubatan ibu bapa <i>Medical treatment expenses for parents</i>	RM5 000	RM2 000	RM1 000
Insurans hayat dan KWSP <i>Life insurance and EPF</i>	RM7 000	RM2 800	RM2 500
Insurans perubatan <i>Medical insurance</i>	RM3 000	RM1 600	RM1 800
Gaya hidup <i>Lifestyle</i>	RM2 500	RM1 200	RM1 200
Pasangan <i>Spouse</i>	RM4 000	RM4 000 (untuk taksiran cukai bersama) (for joint tax assessment)	
Tabung bersih SSPN <i>Net deposit in SSPN</i>	RM8 000	RM5 000	RM6 000

Jadual 3.1 / Table 3.1

Jadual Kadar Cukai Pendapatan Individu
Table of Individual Income Tax Rates

Banjaran Pendapatan Bercukai <i>Chargeable Income (RM)</i>	Pengiraan <i>Calculations (RM)</i>	Kadar <i>Rate (%)</i>	Cukai <i>Tax (RM)</i>
0 – 5 000	5 000 pertama <i>On the first 10 000</i>	0	0
5 001 – 20 000	5 000 pertama <i>On the first 5 000</i>		0
	15 000 berikutnya <i>Next 15 000</i>	1	150
20 001 – 35 000	20 000 pertama <i>On the first 20 000</i>		150
	15 000 berikutnya <i>Next 15 000</i>	3	450
35 001 – 50 000	35 000 pertama <i>On the first 35 000</i>		600
	15 000 berikutnya <i>Next 15 000</i>	8	1 200
50 001 – 70 000	50 000 pertama <i>On the first 50 000</i>		1 800
	20 000 berikutnya <i>Next 20 000</i>	14	2 800
70 001 – 100 000	70 000 pertama <i>On the first 70 000</i>		4 600
	30 000 berikutnya <i>Next 30 000</i>	21	6 300

Jadual 3.2 / Table 3.2

- (a) Sekiranya nisbah pendapatan Puan Aisyah kepada pendapatan suaminya ialah 3 : 2, hitung cukai pendapatan yang perlu dibayar oleh suaminya.
If the ratio of income of Puan Aisyah to her husband is 3 : 2, calculate the income tax payable by her husband.
- (b) Seterusnya, hitung jumlah cukai pendapatan Puan Aisyah dan suami jika mereka menggunakan taksiran cukai bersama.
Hence, calculate the total income tax of Puan Aisyah and husband if they are using joint tax assessment.
- [8 markah/marks]

Jawapan/Answer:

(a)

(b)

- 6 Jadual 4 menunjukkan makanan dan minuman yang telah dipesan oleh Azmah di Restoren Itikmas yang mengenakan cukai perkhidmatan 6%.
Table 4 shows the food and drinks ordered by Azmah in Itikmas Restaurant imposing a service tax of 6%.

Makanan dan minuman <i>Foods and drinks</i>	Harga Price (RM)	Kuantiti Quantity
Nasi ayam/ <i>Chicken rice</i>	12.90	2
Sup cendawan/ <i>Mushroom soup</i>	12.10	1
Jus oren/ <i>Orange juice</i>	4.60	4
Kek coklat/ <i>Chocolate cake</i>	8.90	3

Jadual 4 / Table 4

Hitung jumlah bil yang akan dibayar oleh Azmah.
Calculate the total bill that Azmah has to pay.

[4 markah/marks]

Jawapan/Answer:

- 7 Encik Tan memiliki sebuah kereta dengan kapasiti enjin 1988 cc. Beliau pergi ke sebuah pejabat agensi kerajaan untuk membayar cukai jalan.

Encik Tan owns a car with an engine capacity of 1988 cc. He went to a government agency office to pay his road tax.



Rajah 1 / Diagram 1

Kapasiti enjin Engine capacity (cc)	Kadar cukai Road tax rate	
	Kadar asas Base rate (RM)	Kadar progresif Progressive rate (RM)
1 401 – 1 600	90.00	–
1 601 – 1 800	200.00	+0.40 setiap cc melebihi 1 600 cc +0.40 each cc exceeding 1 600 cc
1 801 – 2 000	280.00	+0.50 setiap cc melebihi 1 800 cc +0.50 each cc exceeding 1 800 cc

Jadual 5 / Table 5

Hitung baki yang diterima oleh Encik Tan jika beliau membayar cukai jalan dengan menggunakan 4 keping RM100 di kaunter pejabat tersebut yang dikendalikan oleh Encik Khairul. Seterusnya, nyatakan agensi Encik Khairul bekerja.

Calculate the change received by Encik Tan if he pays the road tax using 4 notes of RM100 at the counter managed by Encik Kahirul. Hence, state the agency where Encik Khairul works.

[3 markah/marks]

Jawapan/Answer:

BAB 5

Kekongruenan, Pembesaran, dan Gabungan Transformasi

Congruency, Enlargement and Combined Transformations



NOTA EFEKTIF

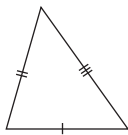
Kongruen

Congruency

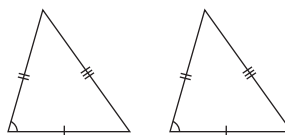
- Rajah mempunyai panjang sisi sepadan dan saiz sudut sepadan yang sama.
Diagrams has the same corresponding sides and angles.

Kekongruenan segi tiga Triangle congruency

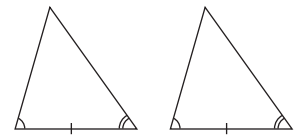
Sisi-Sisi-Sisi (SSS) Side-Side-Side



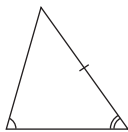
Sisi-Sudut-Sisi (SAS) Side-Angle-Side



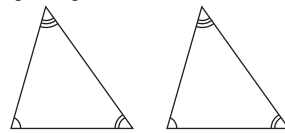
Sudut-Sisi-Sudut (ASA) Angle-Side-Angle



Sudut-Sudut-Sisi (AAS) Angle-Angle-Side

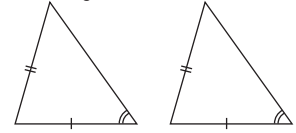


Sudut-Sudut-Sudut (AAA) Angle-Angle-Angle



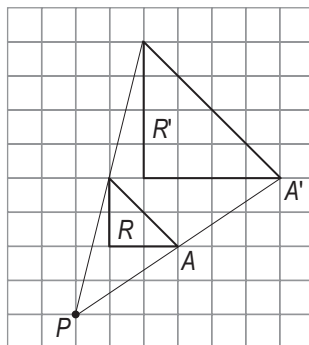
Luas mesti sama
The area must be equal

Sisi-Sisi-Sudut (SSA) Side-Side-Angle



Luas mesti sama
The area must be equal

Pembesaran Enlargement



- Objek dan imej adalah serupa.
Object and image are similar.
- Faktor skala/Scale factor, $k = \frac{PA'}{PA}$
- Luas imej = $k^2 \times$ luas objek
Area of image = $k^2 \times$ area of object

Gabungan Transformasi Combined Transformation

- Gabungan transformasi **AB** bermaksud transformasi **B** diikuti transformasi **A**.
*The combined transformation **AB** means transformation **B** followed by transformation **A**.*
- Untuk menentukan imej daripada objek di bawah transformasi **AB**, ikut tertib transformasi **B** diikuti transformasi **A**.
*To determine the image of an object under transformation **AB**, follow the sequence of transformation **B** followed by transformation **A**.*
- Bagi menentukan objek berdasarkan imej, tertib transformasi dipertimbangkan secara songsang dengan

tertib menentukan imej di bawah gabungan transformasi yang sama.

To determine the object based on the image, the order of transformations is reversed to determine the image under the same combined transformation.

Teselasi Tessellation

- Teselasi ialah pola bagi bentuk berulang yang memenuhi suatu satah tanpa ruang kosong atau pertindihan.
A tessellation is a pattern of recurring shapes that fills a plane without leaving empty spaces or overlapping.
- Teselasi dapat direka daripada transformasi isometri.
A tessellation can be designed using isometric transformation.

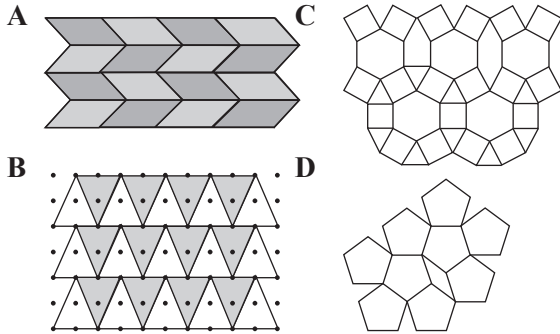


LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

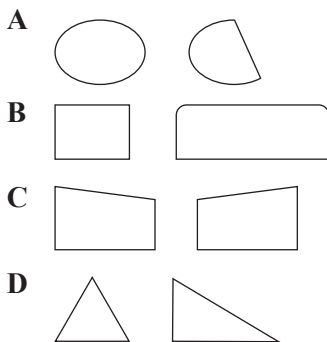
- 1 Antara berikut yang manakah mewakili suatu teselasi?

Which of the following represents a tessellation?



- 2 Antara berikut, pasangan yang manakah yang kongruen?

Which of the following pairs is congruent?



- 3 Pernyataan berikut merujuk kepada ciri-ciri suatu sifat kekongruenan segi tiga.

The following statement refers to the characteristics of a property of triangle congruency.

Dua sudut sepadan adalah sama saiz dan satu daripada sisi sepadan yang bukan terletak di antara dua sudut itu adalah sama panjang.
Two corresponding angles are equal and the length of one of the corresponding sides which does not lie between the two angles are equal.

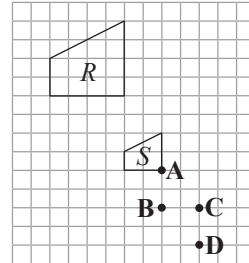
Antara berikut, yang manakah memenuhi ciri-ciri di atas?

Which of the following satisfies the above characteristics?

- A Sisi-Sisi-Sisi (SSS)
Side-Side-Side (SSS)
- B Sudut-Sudut-Sudut (AAA)
Angle-Angle-Angle (AAA)
- C Sudut-Sisi-Sudut (ASA)
Angle-Side-Angle (ASA)
- D Sudut-Sudut-Sisi (AAS)
Angle-Angle-Side (AAS)

- 4 Dalam Rajah 1, S ialah imej bagi R di bawah suatu pembesaran.

In Diagram 1, S is the image of R under an enlargement.



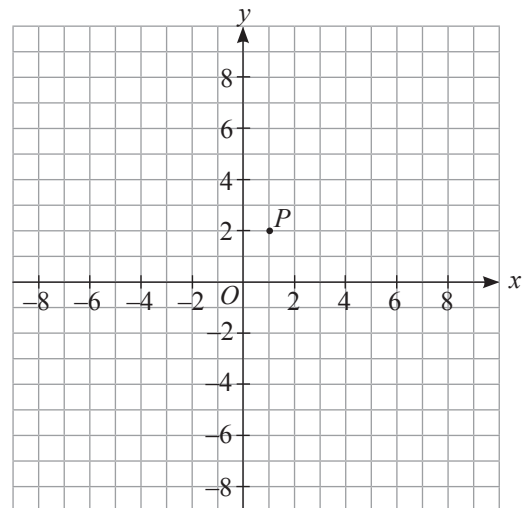
Rajah 1 / Diagram 1

Antara titik A, B, C dan D, yang manakah pusat pembesaran?

Which of the points, A, B, C or D, is the centre of enlargement?

- 5 Rajah 2 menunjukkan titik P yang diplot pada satah Cartes.

Diagram 2 shows point P plotted on a Cartesian plane.



Rajah 2 / Diagram 2

Transformasi T ialah translasi $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$.

Transformasi S ialah pantulan pada garis $x = -2$. Nyatakan koordinat imej bagi titik P di bawah gabungan transformasi TS .

Transformation T is a translation $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$.

Transformation S is a reflection in the line $x = -2$.

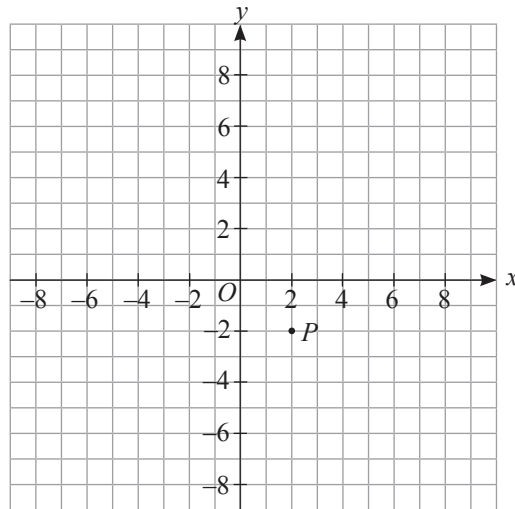
State the coordinates of point P under the transformations TS .

- A $(-6, 5)$
- B $(-4, 0)$
- C $(2, -2)$
- D $(0, 3)$

Soalan Subjektif

Jawab semua soalan.

- 1 (a) Berikan maksud teselasi.
Give the meaning of tessellation.
- (b) Rajah 1 menunjukkan titik P yang dilukis pada satah Cartes.
Diagram 1 shows point P drawn on a Cartesian plane.



Rajah 1 / Diagram 1

Transformasi **K** ialah translasi $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$.

Transformation **K** is the translation $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$.

Transformasi **L** ialah pantulan pada garis $y = 1$.

Transformation **L** is reflection in the line $y = 1$.

Nyatakan koordinat imej bagi titik P di bawah transformasi yang berikut:
State the coordinate of the image of point P under the following transformation:

- (i) **K**, (ii) **KL**.

[4 markah/marks]

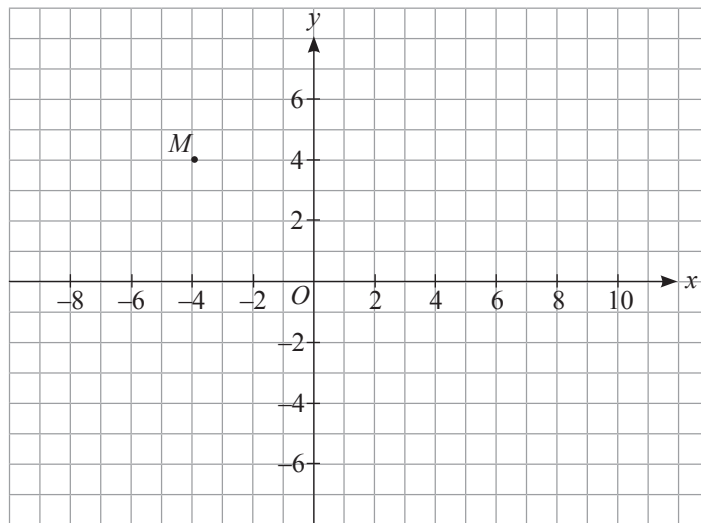
Jawapan/Answer:

(a)

(b) (i)

(ii)

- 2 (a) Rajah 2 menunjukkan titik M yang dilukis pada satah Cartes.
Diagram 2 shows point M drawn on a Cartesian plane.



Rajah 2 / Diagram 2

Transformasi **P** ialah pantulan pada $y = 1$.

*Transformation **P** is reflection in the line $y = 1$.*

Transformasi **Q** ialah satu putaran 90° ikut arah jam pada pusat $(2, -2)$.

*Transformation **Q** is rotation of 90° clockwise at centre $(2, -2)$.*

Nyatakan koordinat imej bagi titik M di bawah transformasi yang berikut:

State the coordinates of the image of point M under the following transformation:

- (i) P^2 , (ii) PQ .

- (b) Rajah 3 di ruang jawapan menunjukkan sebuah poligon, P , yang dilukis pada suatu satah Cartes. Pada ruang jawapan, lukis imej bagi poligon P di bawah transformasi putaran 180° pada pusat $(1, 1)$.

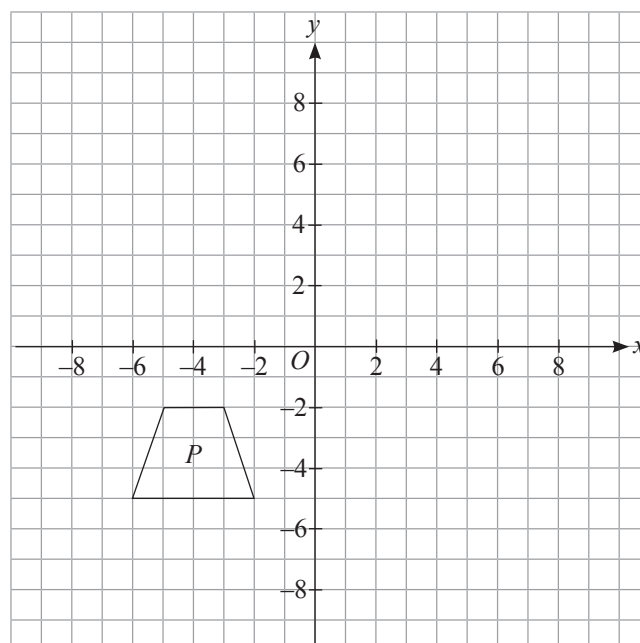
Diagram 3 in the answer space shows a polygon, P , drawn on a Cartesian plane. In the answer space, draw the image of the polygon P under transformation a rotation 180° at the centre $(1, 1)$.

[5 markah/marks]

Jawapan/Answer:

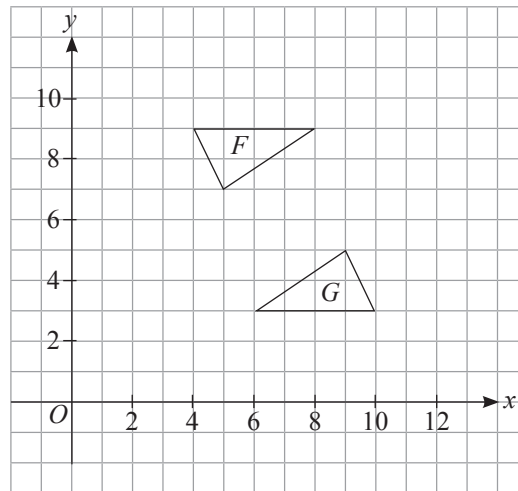
- (a) (i)
 (ii)

- (b)



Rajah 3 / Diagram 3

- 3 Rajah 4 menunjukkan dua segi tiga, F dan G , yang dilukis pada satah Cartes.
Diagram 4 shows two triangles, F and G , drawn on a Cartesian plane.



Rajah 4 / Diagram 4

Diberi bahawa transformasi $\mathbf{M}$ ialah pantulan pada garis $y = 6$ dan G ialah imej bagi F di bawah gabungan transformasi $\mathbf{MN}$. Perihalkan

It is given that transformation $\mathbf{M}$ is a reflection in line $y = 6$ and G is the image of F under combined transformation $\mathbf{MN}$. Describe

- transformasi $\mathbf{N}$,
the transformation $\mathbf{N}$,
- satu transformasi tunggal yang setara dengan gabungan transformasi $\mathbf{MN}$.
a single transformation which is equivalent to the combined transformation $\mathbf{MN}$.

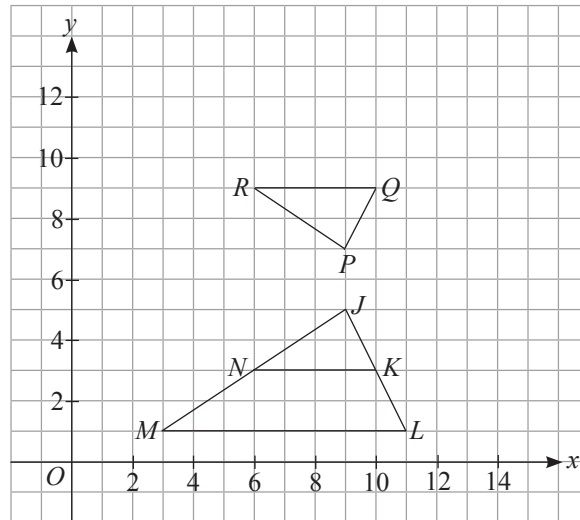
[5 markah/marks]

Jawapan/Answer:

(a)

(b)

- 4 (a) Rajah 5 menunjukkan tiga segi tiga, PQR , JKN dan JLM , yang dilukis pada satah Cartes.
Diagram 5 shows three triangles, PQR , JKN and JLM , drawn on a Cartesian plane.



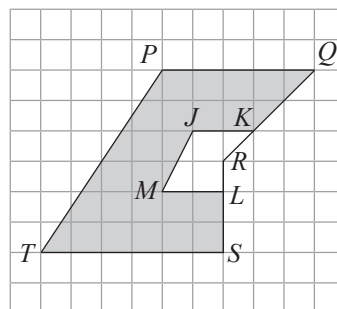
Rajah 5 / Diagram 5

$\triangle PQR$ ialah imej bagi $\triangle JLM$ di bawah transformasi VW .
 $\triangle PQR$ is the image of $\triangle JLM$ under transformation VW .

Huraikan selengkapnya transformasi:
 Describe in full, the transformation:

- (i) W , (ii) V .

- (b) Rajah 6 menunjukkan pentagon $PQRST$ ialah imej bagi pentagon $JKRLM$ di bawah suatu pembesaran.
Diagram 6 shows pentagon $PQRST$ is the image of pentagon $JKRLM$ under an enlargement.



Rajah 6 / Diagram 6

Diberi luas pentagon $JKRLM$ ialah 40 cm^2 . Hitung luas, dalam cm^2 , kawasan yang berlorek.
 Given that the area of pentagon $JKRLM$ is 40 cm^2 . Calculate the area, in cm^2 , of the shaded region.

[5 markah/marks]

Jawapan/Answer:

- (a) (i) W :

- (ii) V :

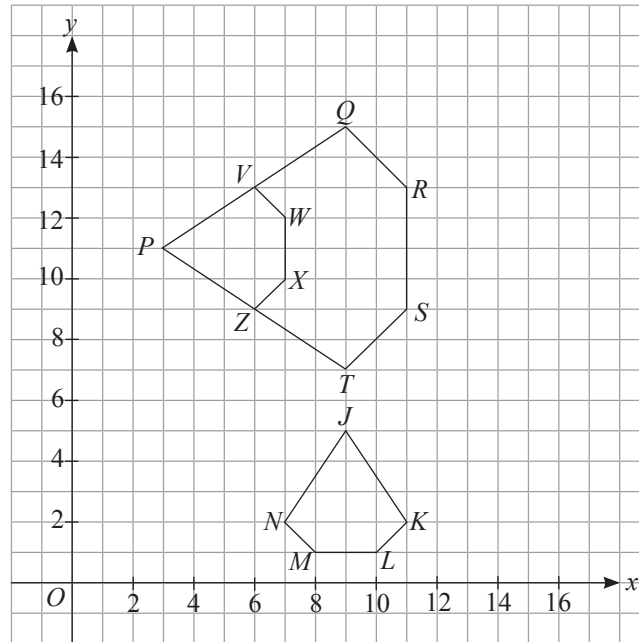
- (b)

- 5 (a) Nyatakan ciri-ciri kekongruenan segi tiga.

State the characteristics of congruence of triangles.

- (b) Rajah 7 menunjukkan tiga pentagon, $PQRST$, $JKLMN$ dan $PVWYZ$, yang dilukis pada satah Cartes.

Diagram 7 shows three triangles, $PQRST$, $JKLMN$ and $PVWYZ$, drawn on a Cartesian plane.



Rajah 7 / Diagram 7

Pentagon $PQRST$ ialah imej bagi pentagon $JKLMN$ di bawah transformasi **GH**.

*Pentagon $PQRST$ is the image of pentagon $JKLMN$ under transformation **GH**.*

Huraikan selengkapnya transformasi:

Describe in full, the transformation:

(i) **H**,

(ii) **G**.

- (c) Diberi luas pentagon $PQRST$ ialah 150 cm^2 . Hitung luas, dalam cm^2 , pentagon $JKLMN$.

It is given that area of pentagon $PQRST$ is 150 cm^2 . Calculate the area, in cm^2 , of pentagon $JKLMN$.

[9 markah/marks]

Jawapan/Answer:

(a)

(b) (i) **H**:

(ii) **G**:

(c)

BAB
6Nisbah dan Graf Fungsi Trigonometri
Ratios and Graphs of Trigonometric Functions

NOTA EFEKTIF

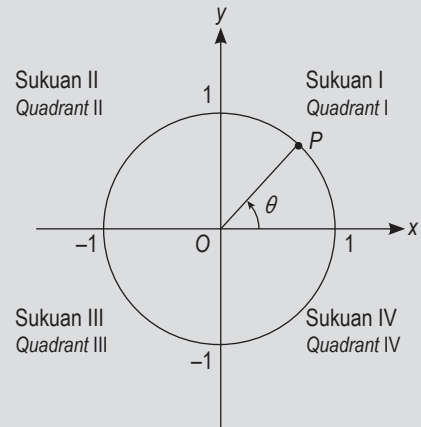
Nilai Sinus, Kosinus dan Tangen bagi Sudut θ , $0^\circ \leq \theta \leq 360^\circ$

The Value of Sine, Cosine and Tangent for Angle θ , $0^\circ \leq \theta \leq 360^\circ$

- 1 Diberi P ialah satu titik yang bergerak di sepanjang lilitan bulatan unit dan θ ialah sudut yang dibentuk oleh jejari bulatan unit, OP , dari paksi- x yang positif mengikut arah lawan jam. Didapati bahawa

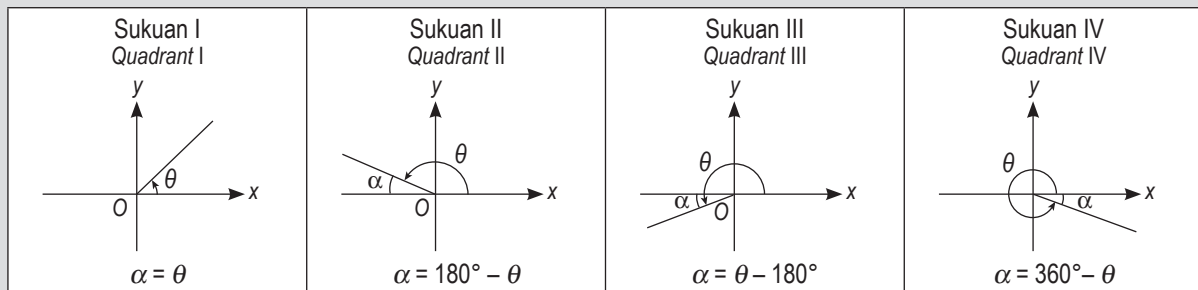
Given that P is a point that moves along the circumference of the unit circle and θ is the angle forms by the radius of the unit circle, OP , from the positive x -axis in an anticlockwise direction. It is found that

- titik P berada dalam sukuan I apabila $0^\circ < \theta < 90^\circ$,
point P is in quadrant I when $0^\circ < \theta < 90^\circ$,
- titik P berada dalam sukuan II apabila $90^\circ < \theta < 180^\circ$,
point P is in quadrant II when $90^\circ < \theta < 180^\circ$,
- titik P berada dalam sukuan III apabila $180^\circ < \theta < 270^\circ$,
point P is in quadrant III when $180^\circ < \theta < 270^\circ$,
- titik P berada dalam sukuan IV apabila $270^\circ < \theta < 360^\circ$.
point P is in quadrant IV when $270^\circ < \theta < 360^\circ$.



- 2 **Sudut rujukan sepadan, α ,** sentiasa kurang daripada 90° . Sudut dalam sukuan II, III dan IV mempunyai sudut rujukan sepadan, α . Sudut dalam sukuan I itu sendiri merupakan sudut rujukan sepadan, $\alpha = \theta$.

The corresponding reference angle, α , is always less than 90° . Angles in quadrants II, III and IV have corresponding reference angles, α . The angle in quadrant I itself is the corresponding reference angle, $\alpha = \theta$.

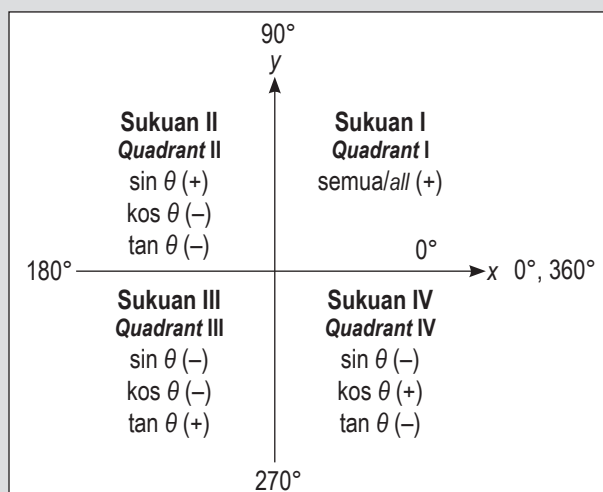


Sudut rujukan dalam sukuan II, III dan IV ialah sudut dalam sukuan I yang sepadan dengannya.

The reference angles in quadrants II, III and IV are the corresponding angles in quadrant I.

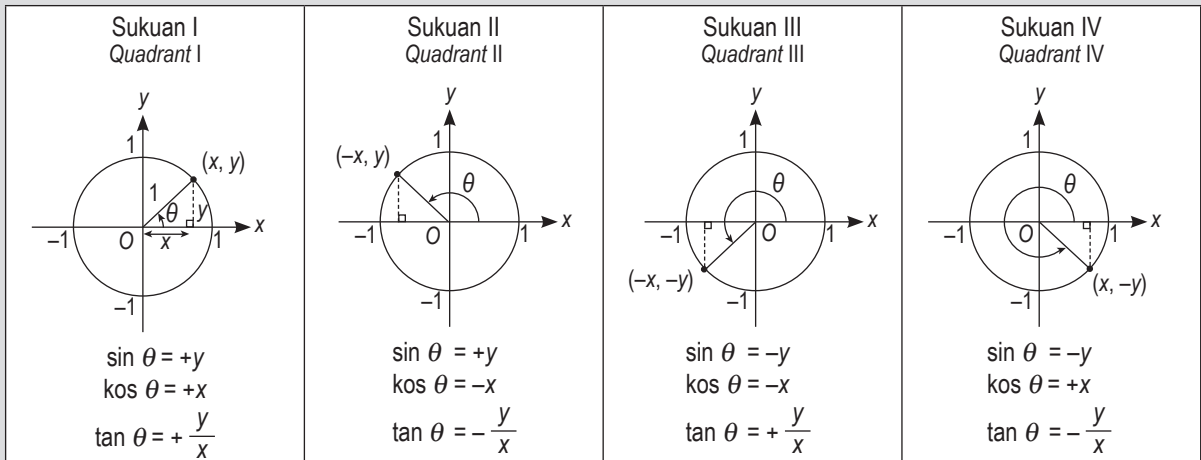
- 3 Hubungan antara fungsi sinus, kosinus dan tangen dengan sudut rujukan sepadan:

The relationships between the function of sine, cosine and tangent with the corresponding angle:

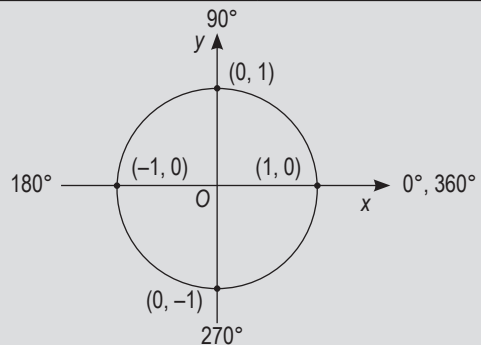
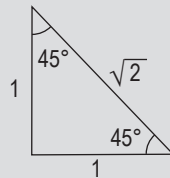
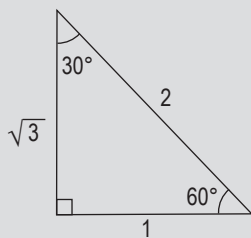


- Sukuan/Quadrant II**
 $\sin \theta = + \sin \alpha = + \sin (180^\circ - \theta)$
 $\cos \theta = - \cos \alpha = - \cos (180^\circ - \theta)$
 $\tan \theta = - \tan \alpha = - \tan (180^\circ - \theta)$
- Sukuan/Quadrant III**
 $\sin \theta = - \sin \alpha = - \sin (\theta - 180^\circ)$
 $\cos \theta = - \cos \alpha = - \cos (\theta - 180^\circ)$
 $\tan \theta = + \tan \alpha = + \tan (\theta - 180^\circ)$
- Sukuan/Quadrant IV**
 $\sin \theta = - \sin \alpha = - \sin (360^\circ - \theta)$
 $\cos \theta = + \cos \alpha = + \cos (360^\circ - \theta)$
 $\tan \theta = - \tan \alpha = - \tan (360^\circ - \theta)$

- 4 Hubungan antara nilai sinus, kosinus dan tangen dengan nilai koordinat-x dan koordinat-y.
The relationships between the values of sine, cosine and tangent with the values of x-coordinate and y-coordinate.



- 5 Nilai sinus, kosinus dan tangen dalam bulatan unit dan segi tiga.
The values of sine, cosine and tangent based in unit circle and triangle.



θ°	30°	45°	60°
Sin θ	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
Kos θ	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
Tan θ	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$

θ°	0°	90°	180°	270°	360°
Sin θ	0	1	0	-1	0
Kos θ	1	0	-1	0	1
Tan θ	0	tidak tertarif undefined	0	tidak tertarif undefined	0

Graf Fungsi Sinus, Kosinus dan Tangen The Graphs of Sine, Cosine and Tangent Functions

	$y = a \sin bx + c,$ $a > 0, b > 0$	$y = a \cos bx + c,$ $a > 0, b > 0$	$y = a \tan bx + c,$ $a > 0, b > 0$
Nilai a berubah The value of a changes	– Nilai maksimum dan nilai minimum berubah Maximum and minimum values changes – Amplitud fungsi = a Amplitude of function = a		– Lengkung graf berubah Graph curvature changes – Tiada amplitud No amplitude
Nilai b berubah The value of b changes	– Tempoh fungsi berubah The period of the value changes – Apabila nilai b bertambah, graf kelihatan mampat secara mengufuk, tempoh fungsi semakin berkurang When the value of b increases, the graph appears to compress horizontally, the period of the function decreases – Tempoh fungsi sinus dan kosinus = $\frac{360^\circ}{b}$; Tempoh fungsi tangen = $\frac{180^\circ}{b}$ The period of the sine and cosine functions = $\frac{360^\circ}{b}$; The period of tangent = $\frac{180^\circ}{b}$		
Nilai c berubah The value of c changes	– Kedudukan graf berubah The position of the graph changes – Apabila $c > 0$, graf beranjak c unit secara menegak ke atas paksi-x When $c > 0$, the graph moves c units vertically up the x-axis – Apabila $c < 0$, graf beranjak c unit secara menegak ke bawah paksi-x When $c < 0$, the graph moves c units vertically down the x-axis		

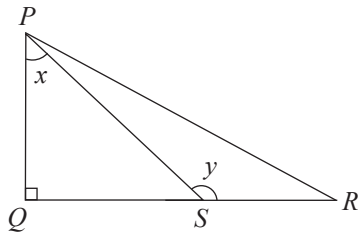


LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 Diberi bahawa $\cos x = -0.4567$ dan $180^\circ \leq x \leq 360^\circ$. Hitung nilai x .
Given that $\cos x = -0.4567$ and $180^\circ \leq x \leq 360^\circ$. Find the value of x
- A $117^\circ 10'$
B $207^\circ 10'$
C $242^\circ 50'$
D $62^\circ 50'$

- 2 Rajah 1 menunjukkan dua segi tiga, PQR dan PQS .
Diagram 1 shows two triangles, PQR and PQS .

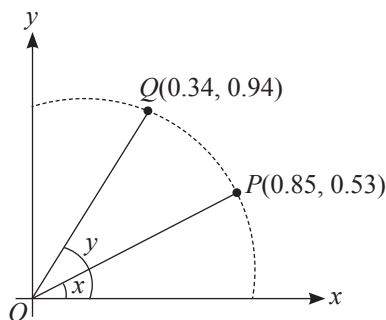


Rajah 1 / Diagram 1

Diberi $SR = 20$ cm, $PS = 10$ cm dan $10QS = 3SR$. Cari nilai bagi $\sin x + \tan y$.
Given $SR = 20$ cm, $PS = 10$ cm and $10QS = 3SR$. Find the value of $\sin x + \tan y$.

- A $-\frac{8}{15}$ C $\frac{27}{20}$
B $-\frac{11}{15}$ D $\frac{31}{20}$

- 3 Rajah 2 menunjukkan titik P dan Q pada satu bulatan unit yang berpusat di O .
Diagram 2 shows points P and Q on a unit circle with centre O .

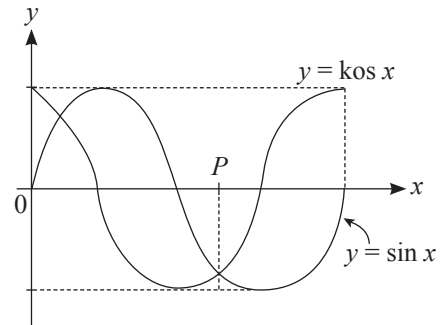


Rajah 2 / Diagram 2

Cari nilai $\sin x + \cos y$.
Find the value of $\sin x + \cos y$.

A 0.87 C 1.47
B 1.19 D 1.79

- 4 Rajah 3 menunjukkan graf $y = \sin x$ dan $y = \cos x$.
Diagram 3 shows the graphs of $y = \sin x$ and $y = \cos x$.

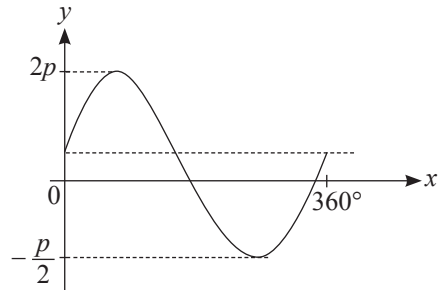


Rajah 3 / Diagram 3

Nyatakan nilai P .
State the value of P .

- A 135° C 225°
B 180° D 315°

- 5 Rajah 4 menunjukkan graf $y = 5 \sin x + 3$.
Diagram 4 shows the graph of $y = 5 \sin x + 3$.



Rajah 4 / Diagram 4

Tentukan nilai p .
Determine the value of p .

- A 3 C 2
B 5 D 4

- 6 Diberi $\sin x = -\frac{1}{\sqrt{2}}$ dan $0^\circ \leq x \leq 360^\circ$. Cari nilai-nilai x .

Given $\sin x = -\frac{1}{\sqrt{2}}$ and $0^\circ \leq x \leq 360^\circ$. Find the values of x .

- A $45^\circ, 135^\circ$ C $225^\circ, 315^\circ$
B $45^\circ, 225^\circ$ D $135^\circ, 225^\circ$

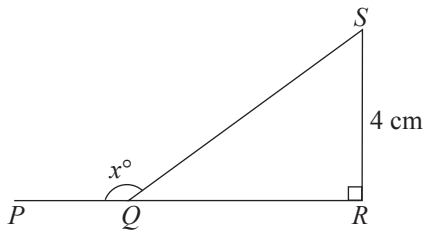
- 7 Apakah nilai minimum bagi graf fungsi $y = 3 \sin 2x + 2$?

What is the minimum value of the graph of the function $y = 3 \sin 2x + 2$?

- A -1 C -3
B 2 D 3

- 8 Rajah 5 menunjukkan segi tiga QRS dan garis lurus PQR .

Diagram 5 shows triangle QRS and straight line PQR .



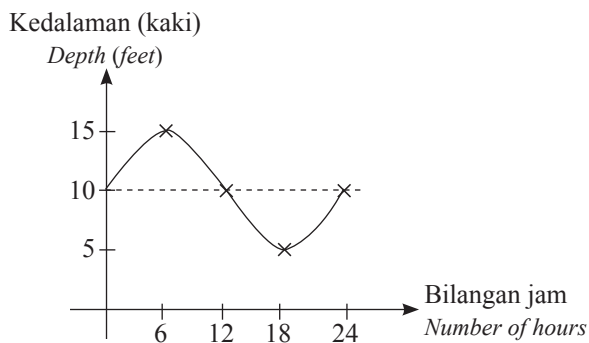
Rajah 5 / Diagram 5

Diberi bahawa $\tan x = -\frac{8}{15}$, cari panjang QS dalam cm.

Given that $\tan x = -\frac{8}{15}$, find the length of QS in cm.

- A 17
B 15
C 8.5
D 7.5
- 9 Rajah 6 ialah sebuah graf yang menunjukkan kedalaman air yang direkodkan oleh sepasukan tentera laut.

Diagram 6 is a graph showing the water depth recorded by a navy personnel team.



Rajah 6 / Diagram 6

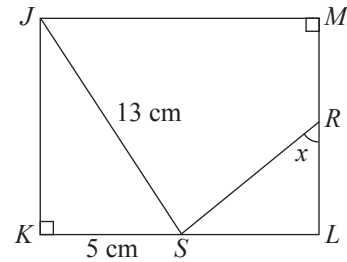
Diberi y mewakili kedalaman air, dalam kaki, dan x mewakili jam selepas tengah hari. Antara berikut, fungsi yang manakah memodelkan kedalaman air yang ditunjukkan dalam graf di atas?

Given that y represents the water depth, in feet, and x represents the hours after noon. Which of the following functions models the water depth shown in the graph above?

- A $y = 5 \sin x + 10$
B $y = 10 \sin x + 15$
C $y = 15 \sin x + 10$
D $y = 10 \sin x + 5$

- 10 Dalam Rajah 7, $JKLM$ ialah sebuah segi empat tepat. R ialah titik tengah ML dan S ialah titik tengah KL .

In Diagram 7, $JKLM$ is a rectangle. R is the midpoint of ML and S is the midpoint of KL .



Rajah 7 / Diagram 7

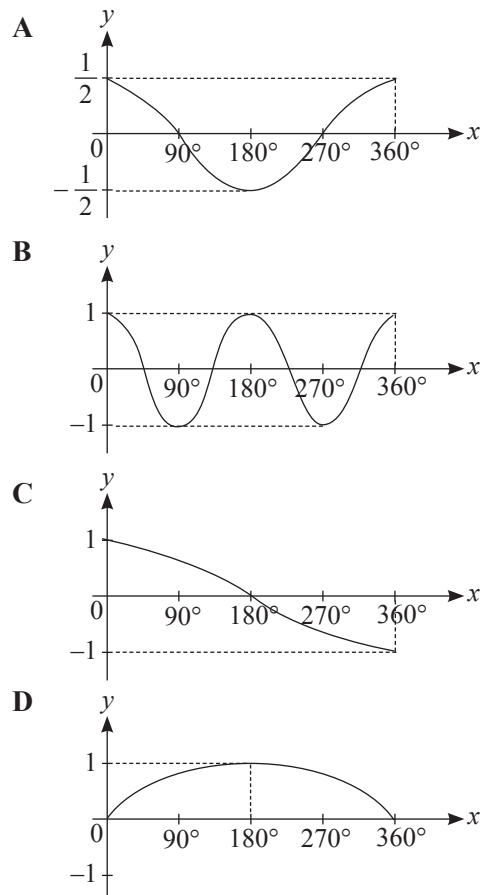
Nilai $\tan x^\circ$ ialah

The value of $\tan x^\circ$ is

- A $-\frac{5}{6}$
B $\frac{5}{6}$
C $-\frac{6}{5}$
D $\frac{6}{5}$

- 11 Antara yang berikut, yang manakah mewakili graf $y = \cos \frac{1}{2}x$?

Which of the following graphs represents $y = \cos \frac{1}{2}x$?



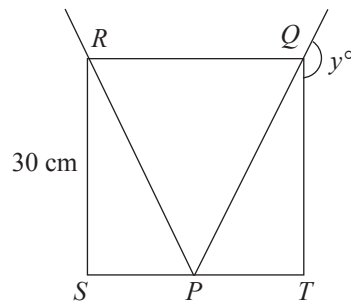
Soalan Subjektif
Jawab semua soalan.

- 1 (a) Pada ruang jawapan, lakarkan graf $y = \frac{3}{2} \cos x$ untuk $0^\circ \leq x \leq 360^\circ$.

In the answer space, sketch graph of $y = \frac{3}{2} \cos x$ for $0^\circ \leq x \leq 360^\circ$.

- (b) Rajah 1 menunjukkan satu hiasan dinding berbentuk segi empat sama yang digantung pada dinding. Dua utas tali, PQ dan PR , diikat pada hiasan dinding itu.

Diagram 1 shows a square wall decoration which is hung on the wall. Two ropes, PQ and PR , are tied to the wall decoration.



Rajah 1 / Diagram 1

Jika P ialah titik tengah ST ,

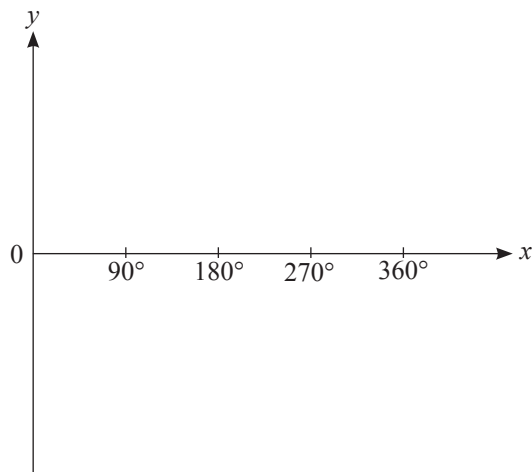
If P is the midpoint of ST ,

- (i) hitung panjang PR dalam cm,
calculate the length of PR in cm,
- (ii) seterusnya, cari nilai $\cos y^\circ$.
hence, find the value of $\cos y^\circ$.

[5 markah/marks]

Jawapan/Answer:

(a)



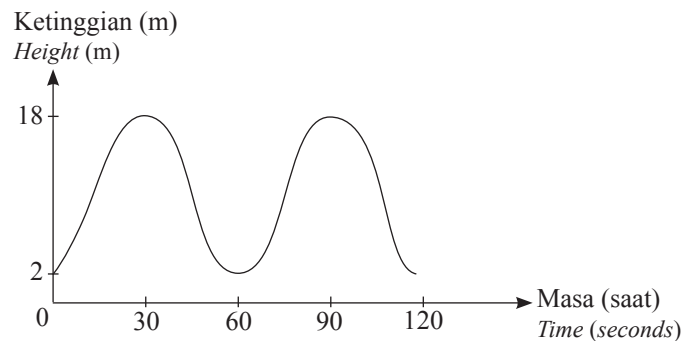
(b)

- 2 Diberi $\sin \theta = -0.8660$ dan $0^\circ \leq \theta \leq 360^\circ$, senaraikan semua nilai yang mungkin bagi θ .
Given $\sin \theta = -0.8660$ and $0^\circ \leq \theta \leq 360^\circ$, find all the possible values of θ .

[3 markah/marks]

Jawapan/Answer:

- 3 Ardel berasa gembira menaiki roda Ferris di sebuah taman tema. Rajah 2 menunjukkan graf fungsi trigonometri yang mewakili ketinggian tempat duduk Ardel di atas roda Ferris.
Ardel feels very happy riding the Ferris wheel at a theme park. Diagram 2 shows the graph of a trigonometric function that represents the height of Ardel's seat on the Ferris wheel.



Rajah 2 / Diagram 2

- (a) Diberi bahawa y mewakili ketinggian, dalam m, tempat duduk itu selepas x saat. Situasi ini diwakili oleh fungsi, $y = -a \cos bx + 10$. Nyatakan nilai a dan nilai b .
Given that y represents the height, in m, of the seat after x seconds. This situation can be represented by the function $y = -a \cos bx + 10$. State the value of a and the value of b .
- (b) Seterusnya, tentukan ketinggian, dalam m, tempat duduk Ardel pada saat ke-85.
Hence, determine the height, in m, of Ardel's seat at the 85th second.

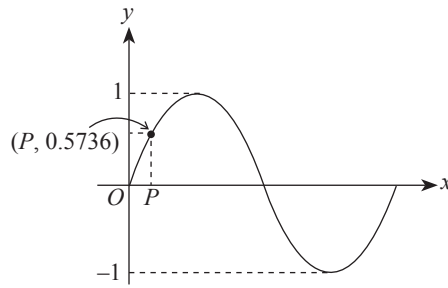
[4 markah/marks]

Jawapan/Answer:

(a)

(b)

- 4 Rajah 3 menunjukkan graf $y = \sin x$.
 Diagram 3 shows the graph $y = \sin x$.



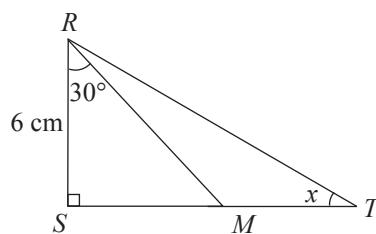
Rajah 3 / Diagram 3

Cari nilai kos P .
 Find the value of $\cos P$.

[3 markah/marks]

Jawapan/Answer:

- 5 Rajah 4 menunjukkan segi tiga bersudut tegak RST . M ialah titik Tengah bagi garis ST .
 Diagram 4 shows right-angled triangle RST . M is the midpoint for line ST .



Rajah 4 / Diagram 4

Diberi $\tan x^\circ = \frac{3}{4}$. Hitung

Given $\tan x^\circ = \frac{3}{4}$. Calculate

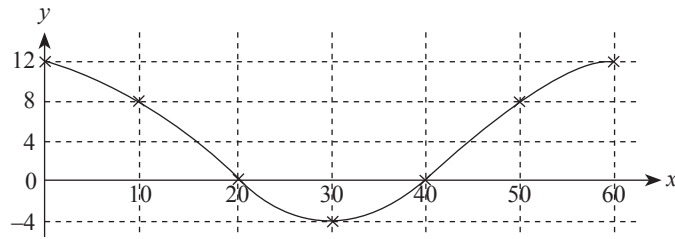
- panjang RT ,
the length of RT ,
- kos $\angle RMT$.
 $\cos \angle RMT$.

[5 markah/marks]

Jawapan/Answer:

- (a)
- (b)

- 6 Rajah 5 menunjukkan graf bagi suatu fungsi trigonometri $y = a \cos bx + c$.
Diagram 5 shows the graph of the trigonometric function $y = a \cos bx + c$.



Rajah 5 / Diagram 5

- (a) Berdasarkan graf di atas, cari
Based on the graph above, find

- (i) amplitud =
amplitude
- (ii) garis keseimbangan =
the midline
- (iii) tempoh =
the period

[5 markah/marks]

- (b) Tuliskan satu fungsi trigonometri dalam bentuk $y = a \cos bx + c$.
Write a trigonometric function in the form $y = a \cos bx + c$.

.....

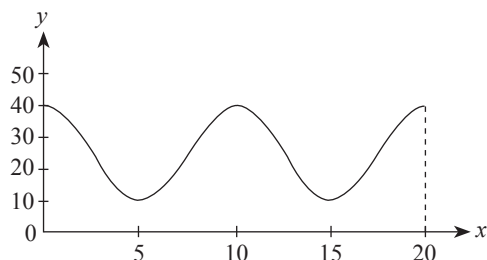
[1 markah/mark]

- (c) Seterusnya, cari nilai y ketika $x = 25$.
Hence, find the value of y when $x = 25$.

[2 markah/marks]

Jawapan/Answer:

- 7 Rajah 6 menunjukkan suatu bacaan arus bagi bekalan yang menggunakan bateri.
Diagram 6 shows the readings of the current from a battery.



Rajah 6 / Diagram 6

- (a) Jika y mewakili halaju aliran arus selepas x saat, nyatakan

If y represents the velocity of the current after x seconds, state

- (i) amplitud bagi arus itu. =
the amplitude of the current
- (ii) tempoh masa bagi arus itu. =
the period of the current
- (iii) garis kesimbangan bagi arus itu =
the midline of the current

[3 markah/marks]

- (b) Nyatakan satu fungsi dalam bentuk $y = a \cos bx + c$ yang memodelkan bacaan arus dalam graf tersebut.

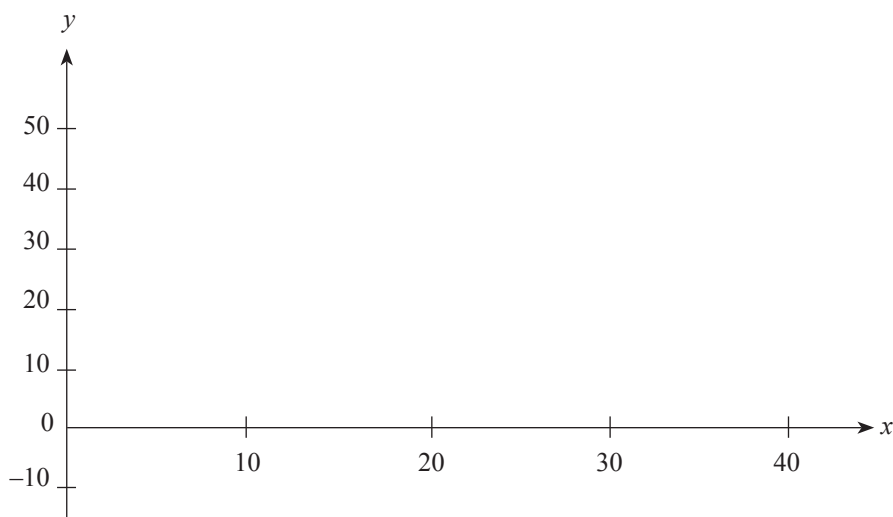
State a function in the form $y = a \cos bx + c$ to model the current readings in the graph.

.....

[1 markah/mark]

- (c) Pada rajah di bawah, lukiskan graf bagi fungsi $y = 20 \sin 9x + 15$.

On the diagram below, draw the graph of the function $y = 20 \sin 9x + 15$.



[3 markah/marks]

BAB 7

Sukatan Serakan Data Terkumpul

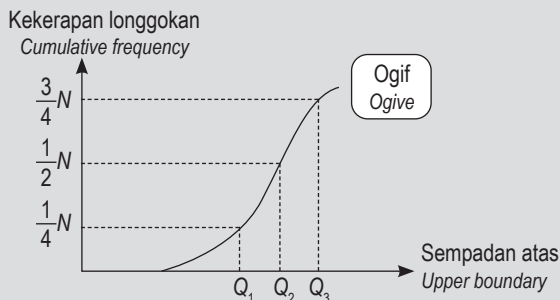
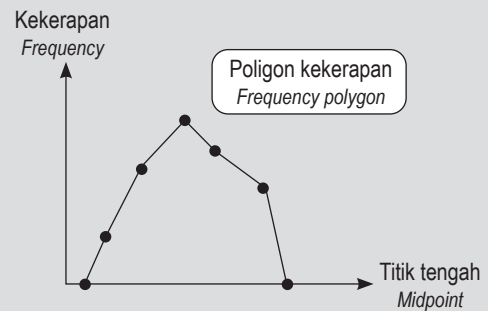
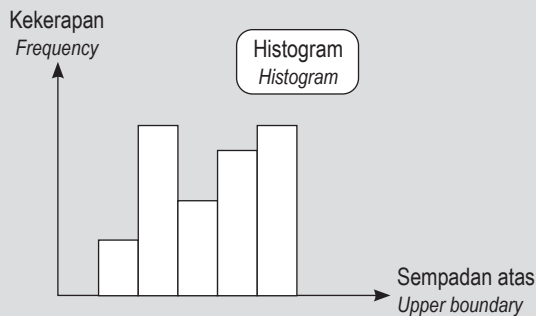
Measures of Dispersion for Grouped Data


 VIDEO
PEMBELAJARAN


NOTA EFEKTIF

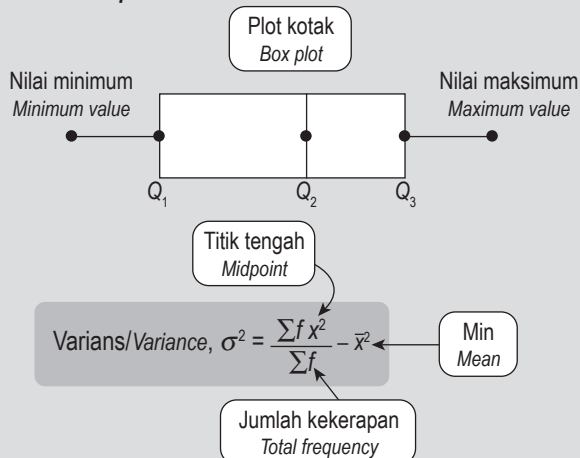
Serakan Dispersion

Selang kelas Class interval	Had bawah Lower limit	Had atas Upper limit	Sempadan bawah Lower boundary	Sempadan atas Upper boundary	Titik tengah Midpoint (x)	Kekerapan Frequency (f)	Kekerapan longgokan Cumulative frequency (cf)
$b - c$	b	c	$\frac{a+b}{2}$	$\frac{c+d}{2}$	$\frac{b+c}{2}$	2	2
$d - e$	d	e	$\frac{c+d}{2}$	$\frac{e+f}{2}$	$\frac{d+e}{2}$	3	5
$f - g$	f	g	$\frac{e+f}{2}$	$\frac{g+h}{2}$	$\frac{f+g}{2}$	5	10



Persentil, P_n , ialah nilai yang membahagikan set data kepada 100 bahagian yang sama.
Percentile, P_n , is a value that divides the set of data into 100 equals parts.

Sukatan Serakan Measures of Dispersion



Julat antara kuartil = $Q_3 - Q_1$
Interquartile range = $Q_3 - Q_1$

Sisihan piawai/Standard deviation
 $\sigma = \sqrt{\sigma^2}$
 $= \sqrt{\frac{\sum f x^2}{\sum f} - \bar{x}^2}$



LATIHAN INTENSIF

Soalan Subjektif

Jawab semua soalan.

- 1 Rajah 1 menunjukkan markah bagi 30 orang murid dalam suatu ujian Biologi.
Diagram 1 shows the marks of 30 students in Biology test.

48	57	30	63	48	85	85	78	37	45
56	55	48	51	75	44	42	36	52	64
33	68	54	62	70	58	35	68	53	47

Rajah 1 / Diagram 1

- (a) Berdasarkan data pada Rajah 1, lengkapkan Jadual 1 di ruang jawapan.
Based on the data in Diagram 1, complete Table 1 in the answer space.
- (b) Nyatakan kelas mod.
State the modal class.
- (c) Berdasarkan Jadual 1, hitung min anggaran markah bagi seorang murid.
Based on Table 1, calculate the estimated mean marks of a student.
- (d) Untuk ceraian soalan ini, gunakan kertas graf yang disediakan.
For this part of question, use the graph paper provided.
 Dengan menggunakan skala 2 cm kepada 10 markah pada paksi mengufuk dan 2 cm kepada 1 orang murid pada paksi mencancang, lukis satu histogram bagi data tersebut.
By using the scale of 2 cm to 10 marks on the horizontal axis and 2 cm to 1 student on the vertical axis, draw a histogram for the data.
- (e) Daripada graf di (d), nyatakan bentuk taburan graf tersebut.
From the graph in (d), state the distribution shape of the graph.

[10 markah/marks]

Jawapan/Answer:

(a)

Markah Marks	Kekerapan Frequency	Sempadan atas Upper boundary
30 – 39		
40 – 49		

Jadual 1 / Table 1

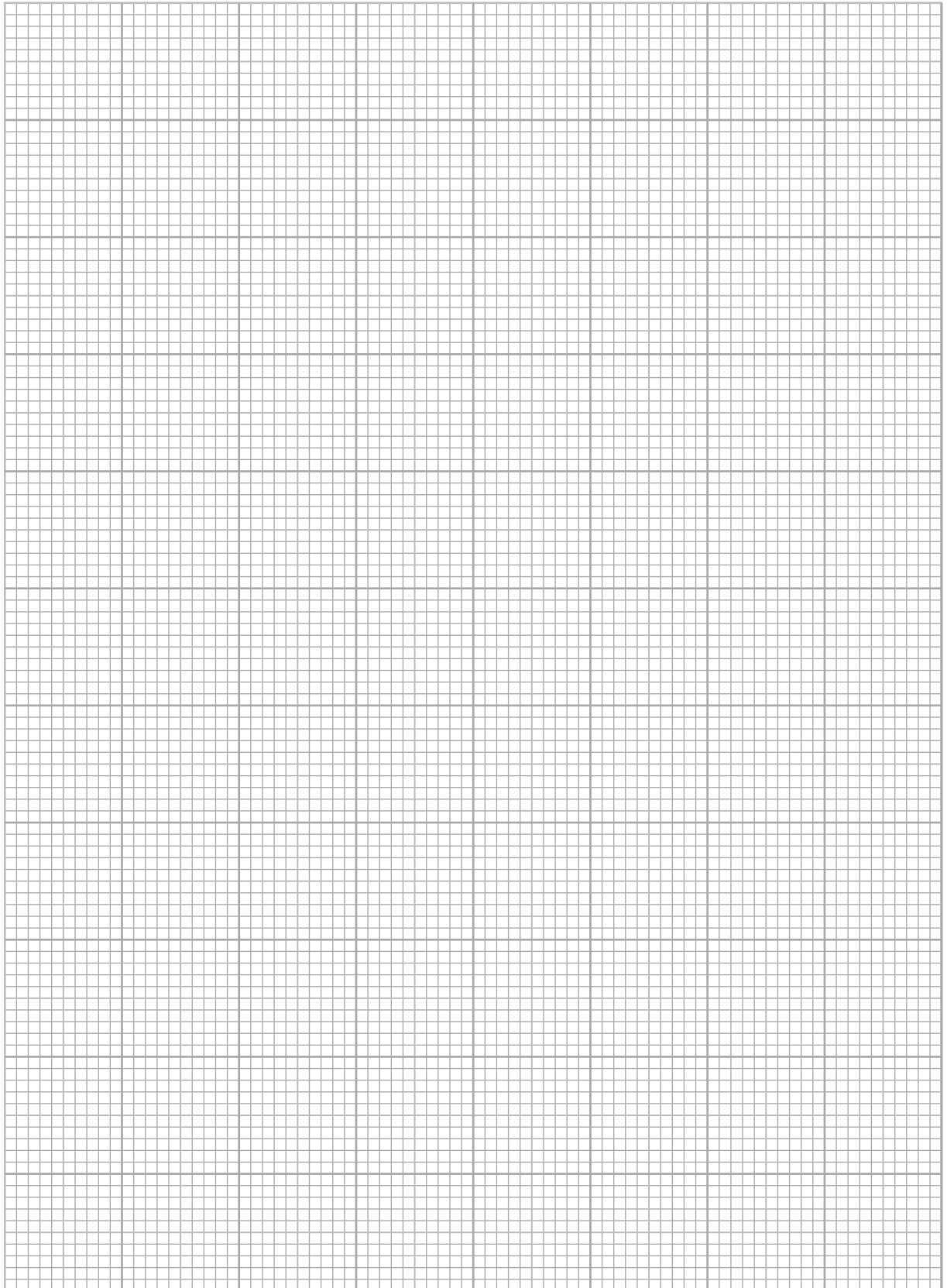
(b)

(c)

(d) Rujuk graf/Refer to the graph

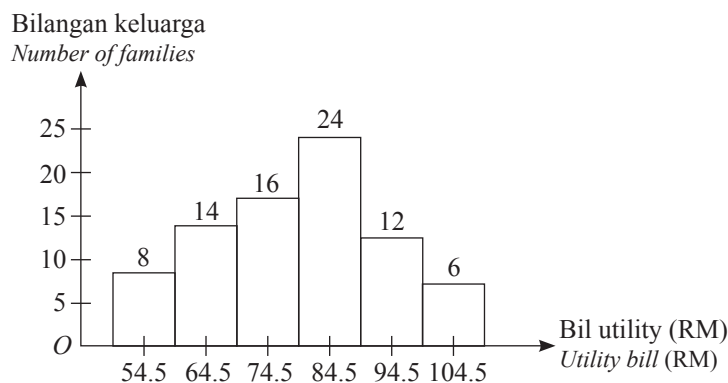
(e)

Graf untuk Soalan 1
Graph for Question 1



Tingkatan 5

- 2 Rajah 2 menunjukkan satu histogram yang mewakili bil utiliti, dalam RM, bagi 80 buah keluarga.
Diagram 2 shows a histogram which represents utility bill, in RM, for 80 families.



Rajah 2 / Diagram 2

- (a) Berdasarkan histogram di atas, lengkapkan Jadual 2 di ruang jawapan.
Based on histogram above, complete Table 2 in the answer space.
- (b) Hitung sisihan piawai bagi data tersebut.
Calculate the standard deviation of the data.
- (c) Untuk ceraian soalan ini, gunakan kertas graf yang disediakan.
For this part of question, use the graph paper provided.
Dengan menggunakan skala 2 cm kepada RM10 bil utiliti pada paksi mengufuk dan 2 cm kepada 10 buah keluarga pada paksi mencancang, lukis satu ogif bagi data tersebut.
By using the scale of 2 cm to RM10 utility bills on the horizontal axis and 2 cm to 10 families on the vertical axis, draw an ogive for the data.
- (d) Berdasarkan ogif yang dilukis di (c), tentukan percentil ke-40.
Based on the ogive drawn in (c), determine the 40th percentile.

[11 markah/marks]

Jawapan/Answer:

(a)

Bil (RM) Bills (RM)	Sempadan atas Upper boundary	Kekerapan longgokan Cumulative frequency
50 – 59	59.5	
60 – 69		

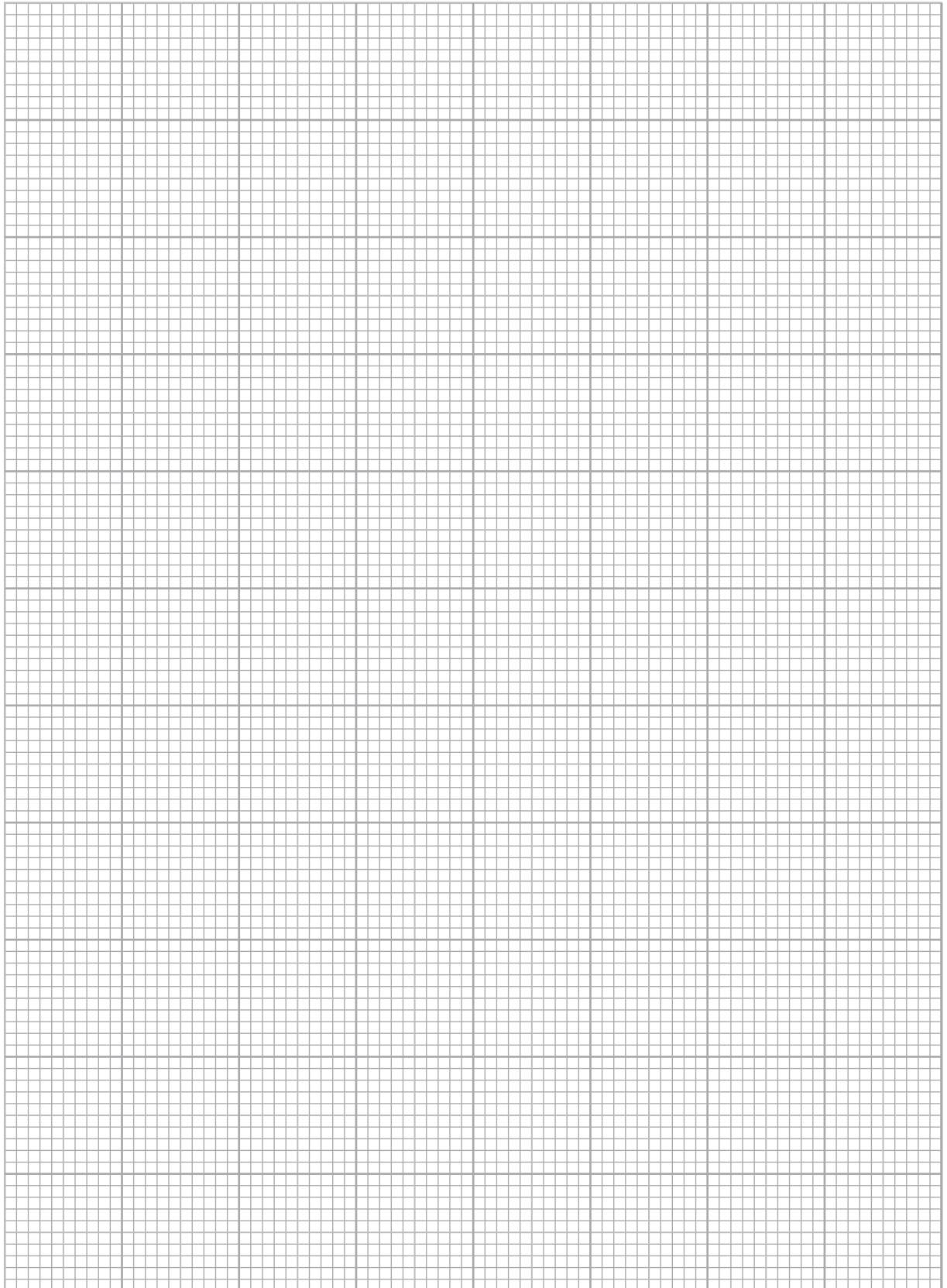
Jadual 2 / Table 2

(b)

(c) Rujuk graf/Refer to the graph

(d)

Graf untuk Soalan 2
Graph for Question 2



Tingkatan 5

- 3 Jadual 3 di ruang jawapan menunjukkan dapatan kajian berkaitan tempoh masa bersukan oleh sekumpulan murid. Selepas semakan data, didapati bahawa data dua orang murid yang masing-masing bersukan selama 18 minit dan 32 minit tidak direkodkan.

Table 3 in the answer space shows the findings of survey related to the duration of time spent on sports by a group of students. After checking the data, it is found that the data of two students who spent 18 minutes and 32 minutes respectively was not recorded.

- (a) Lengkapkan Jadual 3 pada ruang jawapan.

Complete Table 3 in the answer space.

- (b) Untuk ceraian soalan ini, gunakan kertas graf yang disediakan.

For this part of question, use the graph paper provided.

Menggunakan skala 2 cm kepada 5 minit pada paksi mengufuk dan 2 cm kepada 2 orang murid pada paksi mencancang, lukis satu poligon kekerapan bagi 50 orang murid itu.

Using a scale of 2 cm to 5 minutes on the horizontal axis and 2 cm to 2 students on the vertical axis, draw a frequency polygon for the 50 students.

[6 markah/marks]

Jawapan/Answer:

- (a)

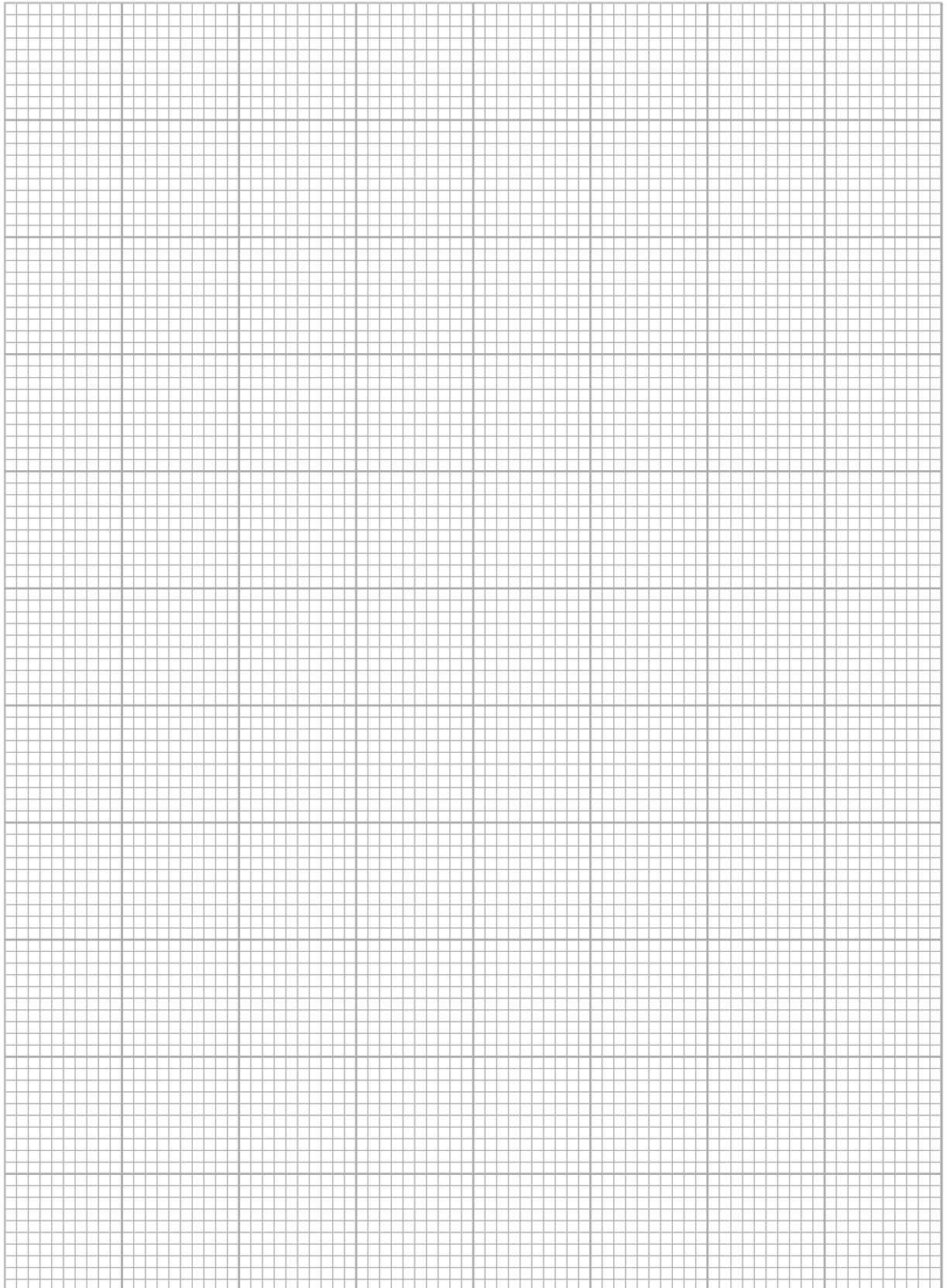
Masa (minit) Time (minutes)	Titik tengah Midpoint	Kekerapan yang direkod Recorded frequency	Kekerapan sebenar Actual frequency
11 – 15	13	4	
16 – 20		6	
21 – 25		10	
26 – 30		9	
31 – 35		14	
36 – 40		5	

Jadual 3 / Table 3

- (b) Rujuk graf/Refer to the graph



Graf untuk Soalan 3
Graph for Question 3



Tingkatan 5

BAB
8Pemodelan Matematik
Mathematical Modelling

NOTA EFEKTIF
Pemodelan Matematik
Mathematical Modeling

- 1 Pemodelan matematik ialah suatu proses membina model matematik yang menggunakan suatu perwakilan bagi sistem atau situasi sebenar dunia.

Mathematical modeling is a process of building a mathematical model that uses a representation of a real-world system or situation.

- 2 Masalah dunia diterjemah sebagai masalah matematik seperti paras air laut di Malaysia 10 tahun lagi, kos belajar di universiti pada 20 tahun akan datang, jumlah penduduk Malaysia pada tahun 2050 dan lain-lain.

World problems are translated as mathematical problems such as the sea level in Malaysia 10 years from now, the cost of studying at a university in the next 20 years, the total population of Malaysia in 2050 and others.

- 3 Masalah matematik ini akan ditafsir semula dalam konteks masalah dunia sebenar, melibatkan fungsi linear, kuadratik dan eksponen.

These mathematical problems will be reinterpreted in the context of real-world problems, involving linear, quadratic and exponential functions.

- 4 Model matematik ialah suatu perwakilan bagi suatu sistem atau senario yang digunakan untuk memperoleh kefahaman secara kualitatif dan/atau kuantitatif bagi masalah dunia sebenar serta meramalkan perlakuan masa depan.

A mathematical model is a representation of a system or scenario used to gain a qualitative and/or quantitative understanding of real-world problems and to predict future behaviour:

Contoh/ Example:

- (a) Dalam sistem kewangan:

In the financial system:

$$I = PrT$$

dengan keadaan/where

I = faedah mudah/simple interest,

P = prinsipal/principal,

r = kadar faedah/interest rate,

t = masa/time

- (b) Dalam sains (Hukum Ohm):

In science (Ohm's Law)

$$V = IR$$

dengan keadaan/where

V = voltan/voltage,

I = arus elektrik/current,

R = rintangan/resistance

- 5 Proses dalam pemodelan matematik.

Processes in mathematical modelling.

- (a) Mengenal pasti dan mendefinisi masalah.

Identifying and defining problems.

- (b) Membuat andaian dan mengenal pasti pemboleh ubah.

Making assumptions and identifying variables.

- (c) Mengaplikasi matematik untuk menyelesaikan masalah.

Applying mathematics to solve problems.

- (d) Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan.

Verifying and interpreting solution in the context of the problem.

- (e) Memurnikan model matematik.

Refining the mathematical model.

- (f) Melaporkan dapatan.

Reporting the findings.

- 6 Andaian yang dilakukan biasanya dimulakan dengan pemboleh ubah paling mudah. Setelah masalah diselesaikan, andaian yang lebih rumit boleh dipertimbangkan.

The assumptions made usually start with the simplest variables. Once the problem is solved, more complex assumptions can be considered.

- 7 Semasa menentusahkan dan mentafsir penyelesaian, kita pertimbangkan:

When verifying and interpreting solutions, we consider:

- (a) Adakah penyelesaian itu menangani masalah berkenaan?

Are the solutions able to solve the problem?

- (b) Adakah penyelesaian itu rasional apabila diterjemahkan kembali ke dunia sebenar?

Are the solutions rational when translated to real-world situation?



LATIHAN INTENSIF

Soalan Objektif
Jawab semua soalan.

- 1 Antara berikut, yang manakah **bukan** komponen dalam pemodelan matematik?
*Which of the following is **not** the components in the mathematical modeling?*
- A Mengenal pasti dan mendefinisikan masalah.
Identifying and defining the problems.
- B Membuat andaian dan mengenal pasti pemboleh ubah.
Making assumptions and identifying variables.
- C Mencari masalah dunia sebenar.
Finding the real world problems.
- D Melaporkan dapatan.
Reporting the findings.
- 2 Berikut merupakan langkah-langkah yang terlibat dalam pemodelan matematik.
The following steps are involved in mathematical modeling.

K: Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan
Verify and interpret solution in the context of the problem

L: Membuat andaian dan mengenal pasti pemboleh ubah
Make assumptions and identify variables

M: Mengenal pasti dan mendefinisikan masalah
Identify and define the problem

N: Mengaplikasikan matematik untuk menyelesaikan masalah
Apply mathematics to solve the problem

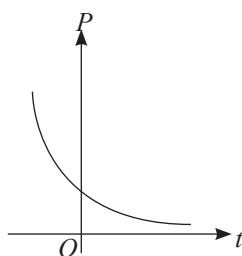
P: Melaporkan dapatan
Report the findings

Q: Memurnikan model matematik
Refine the model

Susun langkah-langkah mengikut urutan yang betul.
Arrange the steps in the correct order.

- A M, L, K, N, P, Q C M, L, N, K, Q, P
B M, N, L, K, Q, P D L, M, N, K, Q, P

- 3 Rajah 1 menunjukkan graf bagi sebuah model matematik dalam suatu kajian sains.
Diagram 1 shows the graph of a mathematical model of a science research.



Rajah 1 / Diagram 1

Tentukan jenis model matematik yang ditunjukkan dalam rajah di atas.

Determine the type of mathematical model shown in the diagram above.

- A Model kuadratik C Model kubik
Quadratic model Cubic model
- B Model linear D Model eksponen
Linear model Exponential model

- 4 Fahni bekerja sebagai seorang jurujual di sebuah syarikat kereta. Syarikat tersebut membayar RM500 sebagai gaji pokok bulanan dan RM150 bagi setiap unit kereta yang dijual. Tentukan ungkapan yang mewakili model matematik bagi gaji bulanan Fahni jika dia menjual x unit kereta setiap bulan.

Fahni works as salesgirl in a car company. The company pays RM500 as the basic salary and RM150 for every unit of car sold. Determine the expression represents the mathematical model of Fahni's monthly salary if she sold x units of cars every month.

- A $y = 150 + 500x$
B $y = 500x - 150$
C $y = 650x$
D $y = 500 + 150x$

- 5 Puan Sally menyimpan RM8 000 di dalam sebuah bank yang menawarkan faedah tahunan sebanyak 3% yang dikompaun setiap tahun.
Mrs. Sally deposits RM8 000 in a bank that offers an annual interest of 3% compounded annually.
Dengan menganggap/ *By assuming*

P = principal
principal
 r = kadar faedah tahunan
the yearly interest rate
 n = bilangan kali faedah dikompaun dalam setahun
number of periods the interest is compound per year
 t = tempoh dalam tahun
term in year

- A Jumlah simpanan = $P(1 + r)^t$
Total saving = $P(1 + r)^t$
- B Jumlah simpanan = $P + r^t$
Total saving = $P + r^t$
- C Jumlah simpanan = $P + Pr^t$
Total saving = $P + Pr^t$
- D Jumlah simpanan = $P^t + r^t$
Total saving = $P^t + r^t$

Soalan Subjektif

Jawab semua soalan.

- 1 Isikan tempat kosong.
Fill in the blanks.

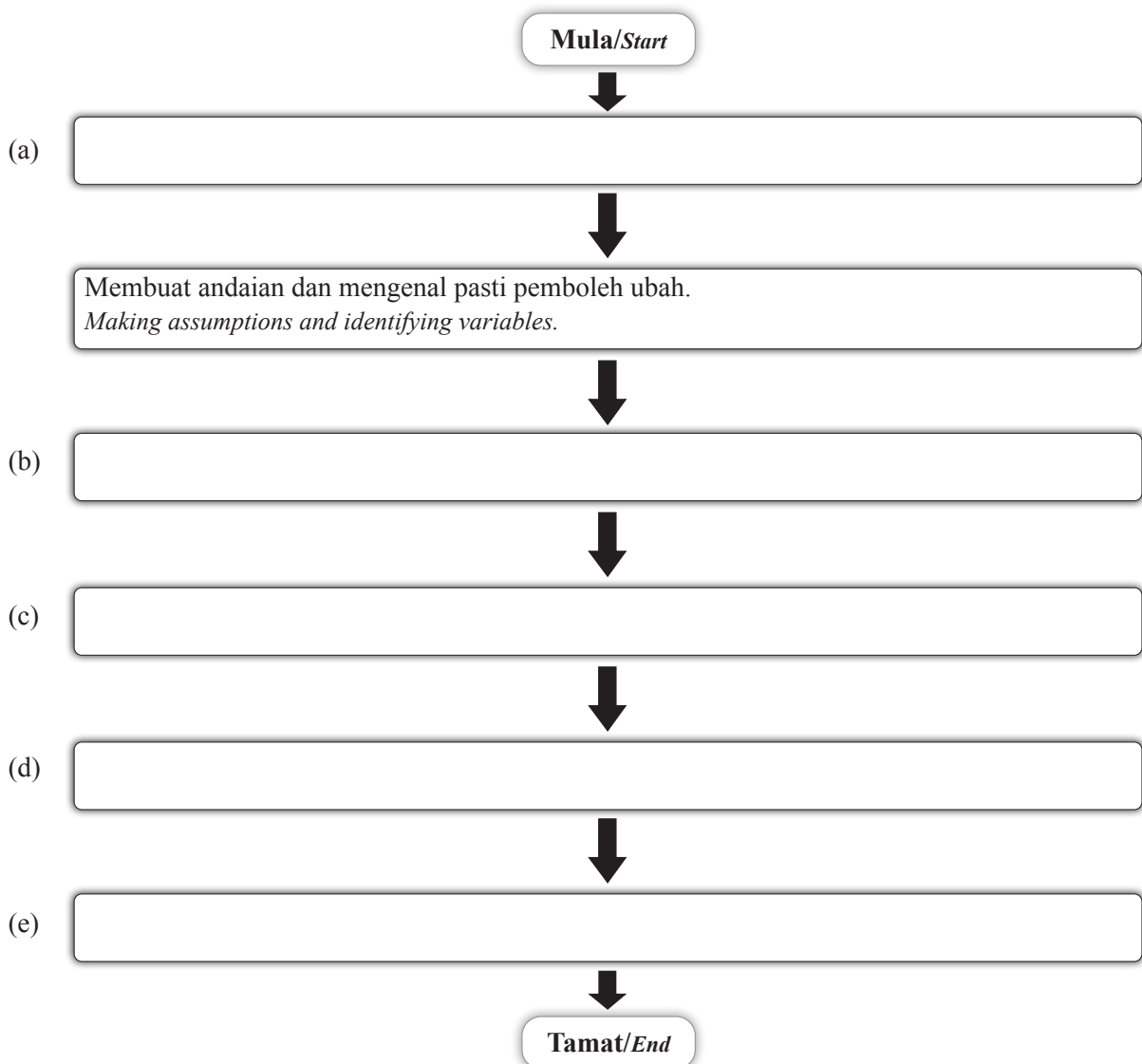
Model matematik ialah suatu perwakilan bagi suatu sistem atau senario yang digunakan untuk memperoleh _____ dan/atau _____ bagi _____ serta meramalkan perlakuan masa depan.

A mathematical model is a representation of a system or scenario used to gain a _____ and/or _____ of _____ and to predict future behaviour.

[3 markah/marks]

- 2 Lengkapkan carta alir dengan komponen dalam pemodelan matematik.
Complete the flow chart with the component of mathematical modeling.

[5 markah/marks]



Kertas Model SPM

KERTAS 1

[40 markah/marks]

Jawab **semua** soalan.Answer **all** questions.

- 1 Selesaikan persamaan linear serentak yang berikut.

Solve the following simultaneous linear equations.

$$6x + 4y = 28$$

$$5x + 2y = 21$$

A $x = \frac{7}{2}$ dan/and $y = \frac{11}{14}$

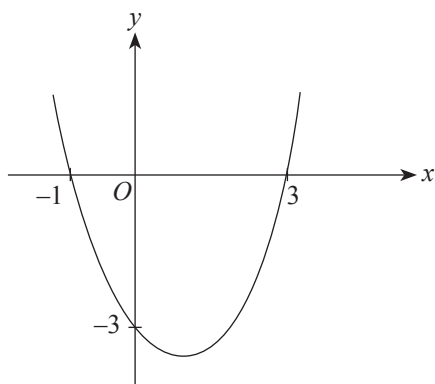
B $x = \frac{21}{7}$ dan/and $y = \frac{7}{4}$

C $x = \frac{21}{7}$ dan/and $y = \frac{7}{2}$

D $x = \frac{7}{2}$ dan/and $y = \frac{7}{4}$

- 2 Rajah 1 menunjukkan graf fungsi kuadratik yang bersilang pada paksi-x di $x = -1$ dan $x = 3$.

Diagram 1 shows a graph of quadratic function which intersects the x-axis at $x = -1$ and $x = 3$.



Rajah 1 / Diagram 1

Cari koordinat titik minimum bagi graf itu.

Find the coordinates of the minimum point of the graph.

- A (1, 0)
B (1, -4)
C (2, 5)
D (2, -3)

- 3 Selesaikan/Solve:

$$4x - 7 \leq 9 + x$$

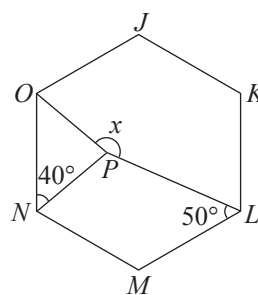
A $x \geq -\frac{16}{3}$

C $x \geq \frac{16}{3}$

B $x \leq -\frac{16}{3}$

D $x \leq \frac{16}{3}$

- 4 Rajah 2 menunjukkan heksagon sekata $JKLMNO$.
Diagram 2 show a regular hexagon $JKLMNO$.



Rajah 2 / Diagram 2

Diberi bahawa $OP = NP$, cari nilai x .

Given that $OP = NP$, find the value of x .

A 100°

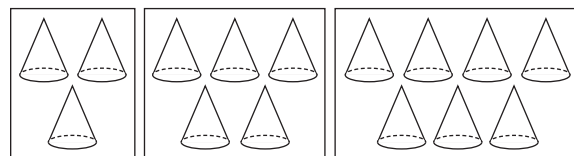
C 150°

B 130°

D 160°

- 5 Rajah 3 menunjukkan tiga susunan pertama kon yang sama saiz.

Diagram 3 shows the first three arrangement of cones of the same size.



Rajah 3 / Diagram 3

Diberi bahawa diameter dan tinggi bagi setiap kon masing-masing ialah 6 cm. Hitung jumlah isi padu, dalam cm^3 , kon pada susunan yang ke-5.

It is given that the diameter and the height of each cone is 6 cm respectively. Calculate the total volume, in cm^3 , of the cones in the 5th arrangement.

A 18π

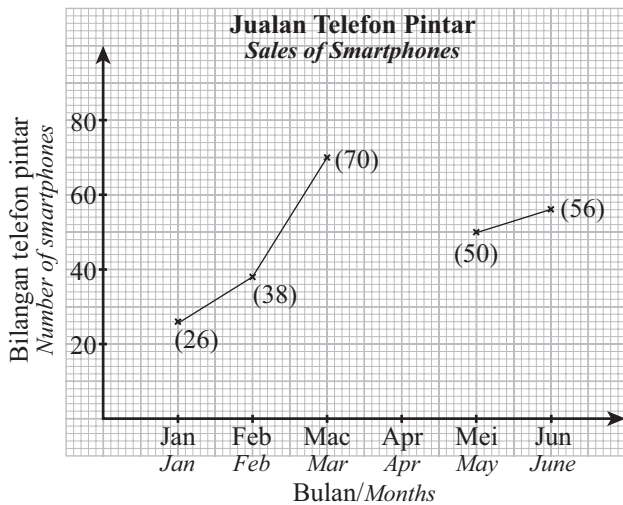
C 198π

B 72π

D 792π

- 6 Rajah 4 ialah graf garis tidak lengkap yang menunjukkan bilangan telefon pintar yang dijual di sebuah kedai dalam masa enam bulan.

Diagram 4 is an incomplete line graph showing the number of smartphones sold in a store over a six-month period.



Rajah 4 / Diagram 4

Diberi min bilangan telefon pintar yang dijual dalam enam bulan tersebut ialah 45. Hitung jumlah bilangan telefon pintar yang dijual pada bulan April.

Given that the mean number of smartphones sold in that six months is 45. Calculate the total number of smartphones sold in April.

- A 15
B 30
C 40
D 48
- 7 Sebuah padang berbentuk segi empat tepat mempunyai panjang 20 m dan lebar 15 m. Seorang murid berjalan secara menyerong dari satu sudut ke sudut yang bertentangan. Berapakah jarak yang dilalui murid tersebut?
- A rectangular field is 20 m long and 15 m wide. A student walks diagonally from one corner to the opposite corner. How far does the student travel?
- A 24 m
B 25 m
C 26 m
D 27 m

- 8 Permudahkan ungkapan $(2x + 3)(x - 4)$.

Simplify the expression $(2x + 3)(x - 4)$.

- A $2x^2 + 5x + 12$
B $2x^2 - 5x - 12$
C $2x^2 + 11x + 12$
D $2x^2 - 11x + 12$

- 9 Selesaikan persamaan $\frac{3x + 6}{2} = 12$.

Solve the equation $\frac{3x + 6}{2} = 12$.

- A $x = 6$
B $x = 7$
C $x = 8$
D $x = 9$

- 10 Seorang pekerja menerima gaji asas sebanyak RM50 sehari. Selain itu, dia menerima bayaran tambahan sebanyak RM8 bagi setiap jam kerja lebih masa. Tulis rumus algebra bagi jumlah gaji, G , dalam sebutan bilangan jam lebih masa, h .

A worker earns a basic wage of RM50 per day. In addition, he receives an extra payment of RM8 for each hour of overtime work. Write an algebraic formula for the total wage, G , in terms of the number of overtime hours, h .

- A $G = 50h + 8$
B $G = 50 - 8h$
C $G = 50 + 8h$
D $G = \frac{50}{h} - 8h$

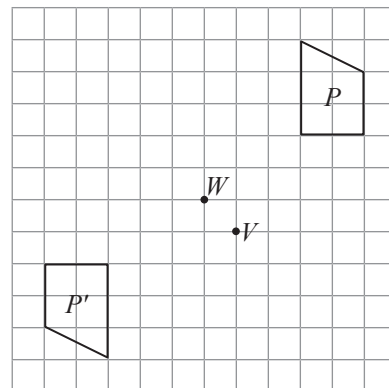
- 11 Diberi bahawa jarak antara titik $(8, 2)$ dan $(x, -3)$ ialah 13 unit. Tentukan nilai x .

Given that the distance between $(8, 2)$ and $(x, -3)$ is 13 units. Determine the value of x .

- A -4
B -6
C 4
D 6

- 12 Dalam Rajah 5, P' ialah imej bagi P di bawah suatu putaran.

In Diagram 5, P' is the image of P under a rotation.



Rajah 5 / Diagram 5

Antara berikut, yang manakah benar?

Which of the following is true?

	Pusat Centre	Sudut Angle	Arah Direction
A	V	90°	Ikut arah jam Clockwise
B	V	180°	—
C	W	90°	Lawan arah jam Anticlockwise
D	W	180°	—

- 13 Jadual 1 menunjukkan ringkasan lima nombor bagi satu set data.

Table 1 shows the five-number summary for a set of data.

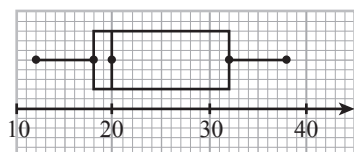
Nilai minimum <i>Minimum value</i>	12
Kuartil pertama <i>First quartile</i>	18
Median <i>Median</i>	24
Kuartil ketiga <i>Third quartile</i>	32
Nilai maksimum <i>Maximum value</i>	38

Jadual 1 / Table 1

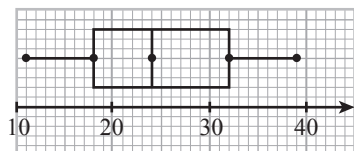
Antara plot kotak berikut, yang manakah mewakili data tersebut dengan betul?

Which of the following box plots represents the data correctly?

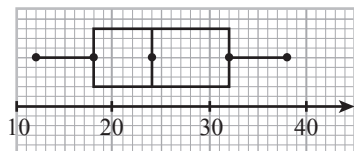
A



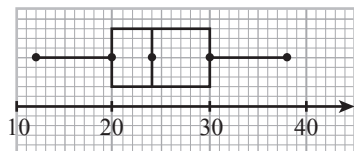
B



C



D



- 14 Jisim sehelai kertas A4 ialah 0.0089456 kg. Jika satu rim mengandungi 400 helai kertas A4, berapakah berat, dalam g, 200 rim kertas A4 dalam bentuk piawai?

The weight of an A4 paper is 0.0089456 kg. If a ream contains 400 sheets of A4 paper, what is the weight, in g, of 200 reams of A4 paper in a standard form?

- A 7.15×10^5
B 7.16×10^5
C 7.16×10^6
D 7.15×10^6

- 15 Sepanjang cuti semester, seramai 60 orang pelajar telah menduduki ujian memandu. Jadual 2 menunjukkan bilangan murid yang lulus dan gagal dalam ujian tersebut.

During the semester break, a total of 60 students took the driving test. Table 2 shows the number of students who passed and failed the test.

Pelajar <i>Students</i>	Lulus <i>Pass</i>	Gagal <i>Fail</i>
Lelaki <i>Male</i>	15	12
Perempuan <i>Female</i>	17	16

Jadual 2 / Table 2

Jika seorang pelajar dipilih secara rawak daripada kumpulan perempuan, hitung kebarangkalian pelajar itu gagal.

If a student is picked at random from the female group, calculate the probability the student failed the test.

- A $\frac{16}{60}$
B $\frac{28}{33}$
C $\frac{16}{33}$
D $\frac{16}{28}$

- 16 Cari nilai x.

Find the value of x.

$$9^{(x-1)} = \frac{27^x}{3^4}$$

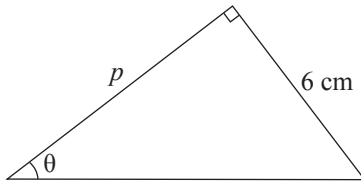
- A $x = -2$
B $x = 2$
C $x = 3$
D $x = 6$

- 17 Imran melabur RM3 000 secara berkala selama tiga bulan dengan jumlah RM1 000 setiap bulan. Harga saham seunit bagi tiga bulan tersebut ialah RM2.00, RM1.80 dan RM1.60. Hitung kos purata seunit sahamnya.

Imran invests RM3 000 periodically over three months with an amount of RM1 000 each month. The share prices per unit for the three months are RM2.00, RM1.80 and RM1.60. Calculate the average cost per unit of her shares.

- A RM1.78
B RM1.80
C RM1.85
D RM1.88

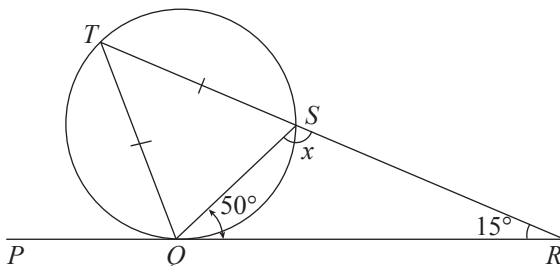
- 18 Rajah 6 menunjukkan sebuah segi tiga.
Diagram 6 shows a triangle.



Rajah 6 / Diagram 6

Diberi $\sin \theta = 0.6$. Hitung panjang, dalam cm, sisi p .
Given $\sin \theta = 0.6$, calculate the length, in cm, of side p .

- A 6
B 8
C 4
D 0.6
- 19 Cari panjang tepi kubus yang sebenar, jika lukisan berskala mempunyai isi padu $64\,000\text{ cm}^3$. Diberi skala lukisan ialah 1 : 3.
Find the actual length of the edge of a cube, if the scaled drawing has a volume of $64\,000\text{ cm}^3$. Given that the scale of the drawing is 1 : 3.
- A 40 cm
B 80 cm
C 120 cm
D 160 cm
- 20 Rajah 7 menunjukkan sebuah bulatan dengan garis lurus PQR menyentuh bulatan pada titik Q .
Diagram 7 shows a circle with a straight line PQR , touching the circle at point Q .



Rajah 7 / Diagram 7

Hitung nilai x .
Calculate the value of x .

- A 65°
B 80°
C 115°
D 130°
- 21 Diberikan dua titik, $M(2, 3)$ dan $N(-2, -3)$. Namakan lokus yang terbentuk apabila titik-titik yang berada pada jarak yang sama dari kedua-dua titik M dan N disambungkan?
Given two points, $M(2, 3)$ and $N(-2, -3)$. Name the locus formed when the points equidistant from both points M and N are connected?
- A Garis lurus selari
Parallel straight lines
B Garis lurus
Straight line
C Pembahagi dua sama serenjang
Perpendicular bisector
D Bulatan
Circle

- 22 Hitung jarak di antara titik $(3, 6)$ dan titik $(3, 10)$.
Calculate the distance between the point $(3, 6)$ and point $(3, 10)$.
- A 3
B 10
C 4
D 6

- 23 -1 ialah salah satu daripada punca-punca bagi persamaan kuadratik $3x^2 - bx - 5 = 0$ dengan b ialah pemalar.

-1 is one of the roots of the quadratic equation $3x^2 - bx - 5 = 0$ where b is a constant.

Antara berikut, yang manakah punca yang satu lagi?

Which of the following is another root?

- A $-\frac{3}{5}$
B $-\frac{5}{3}$
C $\frac{3}{5}$
D $\frac{5}{3}$

- 24 Antara berikut, pernyataan yang manakah palsu?

Which of the following statements is false?

- A Faktor bagi 2 ialah 1 dan 2.
The factors of 2 are 1 and 2.
B Sebahagian nombor dikuasakan dengan sifar menghasilkan 1.
Some of the numbers to the power of zero result equals 1.
C Hasil tambah semua sudut peluaran pentagon ialah 360° .
The sum of the exterior angles of a pentagon is 360° .
D 30 ialah gandaan bagi 5 dan 6.
30 is a multiple of 5 and 6.

- 25 Butik Afia menjual sebuah dompet dengan harga RM235. Pelanggan akan mendapat diskaun RM15 bagi pembelian itu. Hitung harga, dalam asas 6, yang perlu dibayar oleh pelanggan bagi sebuah dompet itu.

Afia Boutique sell a wallet for RM235. The customer will get RM15 discount for the purchase. Calculate the price, in base 6, that the customer has to pay for the wallet.

- A $\text{RM}1004_6$
B $\text{RM}1031_6$
C $\text{RM}1054_6$
D $\text{RM}1055_6$

- 26 Rajah 8 ialah plot batang-dan-daun yang menunjukkan umur sekumpulan pekerja di sebuah syarikat.

Diagram 8 is a stem-and-leaf plot showing the ages of a group of employees at a company.

Umur Pekerja Ages of Workers	
Batang Stem	Daun Leaf
2	2 7
3	3 5 5 8
4	0 0 5 5 8 8 9
5	1 2 4 5

Kekunci: 2 | 2 bermaksud 22 tahun

Key: 2 | 2 means 22 years old

Rajah 8 / Diagram 8

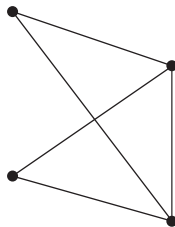
Hitung bilangan pekerja yang berumur 40 tahun dan ke atas.

Calculate the number of employees aged 40 years old and above.

- A 7 C 15
B 11 D 17

- 27 Rajah 9 menunjukkan sebuah graf.

Diagram 9 shows a graph.



Rajah 9 / Diagram 9

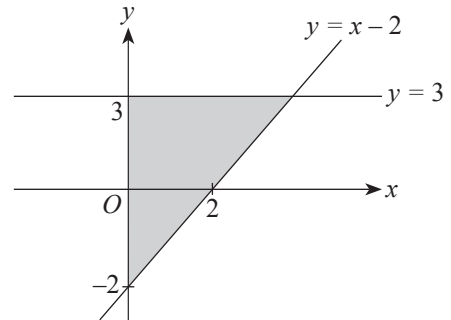
Antara berikut, yang manakah **bukan** pokok bagi graf di atas?

Which of the following is **not** the tree for the graph above?

- A C B D

- 28 Rajah 10 menunjukkan rantau berlorek yang memuaskan sistem ketaksamaan linear $y \geq x - 2$, $y \leq 3$ dan $x \geq 0$.

Diagram 10 shows the shaded region that satisfies the system of linear inequalities $y \geq x - 2$, $y \leq 3$ and $x \geq 0$.



Rajah 10 / Diagram 10

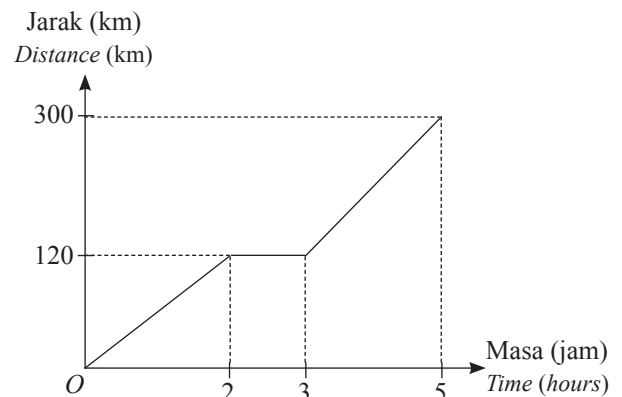
Antara berikut, yang manakah merupakan koordinat bucu-bucu rantau yang memuaskan sistem ketaksamaan linear tersebut?

Which of the following represents the coordinates of the vertices of the region that satisfies the system of linear inequalities?

- A (0, -2), (0, 3), (5, 3)
B (0, 2), (0, 3), (5, 3)
C (0, -2), (0, 3), (3, 3)
D (0, 2), (0, 3), (3, 3)

- 29 Rajah 11 menunjukkan graf jarak-masa bagi sebuah kereta yang bergerak di lebuh raya.

Diagram 11 shows a distance-time graph of a car traveling on a highway.



Rajah 11 / Diagram 11

Hitung kelajuan purata, dalam km j^{-1} , kereta sepanjang 5 jam tersebut.

Calculate the average speed, in km h^{-1} , of the car during the 5 hours.

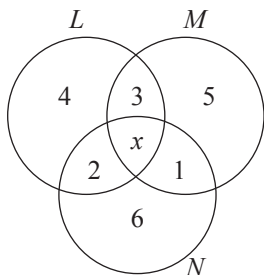
- A 50
B 60
C 70
D 80

- 30 Set data P ialah $\{10, 11, 11, 14, 18, 20, 21, 21\}$. Jika nilai 40 dimasukkan ke dalam set data tersebut sebagai pencilan, apakah kesan yang paling ketara terhadap sukatan serakan bagi set data P ?

Data set P is $\{10, 11, 11, 14, 18, 20, 21, 21\}$. If the value 40 is added to the set of data as an outlier, what is the most significant effect on the measures of dispersion for data set P ?

- A Julat antara kuartil akan meningkat secara mendadak.
The interquartile range will increase dramatically.
 B Nilai julat akan meningkat daripada 11 kepada 30.
The range value will increase from 11 to 30.
 C Sisihan piawai akan menjadi lebih kecil kerana bilangan data bertambah.
The standard deviation will become smaller because the number of data has increased.
 D Median akan berubah menjadi nilai yang paling tidak stabil.
The median will change into the most unstable value.

- 31 Rajah 12 ialah sebuah gambar rajah Venn yang menunjukkan bilangan unsur bagi set L , M dan N .
Diagram 12 is a Venn diagram showing the number of elements for sets L , M and N .



Rajah 12 / Diagram 12

Diberi bahawa set semesta, $\xi = L \cup M \cup N$ dan $n(L \cup M \cap N') = n(M \cap N)$. Hitung nilai x .

Given that the universe set, $\xi = L \cup M \cup N$ and $n(L \cup M \cap N') = n(M \cap N)$. Calculate the value of x .

- A 8
 B 9
 C 10
 D 11
- 32 Ammar ingin membeli sebuah kereta yang berharga RM65 000. Dia perlu menyediakan wang pendahuluan kerana pihak bank hanya meluluskan pinjaman sebanyak RM55 000. Berapakah jumlah minimum yang perlu dia simpan setiap bulan selama 5 bulan jika wang simpanannya ketika ini ialah RM8 500?
Ammar wants to buy a car which costs RM65 000. He needs to prepare a down payment as the bank only approves a loan of RM55 000. What is the minimum amount that he needs to save every month within 5 months if his saving at the moment is RM8 500?

- A RM250
 B RM300
 C RM350
 D RM400

- 33 Diberi bahawa y berubah secara langsung dengan x dan secara songsang dengan z . Apabila $x = 2$ dan $z = 4$, nilai $y = 6$. Cari nilai y apabila $x = 3$ dan $z = 6$.

Given that y varies directly with x and inversely with z . When $x = 2$ and $z = 4$, the value of $y = 6$. Find the value of y when $x = 3$ and $z = 6$.

- A 4
 B 5
 C 6
 D 7

- 34 Diberi bahawa $\begin{pmatrix} 3 & 2 \\ -5 & 4 \end{pmatrix} \begin{pmatrix} 1 \\ -x \end{pmatrix} = \begin{pmatrix} -x \\ -17 \end{pmatrix}$. Hitung nilai x .

It is given that $\begin{pmatrix} 3 & 2 \\ -5 & 4 \end{pmatrix} \begin{pmatrix} 1 \\ -x \end{pmatrix} = \begin{pmatrix} -x \\ -17 \end{pmatrix}$. Calculate the value of x .

- A -3
 B -1
 C 1
 D 3

- 35 Umar membeli polisi insurans motor pihak ketiga. Antara situasi berikut, yang manakah dilindungi oleh polisi tersebut?

Umar bought a third-party motor insurance policy. Which of the following situations is covered by the policy?

- A Kereta Umar dicuri.
Umar's car was stolen.
 B Kos baik pulih kereta yang dilanggar oleh Umar.
The repair cost of the car hit by Umar.
 C Kos baik pulih kereta Umar akibat kemalangan.
The repair cost of Umar's car due to an accident.
 D Kereta Umar terbakar akibat kebocoran tangki minyak.
Umar's car caught on fire due to a fuel tank leak.

- 36 Berdasarkan graf fungsi $y = \sin 2x$ bagi $0^\circ \leq x \leq 180^\circ$, yang manakah antara set koordinat berikut menunjukkan titik maksimum dan titik minimum graf tersebut?

Based on the function graph $y = \sin 2x$ for $0^\circ \leq x \leq 180^\circ$, which of the following sets of coordinates shows the maximum and minimum points of the graph?

- A Maksimum/Maximum = $(90^\circ, 1)$;
 Minimum/Minimum = $(270^\circ, 1)$
 B Maksimum/Maximum = $(45^\circ, 1)$;
 Minimum/Minimum = $(135^\circ, -1)$
 C Maksimum/Maximum = $(0^\circ, 1)$;
 Minimum/Minimum = $(90^\circ, -1)$
 D Maksimum/Maximum = $(45^\circ, 2)$;
 Minimum/Minimum = $(135^\circ, -2)$

- 37 Rajah 13 menunjukkan skor bagi 20 orang peserta dalam satu pertandingan kuiz Matematik. Diagram 13 shows the scores of 20 participants in a Mathematics quiz competition.

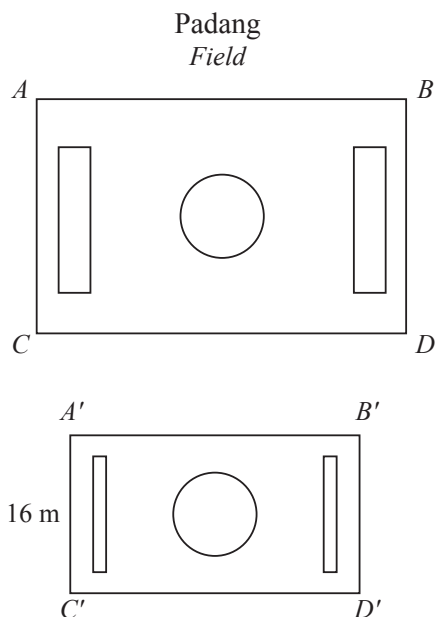
45, 52, 38, 61, 70, 42, 55, 63, 35, 48, 50, 59, 67, 44, 39, 51, 54, 46, 60, 43

Rajah 13 / Diagram 13

Jika data tersebut perlu dibahagikan kepada 8 kelas, tentukan saiz selang kelas yang paling sesuai.

If the data needs to be divided into 8 classes, determine the most appropriate class interval size.

- A 3
B 4
C 5
D 6
- 38 Rajah 14 menunjukkan $A'B'C'D'$ ialah suatu lukisan berskala bagi sebuah padang yang berbentuk segi empat tepat, dilukis dengan skala 1 : 5. Luas padang itu ialah 7 200 m². Diagram 14 shows $A'B'C'D'$ is a scaled drawing of a rectangular field, drawn at a scale of 1 : 5. The area of the field is 7 200 m².



Rajah 14 / Diagram 14

Hitung perimeter, dalam m, padang tersebut. Calculate the perimeter, in m, of the field.

- A 90
B 180
C 1 440
D 340

- 39 Encik Kumar memperoleh pendapatan tahunan sebanyak RM78 450 termasuk elaun pada tahun 2025. Diberi bahawa elaun berjumlah RM15 000 dikecualikan cukai. Encik Kumar juga memberi derma sebanyak 0.5% daripada jumlah pendapatan tahunan beliau kepada rumah kebajikan orang tua yang berdaftar dengan kerajaan. Jadual 3 menunjukkan jumlah tuntutan oleh Encik Kumar.

Mr. Kumar earned an annual income of RM78 450 including allowances in year 2025. It is given that an allowance of RM15 000 is tax-exempt. Mr. Kumar also donated 0.5% of his total annual income to a government-registered home for the elderly. Table 3 shows the total claim by Mr. Kumar.

Pelepasan cukai Tax relief	Amaun Amount (RM)
Individu Individual	9 000
Gaya hidup (had RM2 500) Lifestyle (limit RM2 500)	2 100
Insurans hayat dan KWSP Life insurance and EPF (had/limit RM7 000)	4 800
Insurans perubatan Medical insurance (had/limit RM3 000)	1 540

Jadual 3 / Table 3

Hitung jumlah pendapatan bercukai Encik Kumar pada tahun tersebut.

Calculate Mr. Kumar's taxable income of that year.

- A RM46 010.00 C RM45 217.75
B RM45 617.75 D RM44 157.75

- 40 Susun langkah-langkah berikut dalam urutan yang betul bagi proses penyelesaian masalah matematik:

Arrange the following steps in the correct order for the mathematical problem-solving process:

- I Membuat andaian dan mengenal pasti pemboleh ubah
Making assumptions and identify the variables
II Menentukan dan mentafsir penyelesaian dalam konteks masalah berkenaan
Verifying and interpreting solutions in the context of the problem
III Mengenal pasti dan mendefinisikan masalah
Identifying and defining the problems
IV Mengaplikasi matematik untuk menyelesaikan masalah
Applying mathematics to solve the problems

Apakah susunan yang betul?

What is the correct sequence?

- A III → I → IV → II C III → IV → I → II
B I → III → II → IV D IV → III → I → II

KERTAS 2
Bahagian A
[40 markah/marks]

Jawab **semua** soalan dalam bahagian ini.

*Answer **all** questions in this section.*

- 1 Markah Marissa dalam mata pelajaran Sains, Bahasa Melayu dan Matematik ialah 152_6 , 126_8 dan 101101_2 masing-masing. Apakah beza markah antara mata pelajaran Sains dengan Matematik? Berikan jawapan dalam asas lapan.

Marissa's marks in Science, Bahasa Melayu and Mathematics are 152_6 , 126_8 and 101101_2 respectively. What is the difference in marks between Science and Mathematics? Give the answer in base eight.

[3 markah/marks]

Jawapan/Answer:

2 Diberi fungsi kuadratik:

Given the quadratic function:

$$f(x) = x^2 - 15x + 50$$

(a) Tentukan punca-punca bagi fungsi kuadratik tersebut.

Determine the roots of the quadratic function.

(b) Sebuah sekolah ingin membina sebuah padang permainan berbentuk segi empat tepat dengan panjang dan lebar masing-masing sama dengan punca fungsi tersebut, dalam meter. Pihak sekolah mempunyai 35 m pita keselamatan untuk mengelilingi padang itu.

A school wants to build a rectangular playground with the length and width equal to the roots of the quadratic function, in meters. The school has 35 meters of safety tape to surround the playground.

(i) Tentukan perimeter padang permainan itu dalam meter.

Determine the perimeter of the playground in meters.

(ii) Nyatakan sama ada pita keselamatan tersebut mencukupi untuk mengelilingi padang permainan sepanjang tempoh pembinaan.

State whether the safety tape is sufficient to surround the playground during the construction.

[4 markah/marks]

Jawapan/Answer:

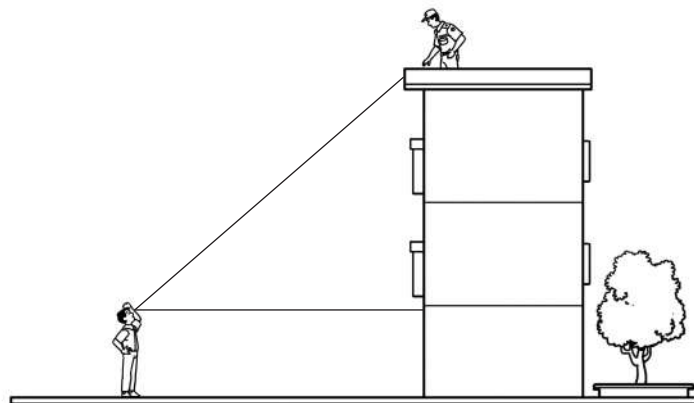
(a)

(b) (i)

(ii)

- 3 Rajah 1 menunjukkan seorang murid berdiri di atas permukaan mendatar dan melihat puncak sebuah bangunan. Seorang pengawal keselamatan yang berada di atas bangunan melihat murid tersebut. Sudut dongak bumbung bangunan daripada murid tersebut ialah 45° . Diberi bahawa tinggi aras mata murid dari aras tanah ialah 1 m.

Diagram 1 shows a student standing on horizontal ground and looking to the rooftop of a building. A security guard that standing in the rooftop of the building is looking to that student. The angle of elevation of the rooftop from the student is 45° . Given that the height of the student's eye level from the ground is 1 m.



Rajah 1 / Diagram 1

- (a) Nyatakan bentuk segi tiga yang terbentuk?

State the shape of the triangle formed?

[1 markah/mark]

- (b) Jika jarak murid dari kaki bangunan ialah 20 meter, hitung tinggi bangunan itu.

If the distance between the student and the base of the building is 20 meters, calculate the height of the building.

[2 markah/marks]

Jawapan/Answer:

(a)

(b)

4 (a) Nyatakan sama ada setiap yang berikut ialah pernyataan atau bukan pernyataan.

State whether each of the following is a statement or not a statement.

(i) Bulan kemerdekaan ialah bulan Oktober.

Independence month is in October.

(ii) $y = x + 15$

[2 markah/marks]

(b) Rajah 2 menunjukkan satu implikasi.

Diagram 2 shows an implication.

Jika $2 + 2 = 2 \times 2$, maka $5 + 5 = 5 \times 5$
If $2 + 2 = 2 \times 2$, then $5 + 5 = 5 \times 5$

Rajah 2 / Diagram 2

(i) Tulis kontrapositif bagi implikasi tersebut.

Write down the contrapositive of the implication.

(ii) Seterusnya, tentukan nilai kebenaran kontrapositif itu.

Hence, determine the truth value of the contrapositive.

[2 markah/marks]

Jawapan/Answer:

(a) (i)

(ii)

(b) (i)

(ii)

- 5 (a) Gambar rajah Venn di ruang jawapan menunjukkan set P , set Q dan set R dengan keadaan set semesta, $\xi = P \cup Q \cup R$. Pada rajah di ruang jawapan, lorek set $P \cup (Q \cap R)$.

The diagram in the answer space shows set P , set Q and set R such that the universal set, $\xi = P \cup Q \cup R$. On the diagram in the answer space, shade the set $P \cup (Q \cap R)$.

[2 markah/marks]

- (b) Rajah 3 menunjukkan gambar rajah Venn bilangan ahli perkhemahan Kem Bina Diri Bestari.

Diberi bahawa:

set semesta, $\xi = \{\text{jumlah ahli}\}$,

set $J = \{\text{ahli kadet bomba}\}$ dan

set $K = \{\text{ahli kadet polis}\}$.

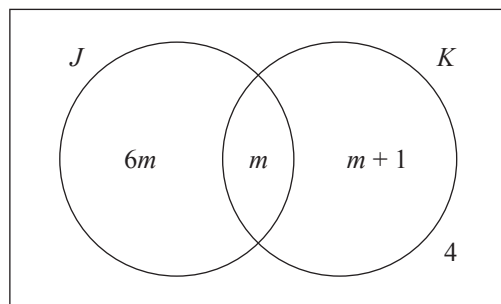
Diagram 3 shows a Venn diagram of the number of campers at Kem Bina Diri Bestari.

It is given that:

the universal set, $\xi = \{\text{total number of members}\}$,

set $J = \{\text{fire cadet members}\}$, and

set $K = \{\text{police cadet members}\}$.



Rajah 3 / Diagram 3

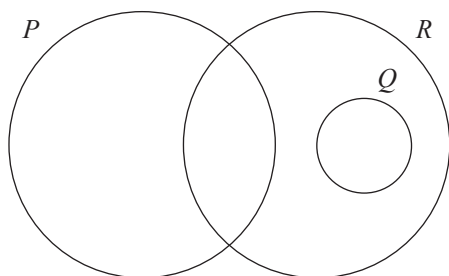
Diberi $n(J \cap K)' = 54$, hitung nilai m .

Given $n(J \cap K)' = 54$, calculate the value of m .

[2 markah/marks]

Jawapan/Answer:

(a)



(b)

6 Rajah 4 menunjukkan penyata tahunan pendapatan Akia.

Diagram 4 shows Akia's annual statement.

PENYATA PENDAPATAN TAHUNAN YANG BERAKHIR PADA 31.12.2025	
ANNUAL INCOME STATEMENT ENDED ON 31.12.2025	
Nama/Name	: AKIA BINTI AMIR
Jumlah pendapatan tahunan	: RM74 200
Total annual income	
Caruman kepada KWSP	: RM6 794
Contribution to EPF	
Zakat	: RM480

Rajah 4 / Diagram 4

Pada tahun 2025, Akia mendermakan RM1 300 kepada Tabung Kanser Negara. Dia menuntut pelepasan individu sebanyak RM9 000, gaya hidup sebanyak RM2 250, perbelanjaan rawatan perubatan ibunya sebanyak RM3 200 dan yuran pengajian separuh masa sebanyak RM6 000.

In 2025, Akia has donated RM1 300 to Tabung Kanser Negara. She claimed tax reliefs for individual for RM9 000, lifestyle for RM2 250, her mother's medical treatment expenses for RM3 200 and part time tuition fees for RM6 000.

(a) Hitung pendapatan bercukai Akia bagi tahun 2025.

Calculate Akia's chargeable income for the year 2025.

[2 markah/marks]

(b) Jadual 1 menunjukkan Kadar Cukai Pendapatan Individu untuk Tahun Taksiran 2025.

Table 1 shows an Individual Income Tax Rates for Assessment Year of 2025.

Banjaran Pendapatan Bercukai (RM) Chargeable Income (RM)	Pengiraan (RM) Calculation (RM)	Kadar (%) Rate (%)	Cukai (RM) Tax (RM)
35 001 – 50 000	35 000 pertama On the first 35 000		600
	15 000 berikutnya Next 15 000	6	900
50 001 – 70 000	50 000 pertama On the first 50 000		1 500
	20 000 berikutnya Next 20 000	11	2 200

Jadual 1 / Table 1

Hitung cukai pendapatan yang perlu dibayar oleh Akia pada tahun tersebut.

Calculate the income tax payable by Akia for that year.

[3 markah/marks]

Jawapan/Answer:

(a)

(b)

- 7 Qayyum bercadang memperbaharui insurans keretanya di Kuching. Keretanya mempunyai kapasiti enjin 1 800 cc dan dia mahu menginsuranskan keretanya sebanyak RM100 000. Jadual 2 menunjukkan kadar yang dikenakan bagi RM1 000 pertama daripada jumlah yang diinsuranskan bagi polisi komprehensif. *Qayyum plans to renew his car insurance in Kuching. His car has an engine capacity of 1 800 cc and he wants to insure it for a sum of RM100 000. Table 2 shows the rate charged for the first RM1 000 of the sum insured for comprehensive policy.*

Kapasiti enjin tidak melebihi (cc) <i>Engine capacity not exceeding (cc)</i>	Semenanjung Malaysia <i>Peninsular Malaysia</i>	Sabah dan Sarawak <i>Sabah and Sarawak</i>
1 650	RM305.50	RM220.00
2 200	RM339.10	RM243.90
3 050	RM372.60	RM266.50

Jadual 2 / Table 2

Bagi polisi komprehensif kereta Qayyum,

For the comprehensive policy of Qayyum's car,

- (a) nyatakan kadar yang dikenakan bagi RM1 000 yang pertama,
state the rate charged for the first RM1 000,

[1 markah/mark]

- (b) hitung premium asas yang perlu dibayar oleh Qayyum.
calculate the basic premium that Qayyum has to pay.

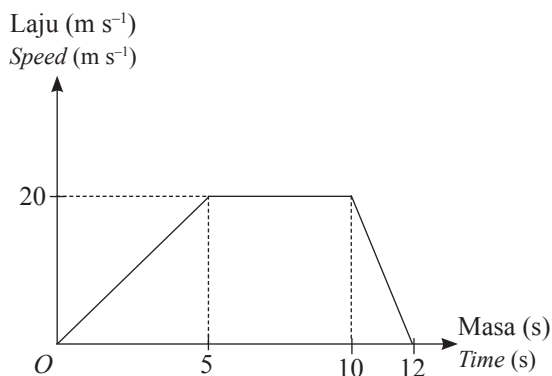
[3 markah/marks]

Jawapan/Answer:

(a)

(b)

- 8 Rajah 5 menunjukkan graf laju-masa pergerakan sebutir zarah dalam tempoh 12 saat.
Diagram 5 shows the speed-time graph of the movement of a particle in a period of 12 seconds.



Rajah 5 / Diagram 5

- (a) Nyatakan laju maksimum yang dicapai oleh zarah itu.
State the maximum speed reached by the particle itu.
- (b) Hitung jarak keseluruhan yang dilalui oleh zarah dalam tempoh 0 hingga 12 saat.
Calculate the total distance travelled by the particle in the period 0 to 12 seconds.

[4 markah/marks]

Jawapan/Answer:

(a)

(b)

- 9 Sebuah tiang bendera berdiri tegak di atas tanah mendatar. Seorang murid berdiri pada jarak 12 m dari kaki bendera tiang tersebut. Sudut dongakan bendera daripada mata murid ialah 40° . Diberi bahawa tinggi aras mata murid dari aras tanah ialah 1.5 m.

A flagpole stands upright on level ground. A student stands at a distance of 12 m from the base of the flagpole. The angle of elevation of the flag from the student's eye is 40° . Given that the height of the student's eye level from the ground is 1.5 m.

- (a) Hitung tinggi tiang bendera dalam m. Beri jawapan betul kepada tiga tempat perpuluhan.

Calculate the height of the flagpole in m. Give the correct answer to three decimal places.

[3 markah/marks]

- (b) Hitung nisbah tinggi tiang bendera kepada jarak murid dari kaki tiang bendera dalam bentuk paling ringkas.

Calculate the ratio of the height of the flagpole to the student's distance from the base of the flagpole in the simplest form.

[1 markah/mark]

Jawapan/Answer:

- (a)

- (b)

- 10 Setiap tahun, pasukan bola tampar sekolah akan mengambil bahagian dalam kejohanan bola tampar peringkat daerah. Jadual 3 menunjukkan kebarangkalian memenangi perlawanan ke atas sekolah *A* dan sekolah *B* bagi pasukan lelaki dan pasukan perempuan.

Every year, the school volleyball teams participate in the district level volleyball championship. Table 3 shows the probability of winning a match against school A and school B for the boys' team and the girls' team.

Pasukan <i>Team</i>	Kebarangkalian menang ke atas <i>Probability of winning against</i>	
	Sekolah <i>A</i> <i>School A</i>	Sekolah <i>B</i> <i>School B</i>
Lelaki <i>Boy</i>	$\frac{2}{5}$	$\frac{8}{15}$
Perempuan <i>Girl</i>	$\frac{3}{7}$	$\frac{3}{8}$

Jadual 3 / Table 3

Jika kebarangkalian memenangi sekurang-kurangnya satu perlawanan melebihi $\frac{7}{10}$, maka pasukan itu berpeluang ke peringkat seterusnya.

Adakah pasukan lelaki atau pasukan perempuan yang akan mendapat peluang itu? Justifikasikan jawapan anda.

If the probability of winning at least one match is more than $\frac{7}{10}$, then the team will have the chance to the next level.

Will the boy team or the girl team get the chance? Justify your answer.

[5 markah/marks]

Jawapan/Answer:

Bahagian B
[45 markah/marks]

Jawab semua **soalan** dalam bahagian ini.

Answer all questions in this section.

- 11** Jadual 1 dan Jadual 2 menunjukkan nama dan jarak lima tempat di negeri Selangor. Rajah 6 menunjukkan graf tak berarah yang tidak lengkap dan mempunyai pemberat.

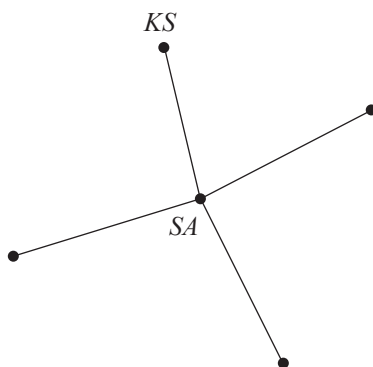
Table 1 and Table 2 show names and distances of five places in Selangor. Diagram 6 shows an incomplete undirected graph connecting the five places.

Destinasi <i>Destination</i>	Bucu <i>Vertex</i>
Klang	<i>K</i>
Kuala Selangor	<i>KS</i>
Shah Alam	<i>SA</i>
Sepang	<i>S</i>
Rawang	<i>R</i>

Jadual 4.1 / Table 4.1

Pasangan bucu <i>Vertex pair</i>	Jarak/Distance <i>(km)</i>
(K, KS)	50
(SA, S)	40
(SA, KS)	45
(SA, K)	14
(R, SA)	28
(R, S)	50
(KS, S)	110
(K, R)	50

Jadual 4.2 / Table 4.2



Rajah 6 / Diagram 6

- (a) Lengkapkan rajah di ruang jawapan dengan melukis satu graf tak terarah dan berpemberat.

Complete the diagram in the answer space by drawing an undirected weighted graph.

[4 markah/marks]

- (b) Lukis satu pokok berpemberat minimum dengan keadaan setiap tempat dilalui sekali sahaja.

Draw a tree with a minimum total weight which shows every place being visited once only.

[3 markah/marks]

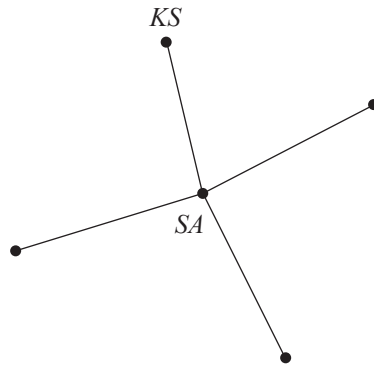
- (c) Berapakah jarak minimum pokok yang anda lukis?

What is the minimum distance of the tree that you have drawn?

[2 markah/marks]

Jawapan/Answer:

(a)



(b)

(c)

- 12** Persatuan Ibu Bapa dan Guru (PIBG) Sekolah Menengah Seri Bestari menganjurkan satu Kem STEM Dinamik semasa cuti sekolah. Peserta kem tersebut terdiri daripada x murid sekolah menengah dan y murid sekolah rendah.

Parents and Teachers Association (PIBG) of Sekolah Menengah Seri Bestari is organizing a Dynamic STEM Champ during the school holidays. The participants of the camp consist of x secondary school students and y primary school students.

Berikut adalah maklumat berkaitan peserta kem tersebut:

The following is the information regarding the camp participants:

- I: Jumlah peserta kem adalah tidak melebihi 240 orang.

The total participants does not exceed 240.

- II: Bilangan murid sekolah menengah adalah sekurang-kurangnya tiga kali bilangan murid sekolah rendah.

The number of secondary school students is at least three times the number of primary school students.

- (a) Berdasarkan maklumat di atas, tulis dua ketaksamaan linear selain daripada $x \geq 0$ dan $y \geq 0$.

Based on the information above, write two inequalities other than $x \geq 0$ and $y \geq 0$.

[2 markah/marks]

- (b) Dengan menggunakan skala 2 cm kepada 30 orang peserta pada kedua-dua paksi, lukis dan lorek rantau yang memuaskan sistem ketaksamaan linear di (a).

By using a scale of 2 cm to 30 participants on both axes, draw and shade the region that satisfies the system of linear inequalities in (a).

[4 markah/marks]

- (c) Berdasarkan graf di **12(b)**, bagi 60 orang murid sekolah rendah:

*Based on the graph in **12(b)**, for 60 primary school students:*

- (i) tentukan bilangan murid sekolah menengah yang mungkin menyertai kem tersebut,

determine the number of secondary school students who may participate in the camp,

[2 markah/marks]

- (ii) jika yuran pendaftaran bagi seorang murid sekolah menengah dan seorang murid sekolah rendah masing-masing ialah RM200 dan RM100, hitung jumlah yuran maksimum yang boleh diterima oleh penganjur.

if the registration fee for a secondary school student and a primary school student is RM200 and RM100 respectively, calculate the maximum total fees that can be received by the organiser.

[2 markah/marks]

Jawapan/Answer:

- (a)

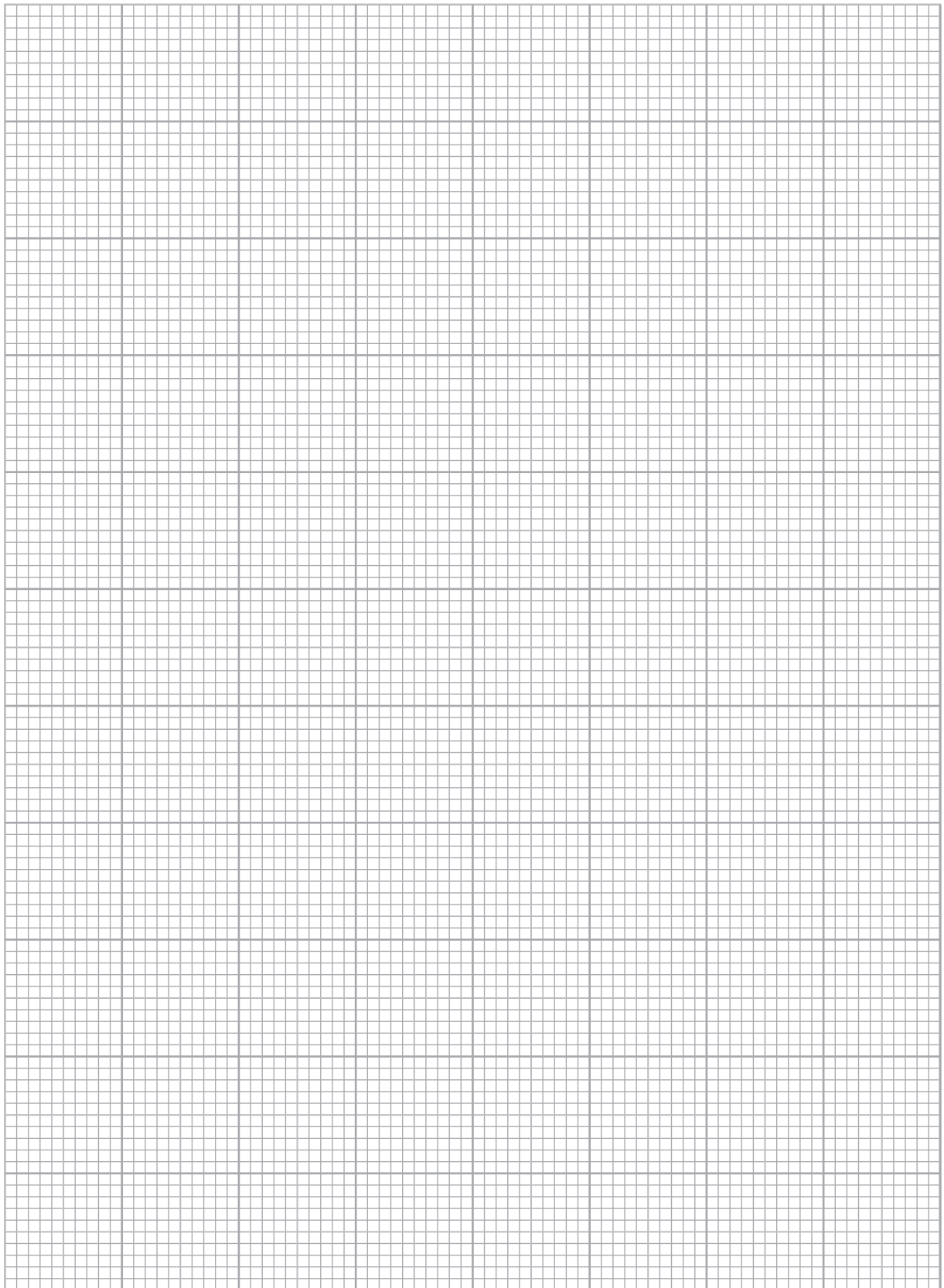
- (b) Rujuk graf

Refer to graph

- (c) (i)

- (ii)

Graf untuk Soalan 12
Graph for Question 12



Kertas Model SPM

- 13 Alia dan dua rakannya pergi ke sebuah restoran untuk makan malam. Alia membayar RM11 untuk 1 pinggan nasi goreng dan 1 gelas jus oren. Suzy membayar 3 pinggan nasi goreng dan Yugini membayar 2 gelas jus oren. Perbezaan harga di antara 3 pinggan nasi goreng dan 2 gelas jus oren ialah RM9. Harga sepinggan nasi goreng adalah lebih tinggi daripada harga segelas jus oren.

Alia and her two friends went to a restaurant for dinner. Alia paid RM11 for 1 plate of fried rice and 1 glass of orange juice. Suzy paid for 3 plates of fried rice and Yugini paid for 2 glasses of orange juice. The difference in price between 3 plates of fried rice and 2 glasses of orange juice is RM9. The price of a plate of fried rice is higher than the price of a glass of orange juice.

- (a) Dengan menggunakan kaedah matriks, hitung harga dalam RM, sepinggan nasi goreng dan segelas jus oren.

Using the matrix method, calculate the price, in RM, of a plate of fried rice and a glass of orange juice.

[5 markah/marks]

- (b) Pada malam berikutnya, Alia ingin membeli 5 pinggan nasi goreng dan 4 gelas jus oren dengan membawa 3 keping wang RM20. Tentukan sama ada Alia mempunyai wang yang mencukupi untuk membeli nasi goreng dan jus oren tersebut. Justifikasi jawapan anda dengan menggunakan pendaraban matriks.

On the following night, Alia wants to buy 5 plates of fried rice and 4 glasses of orange juice, bringing three RM20 notes. Determine whether Alia has enough money to buy the fried rice and orange juice. Justify your answer using matrix multiplication.

[3 markah/marks]

Jawapan/Answer:

- (a)

- (b)

- 14 (a) Nyatakan dua jenis matlamat kewangan.
State two types of financial goals.

[1 markah/mark]

- (b) Jadual 5 menunjukkan pelan kewangan bulanan Puan Fatimah.
Table 5 shows Puan Fatimah's monthly financial plan.

Pendapatan/Income	Amaun/Amount (RM)
Gaji/Salary	2 500
Dividen/Dividend	500
Yuran tuisyen/Tuition fee	1 022
Sewa diterima/Rental received	300
Elaun kehadiran/Attendance allowance	250
Komisen jualan/Sales commission	250
Perbelanjaan tetap bulanan <i>Monthly fixed expenses</i>	Amaun/Amount (RM)
Ansuran pinjaman rumah <i>Housing loan instalment</i>	1 000
Ansuran pinjaman kereta <i>Car loan instalment</i>	500
Insurans/Insurance	200
Perbelanjaan tidak tetap bulanan <i>Monthly variable expenses</i>	Amaun/Amount (RM)
Bil utiliti/Utility bill	150
Makanan dan minuman/Food and drinks	580
Belanja petrol/Petrol expenses	300
Pemberian kepada ibu bapa <i>Allowances to parents</i>	250

Jadual 5 / Table 5

- (i) Nyatakan dua pendapatan pasif Puan Fatimah
State two passive income of Puan Fatimah.
- [1 markah/mark]
- (ii) Berdasarkan Jadual 5, tentukan aliran tunai Puan Fatimah dan nyatakan jenis aliran tunai itu.
Based on Table 5, determine Puan Fatimah's cash flow and state the type of the cash flow.
- [3 markah/marks]
- (iii) Puan Fatimah mempunyai matlamat kewangan iaitu menyimpan wang untuk majlis perkahwinan anak lelakinya dalam masa satu tahun. Dia perlu menyediakan RM10 850 sebagai wang hantaran dan RM13 000 sebagai perbelanjaan majlis tersebut.
Puan Fatimah has a financial goal of saving money for her son's wedding within one year. She needs to prepare RM10 850 as the wedding gift money and RM13 000 for the wedding expenses.
- (a) Hitung jumlah simpanan bulanan yang diperlukan oleh Puan Fatimah untuk mencapai matlamat kewangannya dan aliran tunai di (b)(ii).
Calculate the total of the monthly savings needed by Puan Fatimah to achieve her financial goal and the amount of cash flow in (b)(ii).
- [2 markah/marks]
- (b) Seterusnya, cadangkan dua perubahan yang Puan Fatimah perlu lakukan pada pelan kewangan bulannya dalam Jadual 5 untuk mencapai matlamat kewangannya.
Hence, suggest two changes that Puan Fatimah should make to her monthly financial plan in Table 5 in order to achieve her financial goal.
- [2 markah/marks]

Jawapan/Answer:

(a)

(b) (i)

(ii)

(iii) (a)

(b)

- 15 (a) (i) Rajah 7 di ruang jawapan menunjukkan sebuah segi tiga EFG yang dilukis pada satah Cartes. Diberi transformasi A ialah pantulan pada garis $x = -4$. Lukis imej bagi segi tiga EFG di bawah transformasi A .

Diagram 7 in the answer space shows triangle EFG drawn on a Cartesian plane. Given that the transformation A is a reflection in the line $x = -4$. Draw the image of the triangle EFG under the transformation A .

[1 markah/mark]

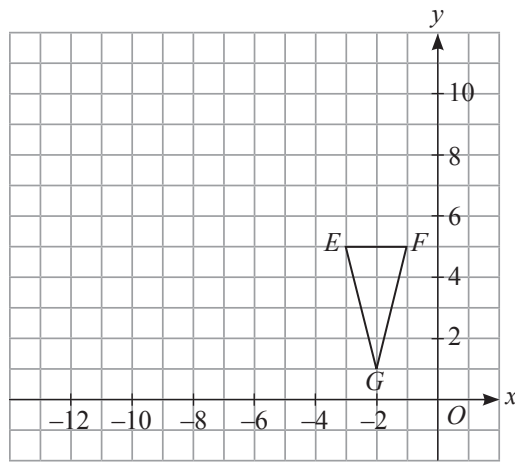
- (ii) Rajah 8 di ruang jawapan menunjukkan sebuah segi empat yang dilukis pada satah Cartes. Lukis empat lagi segi empat untuk menghasilkan suatu teselasi.

Diagram 8 in the answer space shows a quadrilateral drawn on a Cartesian plane. Draw four more quadrilaterals to produce a tessellation.

[1 markah/mark]

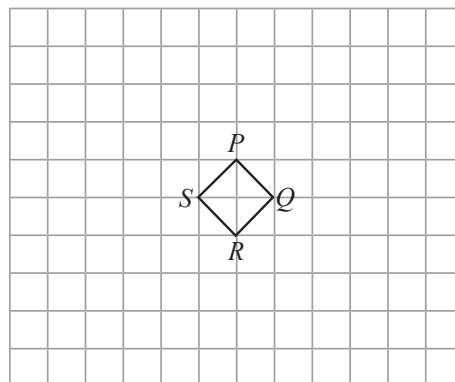
Jawapan/Answer:

(a) (i)



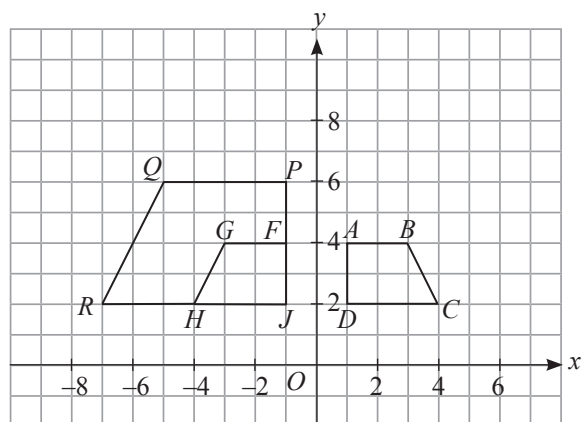
Rajah 7 / Diagram 7

(ii)



Rajah 8 / Diagram 8

- (b) Rajah 9 menunjukkan tiga trapezium, $ABCD$, $FGHJ$ dan $PQRJ$, dilukis pada satah Cartes. *Diagram 9 shows three trapeziums, $ABCD$, $FGHJ$ and $PQRJ$, drawn on a Cartesian plane.*



Rajah 9 / Diagram 9

$PQRJ$ ialah imej bagi $ABCD$ di bawah transformasi WV .
 $PQRJ$ is the image of $ABCD$ under the transformation WV .

- (i) Huraikan selengkapnya transformasi:

Describe in full, the transformation:

(a) V ,

(b) W .

[5 markah/marks]

- (ii) Diberi bahawa luas trapezium $ABCD$ ialah 85 m^2 . Hitung luas, dalam m^2 , trapezium $PQRJ$.
Given that the area of trapezium $ABCD$ is 85 m^2 . Calculate the area, in m^2 , of trapezium $PQRJ$.

[2 markah/marks]

Jawapan/Answer:

(i)

(i)

Bahagian C
[15 markah/marks]

Jawab **satu** soalan dalam bahagian ini.
*Answer **one** question in this section.*

- 16 (a) Di Kilang *AK Enterprise*, bilangan balang biskut, N , yang dihasilkan berubah secara langsung dengan bilangan pekerja, P , dan bilangan hari bekerja, H . Diberi bahawa bilangan balang biskut yang dihasilkan ialah 360 apabila bilangan hari bekerja ialah 2 dan bilangan pekerja ialah 30 orang.
At the AK Enterprise Factory, the number of biscuit jars, N , produced varies directly with the number of employees, P , and the number of working days, H . Given that the number of biscuit jars produced is 360 when the number of working days is 2 and the number of employees is 30.
- (i) Ungkapkan N dalam sebutan P dan H .
Express N in terms of P and H .
- (ii) Hitung bilangan hari bekerja, jika bilangan balang biskut yang dihasilkan ialah 1 920 dan bilangan pekerja ialah 40 orang.
Calculate the number of working days, if the number of biscuit jars produced is 1 920 and the number of employees is 40.

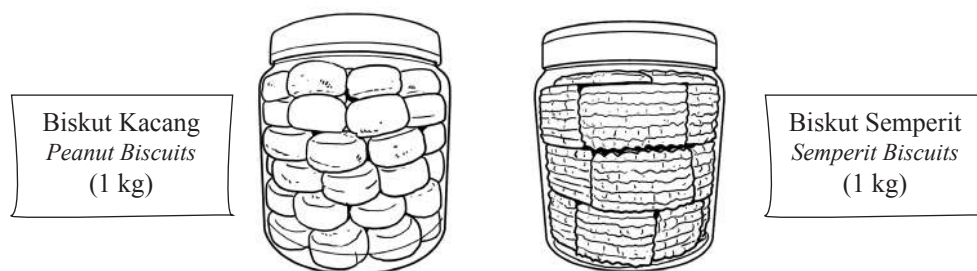
[4 markah/marks]

Jawapan/Answer:

(a) (i)

(ii)

- (b) Rajah 10 menunjukkan jenis biskut yang dihasilkan di Kilang AK Enterprise.
Diagram 10 shows types of biscuits produced in AK Enterprise Factory.



Rajah 10 / Diagram 10

Puan Azifah membeli 24 balang biskut kacang dan 21 balang biskut Semperit dengan harga RM774. Puan Zalina membeli 16 balang biskut kacang dan 20 balang biskut Semperit dengan harga RM624. Diberi RM x ialah harga bagi satu balang biskut kacang dan RM y ialah harga bagi satu balang biskut Semperit.

Puan Azifah bought 24 jars of peanut biscuits and 21 jars of Semperit biscuits for RM774. Puan Zalina bought 16 jars of peanut biscuits and 20 jars of Semperit biscuits for RM624. Given RM x is the price of one jar of peanut biscuits and RM y is the price of a jar of Semperit biscuits.

- (i) Tulis persamaan linear serentak untuk mewakili maklumat di atas.

Write a simultaneous linear equation to represent the information above.

[1 markah/mark]

- (ii) Menggunakan kaedah penggantian atau penghapusan, hitung harga dalam RM, bagi sebalang biskut kacang dan sebalang biskut Semperit.

Using the substitution or elimination method, calculate the price in RM, for a jar of peanut biscuits and a jar of Semperit biscuits.

[4 markah/marks]

Jawapan/Answer:

(i)

(ii)

- (c) Beberapa orang pelanggan Kilang *AK Enterprise* telah membuat pesanan biskut secara dalam talian. Encik Hadi, pekerja kilang tersebut dikehendaki menghantar pesanan ke kediaman pelanggan. Berikut adalah maklumat jarak, dalam km, dan laluan yang digunakan antara enam kediaman pelanggan, *J*, *K*, *L*, *M*, *N* dan *P*.

Several customers of AK Enterprise Factory have placed an order for biscuits online. Encik Hadi, the factory employee is required to deliver the order to the customer's residence. The following is the distance information, in km, and the route used between the six customer's residence, J, K, L, M, N and P.

	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>	<i>N</i>	<i>P</i>
<i>J</i>	–	12	8	14	–	–
<i>K</i>	12	–	–	–	10	7
<i>L</i>	8	–	–	5	–	–
<i>M</i>	14	–	5	–	6	9
<i>N</i>	–	10	–	6	–	4
<i>P</i>	–	7	–	9	4	–

Jadual 6 / Table 6

- (i) Berdasarkan maklumat di atas, lukis graf berpemberat bagi laluan pekerja tersebut.
Based on the information above, draw a weighted graph for the employee routes.
- (ii) Lukis satu graf terarah mewakili laluan sehala dengan jarak terpendek bermula dari kediaman *J* ke semua kediaman lain. Seterusnya, nyatakan jarak terpendek itu.
Draw a directed graph representing a one-way route with the shortest distance starting from residence J to all other residences. Hence, state the shortest distance.

[6 markah/marks]

Jawapan/Answer:

(i)

(ii)

- 17 (a) SMK Telok Gading telah mengadakan hari kantin. Semua murid perlu menggunakan kupon untuk membeli makanan dan minuman. Asha dan Noah masing-masing telah membelanjakan RM30. Noah membeli 4 kupon makanan dan 2 kupon minuman, manakala Asha membeli 2 kupon makanan dan 6 kupon minuman.

SMK Telok Gading has held a canteen day. Students use coupons to buy food and drinks. Asha and Noah have each spent RM30. Noah bought 4 food coupons and 2 drink coupons, while Asha bought 2 food coupons and 6 drink coupons.

Diberi RM x ialah harga bagi satu kupon makanan dan RM y ialah harga bagi satu kupon minuman. Menggunakan kaedah matriks, hitung harga dalam RM, bagi satu kupon makanan dan satu kupon minuman.

Given RM x is the price for one food coupon and RM y is the price for one drink coupon. Using the matrix method, calculate the price in RM, for one food coupon and one drink coupon.

[5 markah/marks]

Jawapan/Answer:

- (b) Sempena hari Kantin di SMK Telok Gading, pihak sekolah menyewa beberapa buah khemah untuk gerai jualan. Kos sewaan, C , berubah secara langsung dengan bilangan khemah, N , dan secara songsang dengan dua kali bilangan hari sewaan, D . Diberi kos sewaan ialah RM150 apabila 6 buah khemah disewa selama 2 hari.

Jika bilangan khemah yang disewa ialah 4 buah, dan tempoh sewaan ditingkatkan kepada 5 hari, hitung kos sewaan yang dikenakan.

In conjunction with the canteen day at SMK Telok Gading, the school rents several tents for sales stalls. The rental cost, C , varies directly with the number of tents, N , and inversely with twice the number of rental days, D . Given the rental cost is RM150 when 6 tents are rented for 2 days.

If the number of tents is 4 and the rental period is increased to 5 days, calculate the rental cost charged.

[4 markah/marks]

Jawapan/Answer:

- (c) Jadual 7 menunjukkan jumlah keuntungan, dalam RM, bagi dua gerai, Kumpulan Alpha dan Kumpulan Beta, semasa hari kantin di SMK Telok Gading.

Table 7 shows the total profit, in RM, for two stalls, Alpha Group and Beta Group, during canteen day at SMK Telok Gading.

Kumpulan Group	Keuntungan gerai (RM) Stall profits (RM)
Alpha	80, 85, 90, 95, 100
Beta	60, 75, 90, 105, 120

Jadual 7 / Table 7

- (i) Hitung min bagi data tersebut.

Calculate mean of the data.

[2 markah/marks]

- (ii) Kumpulan manakah yang menunjukkan prestasi jualan yang lebih konsisten? Berikan justifikasi anda.

Which group shows a more consistent sales performance? Give your justification.

[4 markah/marks]

Jawapan/Answer:

JAWAPAN

Ulang Kaji Menengah Rendah



Matematik Pengguna: Simpanan dan Pelaburan, Kredit dan Hutang *Consumer Mathematics: Savings and Investments, Credit and Debt*

$$1 \quad \frac{10}{100} \times \text{RM}3\,400 = \text{RM}340$$

Ansuran bulanan/Monthly installment

$$= \frac{(3\,400 - 340) + (3\,060)\left(\frac{8}{100}\right)(1.5)}{18}$$

$$= \text{RM}190.40$$

2 Peratus hibah/Percentage of hibah

$$= \frac{1\,500}{60\,000} \times 100$$

$$= 2.5\%$$

$$\text{Dis } 2025 = \text{RM}61\,500.00$$

$$\text{Dis } 2026 = \frac{2.5}{100} \times 61\,500 = \text{RM}1\,537.50$$

$$\text{Dis } 2027 = \frac{2.5}{100} \times (61\,500 + 1\,537.50) = \text{RM}1\,575.94$$

Jumlah wang dalam akaun simpanan pada Disember 2027:

Amount of money in savings account by December 2027:

$$= \text{RM}63\,037.50 + \text{RM}1\,575.94$$

$$= \text{RM}64\,613.44$$

$$3 \quad r = 3.5\% = 0.035$$

$$t = 9 \text{ tahun/years}$$

$$P = 90\% \times \text{RM}49\,715$$

$$= \text{RM}44\,743.50$$

$$I = Prt$$

$$= (\text{RM}44\,743.50)(0.035)(9)$$

$$= \text{RM}14\,094.20$$

$$I + P = \text{RM}14\,094.20 + \text{RM}44\,743.50$$

$$= \text{RM}58\,837.70$$

Ansuran bulanan/Monthly installment

$$= \frac{\text{RM}58\,837.70}{(9 \text{ tahun/years} \times 12 \text{ bulan/months})}$$

$$= \text{RM}544.80$$

Baki pinjaman 4 tahun/Balance of loan for 4 years

$$= \text{RM}544.80 \times 4 \text{ tahun/years} \times 12 \text{ bulan/months}$$

$$= \text{RM}26\,150.40$$



Garis Lurus *Straight Lines*

1 A

2 D

$$3 \quad 2y = -3x + 8$$

$$y = -\frac{3}{2}x + 4$$

$$m = -\frac{3}{2}$$

$$y = mx + c$$

$$6 = -\frac{3}{2}(4) + c$$

$$c = 12$$

$$\therefore y = -\frac{3}{2}x + 12$$

$$4 \quad (a) \quad m_{MN} = \frac{4-2}{3-0}$$

$$= \frac{2}{3}$$

$$y = mx + c$$

$$\therefore y = \frac{2}{3}x + 2$$

$$(b) \quad \frac{2}{3} = \frac{-2-r}{0-(-6)}$$

$$r = -6$$



Polygon *Polygons*

$$1 \quad \frac{360}{20} = 18$$

$$2 \quad (a) \quad x + 100^\circ + 65^\circ + 125^\circ + 90^\circ = 540^\circ$$

$$x = 160^\circ$$

$$(b) \quad x + 120^\circ + 53^\circ + 90^\circ = 360^\circ$$

$$x = 97^\circ$$

$$3 \quad x = \frac{(7-2)180}{7}$$

$$x = 128.57^\circ$$

$$y = \frac{360}{7}$$

$$= 51.43^\circ$$

$$x - y = 128.57 - 51.43$$

$$= 77.14^\circ$$

$$4 \quad \angle EHG = 180^\circ - 30^\circ - 100^\circ$$

$$= 50^\circ$$

$$\angle EHI = \frac{1}{2} \times 50^\circ$$

$$= 25^\circ$$

$$\angle HOI = 180^\circ - 88^\circ - 25^\circ$$

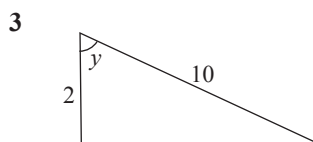
$$= 67^\circ$$

$$x = \angle HOI = 67^\circ$$



Sudut dan Tangen bagi Bulatan Angles and Tangents of Circles

- 1 $\angle JOL = 100^\circ$
 $\angle LJO = 40^\circ$
 $x = 90^\circ - 40^\circ = 50^\circ$
- $\angle MJO = 15^\circ$
 $\angle JOL = 360^\circ - 100^\circ = 260^\circ$
 $\angle JML = 100^\circ \div 2 = 50^\circ$
 $\angle MLO = 360^\circ - 15^\circ - 260^\circ - 50^\circ = 35^\circ$
 $y = 90^\circ - 35^\circ = 55^\circ$
- 2 $\angle PRQ = 80^\circ \div 2 = 40^\circ$
 $\angle PRA = 180^\circ - 40^\circ - 60^\circ = 80^\circ$
 $\angle PQO = \frac{180^\circ - 80^\circ}{2} = 50^\circ$
 $x = 80^\circ - 50^\circ = 30^\circ$



$$\begin{aligned}\cos y^\circ &= \frac{2}{10} \\ y^\circ &= \cos^{-1}\left(\frac{2}{10}\right) \\ y^\circ &= 78.46^\circ \\ x^\circ &= 180^\circ - 78.46^\circ \\ &= 101.54^\circ\end{aligned}$$



Rumus Algebra Algebraic Formulae

- 1 (a) $5m + 3n = 7 + n$
 $2n = 7 - 5m$
 $n = \frac{7 - 5m}{2}$
- (b) $p - 4 = \frac{2p}{5q}$
 $5pq - 20q = 2p$
 $5pq - 2p = 20q$
 $p(5q - 2) = 20q$
 $p = \frac{20q}{5q - 2}$
- (c) $2k^2 + 5n = 3p$
 $2k^2 = 3p - 5n$
 $k^2 = \frac{3p - 5n}{2}$
 $k = \sqrt{\frac{3p - 5n}{2}}$
- (d) $2p = \sqrt{\frac{m - n}{2}}$
 $4p^2 = \frac{m - n}{2}$
 $8p^2 = m - n$
 $m = 8p^2 + n$

- 2 (a) $f = 5g + h$
 $8 = 5g + 3$
 $5g = 5$
 $g = 1$
- (b) $p - q = \frac{p + 3}{k}$
 $p - q = \frac{p + 3}{\left(\frac{1}{2}\right)}$
 $p - 4 = 2(p + 3)$
 $p - 4 = 2p + 6$
 $p = -10$
- 3 (a) $j = \frac{L}{2\pi t}$
- (b) $120 = 2\left(\frac{22}{7}\right)(j)(12)$
 $j = 1.591$



Indeks Indices

- 1 (a) $g^{13}h^{14}$
(b) $5xy^{11}$
- 2 $4^m \times 4^3 = 4\,096$
 $4^m \times 4^3 = 4^6$
 $4^{m+3} = 4^6$
 $m + 3 = 6$
 $m = 3$
- 3 $\frac{4^{12} + 7^n}{4^m + 7^4} = 784$
 $\frac{4^{12} + 7^n}{4^m + 7^4} = 4^2 \times 7^2$
 $12 - m = 2$
 $m = 10$
 $n - 4 = 2$
 $n = 6$
 $\frac{n}{m} = \frac{6}{10} = \frac{3}{5}$
- 4 $8p + 3p - 2 = 30 - 5p$
 $16p = 32$
 $p = 2$
- 5 $2^{(x-2)} \times (32) = 2^{(y+6)}$
 $2^{(x-2)} \times 2^5 = 2^{(y+6)}$
 $2^{(x-2+5)} = 2^{(y+6)}$
 $2^{(x+3)} = 2^{(y+6)}$
 $x + 3 = y + 6$
 $x = y + 3 \dots \textcircled{1}$
- $5^{(-2x+9)} \times 5^y = 5^2$
 $5^{(-2x+y+9)} = 5^2$
 $-2x + y + 9 = 2$
 $-2x + y = -7 \dots \textcircled{2}$
- Gantikan ① dalam ②,
Substitute ① into ②,
 $-2(y + 3) + y = -7$
 $-2y - 6 + y = -7$
 $y = 1$
 $x = 1 + 3$
 $= 4$

Tingkatan 4



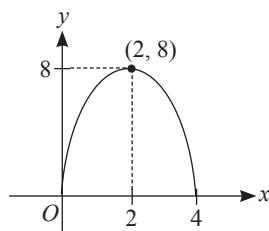
Fungsi dan Persamaan Kuadratik dalam Satu Pemboleh Ubah
Quadratic Functions and Equations in One Variable

Soalan Objektif

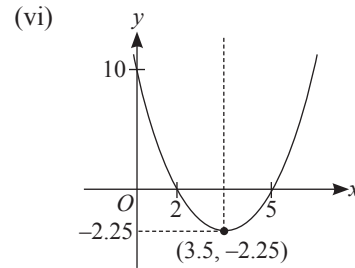
- 1 B 2 D 3 A 4 B 5 A
 6 C 7 D

Soalan Subjektif

- 1 $x(3x + 2) = 60 - x$
 $3x^2 + 2x = 60 - x$
 $3x^2 + 3x - 60 = 0$
 $x^2 + x - 20 = 0$
 $(x - 4)(x + 5) = 0$
 $x = 4, x = -5$ (abaikan/ignored)
 Harga bagi 1 kg rambutan
Price of 1 kg of rambutans
 $= 3(4) + 2$
 $= \text{RM}14$
- 2 (a) (i) $\cap$
 (ii) 0
 (iii) $0 = -2x^2 + 8x$
 $0 = -2x(x - 4)$
 $x = 0, x = 4$
 (iv) $x = -\frac{8}{2(-2)}$
 $x = 2$
 (v) $f(2) = -2(2)^2 + 8(2)$
 $= 8$
 Titik maksimum/Maximum point = (2, 8)
 (vi)



- (b) (i) $\cup$
 (ii) 10
 (iii) $0 = x^2 - 7x + 10$
 $0 = (x - 2)(x - 5)$
 $x = 2, x = 5$
 (iv) $x = -\frac{(-7)}{2(1)}$
 $x = 3.5$
 (v) $f(3.5) = (3.5)^2 - 7(3.5) + 10$
 $= -2.25$
 Titik minimum/Minimum point = (3.5, -2.25)



- 3 $0 = 2t^2 + 3t - 44$
 $0 = (t - 4)(2t + 11)$
 $t = 4, t = -\frac{11}{2}$ (abaikan/ignored)
 $\therefore$ Bola menyentuh permukaan tanah ketika 4 s.
The ball will touch the ground at 4 s.
- 4 (a) $f(x) = (-x - 2)(x - 6)$
 $0 = -x^2 + 6x - 2x + 12$
 $0 = -x^2 + 4x + 12$
 $0 = (x - 6)(x + 2)$
 $x = 6, x = -2,$
 $\therefore p = 12, q = 6$
 (b) Persamaan paksi simetri
The equation of the axis of symmetry
 $x = -\frac{b}{2a}$
 $x = -\frac{4}{2(-1)}$
 $x = 2$
 (c) Ganti $x = 2$ dalam $f(x) = -(x + 2)(x - 6)$,
Substitute $x = 2$ in $f(x) = -(x + 2)(x - 6)$,
 $f(2) = -(2 + 2)(2 - 6)$
 $= 16$
 Titik maksimum/Maximum point = (2, 16)
- 5 $3x(3x + 5) = 84$
 $9x^2 + 15x - 84 = 0$
 $3x^2 + 5x - 28 = 0$
 $(x + 4)(3x - 7) = 0$
 $x = -4$ (abaikan/ignored), $x = \frac{7}{3}$
 Panjang tapak pasar malam
The length of night market site
 $= 3\left(\frac{7}{3}\right) + 5$
 $= 12 \text{ m}$
- 6 (a) $\frac{1}{2}(3x + 4 + 6x)(2x - 1)$
 $= \frac{1}{2}(18x^2 - x - 4)$
 $= 9x^2 - \frac{1}{2}x - 2$
 (b) $9x^2 - \frac{1}{2}x - 2 = 220.5$
 $18x^2 - x - 441 = 0$
 $18x^2 - x - 445 = 0$
 $(x - 5)(18x + 89) = 0$
 $x = 5, x = -\frac{89}{18}$ (abaikan/ignored)
 $\therefore PQ = 3(5) + 4 = 19 \text{ cm}$



Asas Nombor Number Bases

Soalan Objektif

- 1 B 2 D 3 C 4 D 5 A
6 C 7 A 8 A 9 C

Soalan Subjektif

- 1 $P: RM230_5 = 2 \times 5^2 + 3 \times 5^1 + 0 \times 5^0$
 $= RM65_{10}$
 $Q: RM214_6 = 2 \times 6^2 + 1 \times 6^1 + 4 \times 6^0$
 $= RM82_{10}$

Jumlah harga/Total price
 $= 65 + 82$
 $= RM147_{10}$

- 2 $RM21001_3$
 $= 2(3^4) + 1(3^3) + 0(3^2) + 0(3^1) + 1(3^0)$
 $= RM190$
 $\frac{80}{100} \times RM190 = RM152_{10}$

$$\begin{array}{r} 6 \overline{) 152} - 2 \\ 6 \overline{) 25} - 1 \\ 6 \overline{) 4} - 4 \\ \hline 0 \end{array}$$

$\therefore RM412_6$

- 3 $RM22452_6$
 $= 2(6^4) + 2(6^3) + 4(6^2) + 5(6^1) + 2(6^0)$
 $= RM3200_{10}$
 $RM25012_6$
 $= 2(6^4) + 5(6^3) + 0(6^2) + 1(6^1) + 2(6^0)$
 $= RM3680_{10}$
 $\therefore \frac{480}{3200} \times 100 = 15\%$

- 4 $1100_2 < p \leq 121_3$
 $1100_2 = 12_{10}$
 $121_3 = 16_{10}$
 $1210 < p \leq 16_{10}$
 $p = 13, 14, 15, 16$

- 5 $7^4 + 2(7) + 4^0 = 10021_7$
 $10021_7 = 4560_8$

- 6 (a) $148_{10} - 82_{10} = 230_{10}$

$$\begin{array}{r} 5 \overline{) 230} - 1 \\ 5 \overline{) 46} - 1 \\ 5 \overline{) 9} - 4 \\ 5 \overline{) 1} - 1 \\ \hline 0 \end{array}$$

$\therefore 1410_5$

- (b) $148_{10} - 19_{10} = 129_{10}$

$$\begin{array}{r} 4 \overline{) 129} - 1 \\ 4 \overline{) 32} - 1 \\ 4 \overline{) 8} - 0 \\ 4 \overline{) 2} - 2 \\ \hline 0 \end{array}$$

$\therefore 2001_4$

$$7 \quad RM404_7 = RM200_{10}$$

$$\frac{80}{100} \times RM200 = RM160$$

$$RM231_7 = RM120_{10}$$

$$\frac{85}{100} \times RM120 = RM102$$

$$RM300 - RM160 - RM102 = RM38$$

$$8 \quad 5 \text{ kg} = RM3130_4$$

$$= 3(4^3) + 1(4^2) + 3(4^1) + 0(4^0)$$

$$= RM220_{10}$$

$$1 \text{ kg} = RM44_{10}$$

$$7 \text{ kg} = RM308_{10}$$

$$RM330_{10} - RM308_{10} = RM22_{10}$$

$$\begin{array}{r} 3 \overline{) 22} - 1 \\ 3 \overline{) 7} - 1 \\ 3 \overline{) 2} - 0 \\ \hline 0 \end{array}$$

$\therefore 211_3$

$$9 \quad \text{Affan} = 301_5 = 76_{10}$$

$$\text{Aira} = 48_{10}$$

$$\text{Ali} = 96_{10}$$

$$\begin{array}{r} 7 \overline{) 96} - 5 \\ 7 \overline{) 13} - 6 \\ 7 \overline{) 1} - 1 \\ \hline 0 \end{array}$$

$\therefore 165_7$



Penaakulan Logik Logical Reasoning

Soalan Objektif

- 1 C 2 B 3 B 4 B 5 D

Soalan Subjektif

- 1 (a) Bukan pernyataan/Not a statement
 (b) $m \leq 5$
 (c) $3(n) + 2(n-1)^2, n = 1, 2, 3, \dots$
- 2 (a) Akas: Jika $2x - 3 = 7$, maka $x = 5$
 Converse: If $2x - 3 = 7$, then $x = 5$
 Kontrapositif: Jika $2x - 3 \neq 7$, maka $x \neq 5$.
 Contrapositive: if $2x - 3 \neq 7$, then $x \neq 5$.
 (b) $7n^2 - 3, n = 1, 2, 3, \dots$
- 3 (a) Palsu/False
 (b) Premis 2: 19 ialah nombor perdana.
 Premise 2: 19 is a prime number.
- 4 (a) Lemah dan tidak meyakinkan. Kesimpulan palsu.
 Weak and not cogent. The conclusion is false.
 (b) (i) Kesimpulan: 21 bukan gandaan 6.
 Conclusion: 21 is not a multiple of 6.
 (ii) Sah kerana menepati hujah Bentuk III. Tidak munasabah kerana Premis 2 palsu.
 Valid because it does comply the argument of Form III. Unsound because Premise 2 is false.
- 5 (a) Kontrapositif: Jika 30 tidak boleh dibahagi tepat dengan 6, maka 6 bukan faktor bagi 36.
 Contrapositive: If 30 is not divisible by 6, then 6 is not a factor of 30.
 Benar/True

- (b) $(-3)^3 = 27$ atau/or $(-5)^2 = 25$
 (c) Semua/All
 (d) (i) Premis 2: 36 tidak boleh dibahagi tepat dengan 3.
Premise 2: 36 is not divisible by 3.
 (ii) Sah dan tidak munasabah. Menepati hujah Bentuk III tetapi kesimpulan palsu.
Valid and unsound. It does comply the argument of Form III but the conclusion is false.
 (e) $(7 - 2) \times 180^\circ$
 $= 900^\circ$



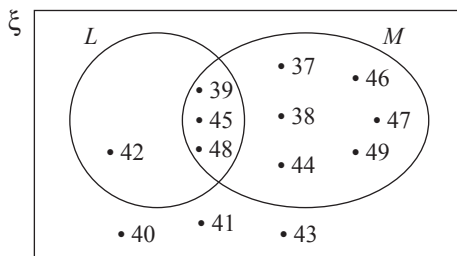
Operasi Set Operations on Sets

Soalan Objektif

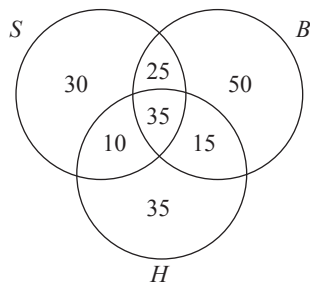
- 1 C 2 C 3 C 4 D 5 C
 6 A 7 A 8 C 9 B 10 A

Soalan Subjektif

- 1 (a) $\{\}, \{k\}, \{m\}, \{n\}, \{k, m\}, \{k, n\}, \{m, n\}, \{k, m, n\}$
 (b) $R' \cap S$
 2 (a) (i) $R = \{23, 29\}$
 (ii) $S = \{21, 23, 30\}$
 (b) $S \cup R \cap T' = \{23, 29\}$
 $n(S \cup R \cap T') = 2$
 3 (a) $L = \{39, 42, 45, 48\}$
 $M = \{37, 38, 39, 44, 45, 46, 47, 48, 49\}$
 (b)



4



- (a) $10 + 25 + 15 = 50$
 (b) $30 + 25 + 50 = 105$



Rangkaian dalam Teori Graf Network in Graph Theory

Soalan Objektif

- 1 D 2 A 3 B 4 D 5 C
 6 D 7 B 8 A 9 B 10 C

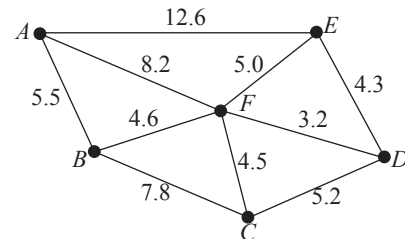
Soalan Subjektif

- 1 (a) 6
 (b) 8
 (c) 16
 2 (a) $A \rightarrow C \rightarrow D \rightarrow B \rightarrow E \rightarrow A$
 Masa terpendek
Shortest time
 $= 11 + 4 + 6 + 8 + 7$
 $= 36$ minit/minutes

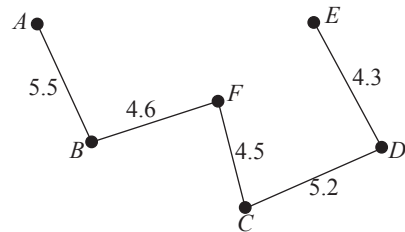
- (b) Laju/Speed $= 1.15 \text{ m s}^{-1}$
 $= 1.15 \times 60$
 $= 69 \text{ m min}^{-1}$

Jarak perjalanan terpendek
Distance of shortest route
 $= 69 \times 36$
 $= 2484 \text{ m}$

3 (a)



(b) (i)



(ii) 24.1 km



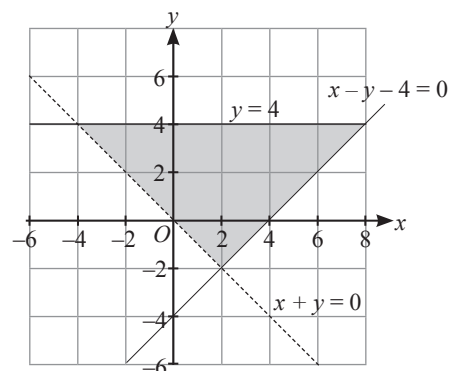
Ketaksamaan Linear dalam Dua Pemboleh Ubah Linear Inequalities in Two Variables

Soalan Objektif

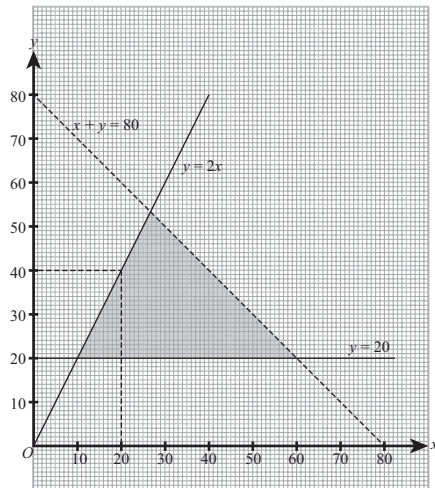
- 1 C 2 B 3 A 4 A 5 D
 6 C 7 B 8 D

Soalan Subjektif

- 1 (a) $6y > 5x - 30$
 (b) $y \leq 8$
 (c) $x \geq 6$
 2

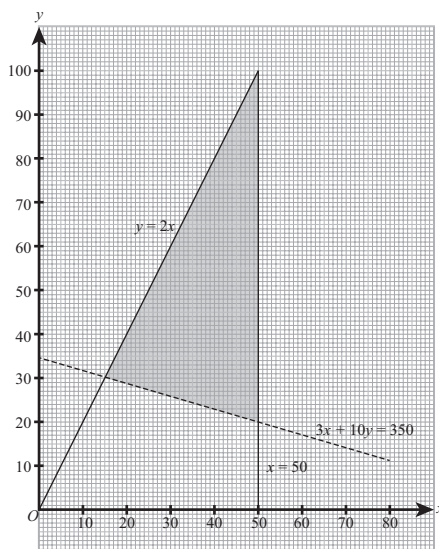


- 3 (a) (i) $x + y < 80$
 (ii) $x \geq \frac{1}{2}y$ atau/ or $y \leq 2x$
 (iii) $y \geq 20$
 (b)



- (c) (i) 40
 (ii) $20(\text{RM}20) + 40(\text{RM}10) = \text{RM}800$

- 4 (a) I: $x \leq 50$
 II: $y \leq 2x$
 III: $3x + 10y > 350$
 (b)



- (c) (i) $(50, 100) \rightarrow 3(50) + 10(100) = \text{RM}1150$
 (ii) Tidak, titik $(15, 70)$ berada di luar rantau berlorek.
 No, point $(15, 70)$ is outside the shaded region.



Graf Gerakan Graphs of Motion

Soalan Objektif

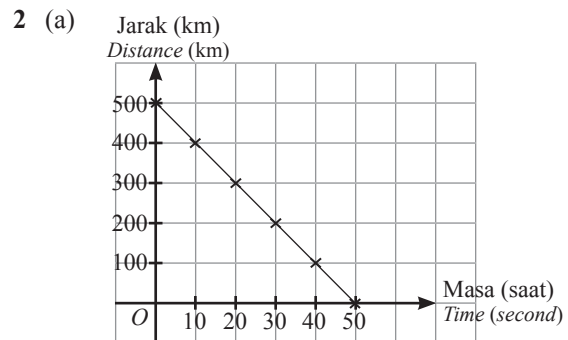
- 1 A 2 B 3 C 4 C 5 D
 6 B 7 B

Soalan Subjektif

- 1 (a) $8 - 3 = 5$ saat/seconds

(b) $\frac{v}{3} = 100$
 $v = 3 \times 100$
 $v = 300$

(c) $\frac{0 - 300}{10 - 8} = -150 \text{ m s}^{-1} = 150 \text{ m s}^{-1}$



- (b) (i) 500 km
 (ii) 50 saat/seconds

(c) Kelajuan/Speed = $\frac{500 - 0}{40} = 12.5 \text{ m s}^{-1}$

- 3 (a) $0.5 \text{ jam/hour} = 30 \text{ minit/minutes}$

(b) $\frac{260 - d}{3 - 0} = \frac{d - 0}{4 - 3}$
 $d = 65 \text{ km}$

(c) $260 - 65 = 195 \text{ km}$

- 4 (a) Tempoh masa/Duration
 $= 6.0 - 5.0$
 $= 1 \text{ jam/hour}$
 $= 60 \text{ minit/minutes}$

(b) Kadar perubahan laju/Rate of change of speed
 $= \frac{140 - 90}{5} = 10 \text{ km j}^{-2}/\text{km h}^{-2}$

(c)
 $\left(\frac{1}{2} \times 5.0 \times (140 + 90) + (140 \times 1.0)\right)$
 $+ \left(\frac{1}{2} \times (t - 6.0) \times 140\right) = 785$
 $575 + 140 + 70(t - 6.0) = 785$
 $t - 6 = 1$
 $t = 7 \text{ jam/hours}$

5 (a) $\frac{10 - 15}{10 - 0} = \frac{1}{2} \text{ m s}^{-2}$

(b)

$$\left[\frac{1}{2}(15 + 10)10\right] + (10)(10) + \left[\frac{1}{2} \times (t - 20) \times 10\right] = 265$$

$$125 + 100 + 5(t - 20) = 265$$

$$5(t - 20) = 40$$

$$(t - 20) = 8$$

$$t = 8 + 20$$

$$t = 28$$



Sukatan Serakan Data Tak Terkumpul
Measures of Dispersion for Grouped Data

Soalan Objektif

- 1 B 2 A 3 D 4 D 5 C
6 C 7 A 8 A 9 C

Soalan Subjektif

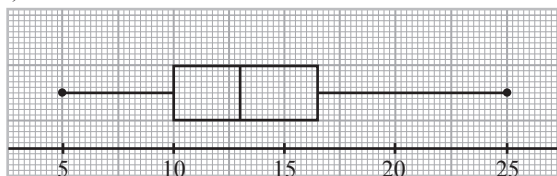
1 (a)

Batang Stem	Daun Leaf
0	5 7 8 9
1	0 0 1 2 2 3 3 4 5 5 6 7 8
2	0 2 5

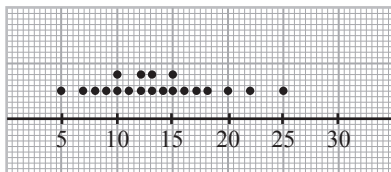
Kekunci: 2 | 0 bermaksud 20

Key: 2 | 0 means 20

(b)



(c)



2 Mod/Mode = 70

Median/Median = 65

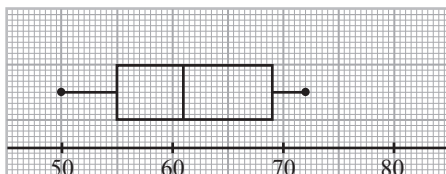
Min/Mean

$$= \frac{3(80) + 7(75) + 13(70) + 12(65) + 9(60) + 6(55)}{50}$$

$$= \frac{3\,325}{50}$$

$$= 66.5$$

3 (a)



(b) Simetri/Symmetry

4 (a) $\bar{x} = \frac{330}{15}$
 $= 22$

(b) $\sigma = \sqrt{\frac{8\,924}{15} - 22^2}$
 $= \sqrt{110.93}$
 $= 10.53$

5 (a) Oleh sebab mod ialah 92, maka nilai 92 muncul dua kali. Maka, $x = 92$.

Since the mode is 92, so the value of 92 appears twice.
Hence, $x = 92$.

$$\frac{79 + 92 + 92 + 99 + 111 + 118 + y}{7} = 104$$

$$y = 137$$

$$(b) \sigma^2 = \frac{79^2 + 92^2 + 92^2 + 99^2 + 111^2 + 118^2 + 137^2}{7} - 104^2$$

$$= \frac{2\,272}{7}$$

$$\sigma = \sqrt{\frac{2\,272}{7}}$$

$$= 18.02$$

6 (a) Sisihan piawai/Standard deviation

$$(b) \text{Min}_{\text{Farid}} = \frac{9.8 + 10.2 + 9.9 + 10.1 + 10.0}{5} = 10.0$$

$$\text{Min}_{\text{Armin}} = \frac{8.7 + 11.5 + 9.2 + 10.8 + 11.0}{5} = 10.24$$

Sisihan piawai_{Farid}/Standard deviation_{Farid}

$$= \sqrt{\frac{9.8^2 + 10.2^2 + 9.9^2 + 10.1^2 + 10.0^2}{5} - 10.0^2}$$

$$= 0.1414$$

Sisihan piawai_{Armin}/Standard deviation_{Armin}

$$= \sqrt{\frac{8.7^2 + 11.5^2 + 9.2^2 + 10.8^2 + 11.0^2}{5} - 10.24^2}$$

$$= 1.0892$$

Athlet pilihan ialah Farid kerana ujian jaraknya lebih konsisten.

The chosen athlete is Farid because his distance tests are more consistent.



Kebarangkalian Peristiwa Bergabung
Probability of Combined Events

Soalan Objektif

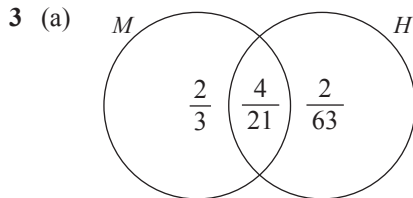
- 1 C 2 D 3 B 4 C 5 B
6 A 7 C 8 B

Soalan Subjektif

1 (a) $\frac{68}{120} \times \frac{67}{119}$
 $= \frac{67}{210}$

(b) $\frac{75}{127} \times \frac{74}{126}$
 $= \frac{925}{2\,667}$

2 $\left(\frac{7}{12} \times \frac{6}{11}\right) + \left(\frac{5}{12} \times \frac{4}{11}\right)$
 $= \frac{31}{66}$



(b) $1 - \left(\frac{2}{3} + \frac{4}{21} + \frac{2}{63} \right)$
 $= \frac{1}{9}$

4 (a) $\left(\frac{x}{x+16} \times \frac{7}{12} \right) + \left(\frac{6}{x+16} \times \frac{5}{12} \right) = \frac{31}{60}$
 $48x = 432$
 $x = 9$

(b) Kebarangkalian sekurang-kurangnya seorang atlet perempuan dipilih
The probability that at least one female athlete is selected

$$= 1 - \left(\frac{9}{15} \times \frac{7}{12} \right)$$

$$= \frac{13}{20}$$

5 Kebarangkalian pasukan lelaki menang

The probability of boys' team wins

$$= \left(\frac{7}{15} \times \frac{3}{5} \right) + \left(\frac{2}{5} \times \frac{8}{15} \right) + \left(\frac{7}{15} \times \frac{2}{5} \right)$$

$$= \frac{17}{25}$$

Kebarangkalian pasukan perempuan menang

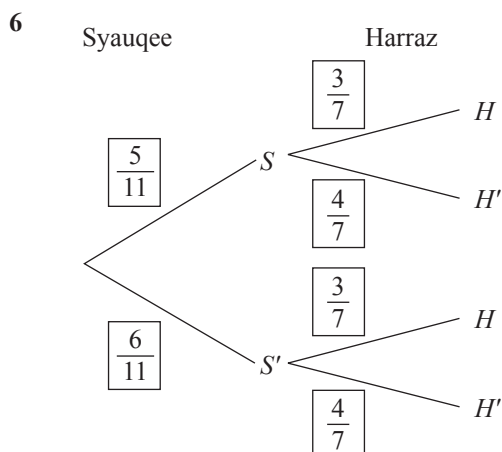
The probability of girls' team wins

$$= \left(\frac{4}{7} \times \frac{5}{8} \right) + \left(\frac{3}{8} \times \frac{3}{7} \right) + \left(\frac{4}{7} \times \frac{3}{8} \right)$$

$$= \frac{41}{56}$$

Kedua-dua pasukan lelaki dan pasukan perempuan akan mendapat peluang ke peringkat seterusnya.

Both boy team and girl team will get the chance to the next level.



$$\left(\frac{5}{11} \times \frac{4}{7} \right) + \left(\frac{6}{11} \times \frac{3}{7} \right)$$

$$= \frac{38}{77}$$



Matematik Pengguna: Pengurusan Kewangan

Consumer Mathematics: Financial Management

Soalan Subjektif

1 Pendapatan bulanan/*Monthly income*

$$= \frac{1}{3} \times 14\,100$$

$$= \text{RM}4\,700$$

Pendapatan kelas tuisyen

Income earned from tuition classes

$$= \text{RM}2\,700 + \text{RM}4\,500 - \text{RM}4\,700$$

$$= \text{RM}2\,500$$

2 (a) $\text{RM}1\,950 - \text{RM}550 - \text{RM}1\,000$

$$= \text{RM}400$$

$\therefore$ Aliran tunai positif/*Positive cash flow*

(b) Gaji tahun 2025/*Salary in 2025*

$$= \left(\frac{130}{100} \times \text{RM}1\,950 \right)$$

$$= \text{RM}2\,145$$

Perbelanjaan/*Expenditure*

$$= \left(\frac{120}{100} \times \text{RM}1\,550 \right)$$

$$= \text{RM}2\,015$$

$$\text{RM}2\,145 - \text{RM}2\,015 = \text{RM}130$$

$\therefore$ Aliran tunai positif/*Positive cash flow*

3 $\text{RM}5\,000 + \text{RM}950 - \text{RM}2\,000 - \text{RM}1\,050$

$$= \text{RM}2\,900$$

$\therefore$ Aliran tunai positif/*Positive cash flow*

4 (a) Pendapatan bulanan/*Monthly income* = $\text{RM}4\,200$

Perbelanjaan bulanan/*Monthly expenditure*

$$= \text{RM}2\,950$$

Lebih pendapatan bulanan/*Monthly surplus*

$$= 4\,200 - 2\,950$$

$$= \text{RM}1\,250$$

Tempoh simpanan/*Saving period*

$$= 15 \text{ bulan/months}$$

Jumlah simpanan maksimum/*Maximum savings*

$$= 1\,250 \times 15$$

$$= \text{RM}18\,750$$

(b) Harga motosikal/*Price of motorcycle* = $\text{RM}18\,000$

Oleh itu, Farah mampu mencapai matlamat kewangannya kerana jumlah simpanan ($\text{RM}18\,750$) melebihi harga motosikal.

Therefore, Farah is able to achieve her financial goal as the total savings ($\text{RM}18\,750$) exceed the price of the motorcycle.

(c) Mana-mana satu langkah munasabah:

Any reasonable action:

- Mengurangkan perbelanjaan yang tidak perlu
Reduce unnecessary expenses
- Menambah pendapatan melalui kerja sambilan
Increase income through part-time work
- Memanjangkan tempoh simpanan
Extend the saving period

Tingkatan 5

Ubahan
Variable

Soalan Objektif

- 1 A 2 C 3 C 4 B 5 C
6 B 7 B

Soalan Subjektif

$$1 \quad p \propto \frac{\sqrt{q}}{r}$$

$$p = k \frac{\sqrt{q}}{r}$$

$$5 = \frac{k\sqrt{25}}{x}$$

$$x = \frac{k\sqrt{25}}{5}$$

$$x = \frac{5k}{5}$$

$$x = k \dots\dots\dots ①$$

$$12 = \frac{k\sqrt{4}}{x^2} \dots\dots\dots ②$$

Ganti/Substitute ① dalam/in ②:

$$12 = \frac{k\sqrt{4}}{k^2}$$

$$12 = \frac{2}{k}$$

$$k = \frac{1}{6}$$

$$\therefore p = \frac{\sqrt{q}}{6r}$$

$$2 \quad h \propto \frac{1}{t}$$

$$h = \frac{k}{t}$$

$$60 = \frac{k}{\frac{20}{60}}$$

$$k = 20$$

$$h = \frac{20}{t}$$

$$h = \frac{20}{\frac{2}{3}}$$

$$h = 30 \text{ cm}$$

$$3 \quad (a) \quad T \propto \frac{1}{X}$$

$$T = \frac{k}{X}$$

$$8 = \frac{k}{9}$$

$$k = 72$$

$$\therefore T = \frac{72}{X}$$

$$(b) \quad T = \frac{72}{X}$$

$$n = \frac{72}{6}$$

$$= 12$$

$$4 \quad (a) \quad x \propto lp$$

$$x = klp$$

$$400 = k(8)(6)$$

$$k = \frac{25}{3}$$

$$\therefore x = \frac{25}{3} lp$$

$$(b) \quad x = \frac{25}{3} lp$$

$$x = \frac{25}{3} (165)$$

$$x = \text{RM1 375}$$

$$5 \quad r \propto \frac{s}{t^3}$$

$$r = \frac{ks}{t^3}$$

$$6 = \frac{k(4)}{2^3}$$

$$k = 12$$

$$r = \frac{12s}{t^3}$$

$$3 = \frac{12m}{8^3}$$

$$m = 128$$

$$6 \quad x \propto \frac{y^2}{z}$$

$$x = \frac{ky^2}{z}$$

$$18 = \frac{k(3)^2}{2}$$

$$k = 4$$

$$x = \frac{4y^2}{z}$$

$$10 = \frac{4(4)^2}{z}$$

$$z = \frac{32}{5}$$

$$7 \quad I \propto Pt$$

$$I = kPt$$

$$192 = k(1\,000)(24)$$

$$k = \frac{1}{125}$$

$$I = \frac{1}{125} Pt$$

$$480 = \left(\frac{1}{125}\right)(P)(6)$$

$$P = \text{RM10 000}$$



Matriks Matrices

Soalan Objektif

- 1 D 2 C 3 A 4 C 5 B
6 D 7 A 8 C 9 D 10 D

Soalan Subjektif

- 1 (a) $(8)(m) - (-6)(-4) = 0$
 $m = 3$
(b) $x = \text{Sains/Science}, y = \text{Matematik/Mathematics}$
 $110x + 80y = 870$
 $120x + 50y = 800$

$$\begin{bmatrix} 110 & 80 \\ 120 & 50 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 870 \\ 800 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{(110)(50) - (80)(120)} \begin{bmatrix} 50 & -80 \\ -120 & 110 \end{bmatrix} \begin{bmatrix} 870 \\ 800 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$$

$\therefore x = 5, y = 4$

2 (a) $GH = \begin{bmatrix} 6 & -18 \\ 14 & -42 \end{bmatrix}$

Peringkat matriks 2×2 .
The order of the matrix is 2×2 .

- (b) Air mineral/Mineral water = x ,
Sandwich tuna/Tuna sandwich = y
 $60x + 40y = 260$
 $20x + 50y = 270$

$$\begin{bmatrix} 60 & 40 \\ 20 & 50 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 260 \\ 270 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{(60)(50) - (40)(20)} \begin{bmatrix} 50 & -40 \\ -20 & 60 \end{bmatrix} \begin{bmatrix} 260 \\ 270 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1.00 \\ 5.00 \end{bmatrix}$$

$\therefore x = \text{RM}1.00, y = \text{RM}5.00$

3 $x + y = 10\,000$
 $0.08x + 0.12y = 960$
 $8x + 12y = 96\,000$

$$\begin{bmatrix} 1 & 1 \\ 8 & 12 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10\,000 \\ 96\,000 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{1(12) - 1(8)} \begin{bmatrix} 12 & -1 \\ -8 & 1 \end{bmatrix} \begin{bmatrix} 10\,000 \\ 96\,000 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6\,000 \\ 4\,000 \end{bmatrix}$$

$x = \text{RM}6\,000, y = \text{RM}4\,000$

Nisbah jumlah wang yang dimasukkan ke dalam bank P kepada bank Q ialah 3 : 2.
The ratio of the amount of money deposited in bank P to the amount deposited in bank Q is 3 : 2.

- 4 (a) (i) Peringkat matriks 3×2 .
The order of the matrix is 3×2 .
(ii) $3Q_{23} = 3(8) = 24$

- (b) $x = \text{pen penanda premium/premium marker pen}$
 $x = \text{pembaris edisi khas/special edition ruler}$
 $2x + 3y = 21$
 $4x + y = 26$

$$\begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 21 \\ 26 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{(2)(1) - (3)(4)} \begin{bmatrix} 1 & -3 \\ -4 & 2 \end{bmatrix} \begin{bmatrix} 21 \\ 26 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5.70 \\ 3.20 \end{bmatrix}$$

$\therefore x = \text{RM}5.70, y = \text{RM}3.20$

- (c) Pen penanda premium/Premium marker pen
 $= 5.70 \times 0.70$
 $= \text{RM}3.99$
Pembaris edisi khas/Special edition ruler
 $= 3.20 \times 0.80$
 $= \text{RM}2.56$
 $[3 \quad 2] \begin{bmatrix} 3.99 \\ 2.56 \end{bmatrix}$
 $= (3 \times 3.99) + (2 \times 2.56)$
 $= \text{RM}17.09$



Matematik Pengguna: Insurans Consumer Mathematics: Insurance

Soalan Objektif

- 1 B 2 C 3 C 4 A 5 A
6 D 7 C

Soalan Subjektif

- 1 $90\% \times \text{RM}1\,000\,000$
 $= \text{RM}900\,000$
Pampasan/Compensation
 $= \frac{\text{RM}600\,000}{\text{RM}900\,000} \times \text{RM}250\,000$
 $= \text{RM}166\,667.67$ (anggaran/estimation)

- 2 Kos perubatan tolak deduktibel
Medical expenses after deduct deductible
 $= \text{RM}40\,000 - \text{RM}800$
 $= \text{RM}39\,200$

Kos yang ditanggung oleh Puan Mas
Medical expenses borne by Puan Mas
 $= \text{RM}800 + (20\% \times \text{RM}39\,200)$
 $= \text{RM}800 + \text{RM}7\,840$
 $= \text{RM}8\,640$

- 3 $\frac{80}{100} \times \text{RM}420\,000 = \text{RM}336\,000$
 $\left(\frac{\text{RM}300\,000}{\text{RM}336\,000} \times \text{RM}25\,000 \right) - \text{RM}3\,000$
 $= \text{RM}19\,321.43$

- 4 $\frac{250\,000}{1\,000} \times 1.93 + \left[\left(\frac{10}{100} \times 250\,000 \right) \times 2.00 \right]$
 $= 482.50 + \frac{25\,000}{1\,000} \times 2.00$
 $= 482.50 + 50.00$
 $= \text{RM}532.50$

- 5 (a) $266.50 + \frac{120\,000 - 1\,000}{1\,000} \times 20.30 = 2\,682.20$
 $2\,682.20 - \left(\frac{35}{100} \times 2\,682.20 \right) = \text{RM}1\,743.43$
- (b) $266.50 - (55\% \times 266.50)$
 $= 266.50 - 146.58$
 $= \text{RM}119.92$



Matematik Pengguna: Percukaian Consumer Mathematics: Taxation

Soalan Objektif

- 1 D 2 D 3 B 4 A 5 D
 6 A 7 D

Soalan Subjektif

- 1 Pendapatan bercukai

Chargeable income

$$= \text{RM}49\,500 - \text{RM}300 - \text{RM}1\,350$$

$$= \text{RM}47\,850$$

Cukai bagi 35 000 pertama/*On the first 35 000*
 $= \text{RM}600$

Cukai atas baki berikutnya

Tax on the next balance

$$= (\text{RM}47\,850 - \text{RM}35\,000) \times \frac{8}{100}$$

$$= \text{RM}1\,028$$

Cukai pendapatan yang perlu dibayar

Payable income tax

$$= \text{RM}600 + \text{RM}1\,028$$

$$= \text{RM}1\,628$$

- 2 $11 \times 23.5 \times \text{RM}0.40 = \text{RM}103.40$

- 3 $\frac{6}{100} \times \text{RM}30\,000 = \text{RM}1\,800$

- 4 (a) Pendapatan bercukai/*Chargeable income*
 $= \text{RM}178\,000 - \text{RM}10\,000 - \text{RM}12\,500$
 $= \text{RM}155\,500$

- (b) Cukai bagi RM100 000 pertama

Tax on the first RM100 000

$$= \text{RM}9\,400$$

Cukai atas baki berikutnya

Tax on the next balance

$$= (\text{RM}155\,500 - \text{RM}100\,000) \times 25\%$$

$$= \text{RM}13\,875$$

Cukai pendapatan yang perlu bayar

Payable income tax

$$= \text{RM}9\,400 + \text{RM}13\,875$$

$$= \text{RM}23\,275$$

- 5 (a) Pendapatan tahunan suami / *Husband's annual income*
 $= \frac{\text{RM}130\,200}{5} \times 2$
 $= \text{RM}52\,080$

Pendapatan bercukai / *Chargeable income*

$$= \text{RM}52\,080 - \text{RM}9\,000 - \text{RM}1\,000 - \text{RM}2\,500$$

$$- \text{RM}1\,800 - \text{RM}1\,200 - \text{RM}6\,000$$

$$= \text{RM}30\,580$$

$$150 + (\text{RM}30\,580 - \text{RM}20\,000) \times \frac{3}{100}$$

$$= \text{RM}467.40$$

$$\text{RM}467.40 - \text{RM}400 - \text{RM}590 = -\text{RM}552.60$$

$\therefore$ Suami Puan Aisyah tidak perlu membayar cukai pendapatan.

Puan Aisyah's husband does not need to pay income tax.

- (b) Pendapatan bercukai / *Chargeable income*

$$= \text{RM}130\,200 - \text{RM}9\,000 - \text{RM}3\,000$$

$$- \text{RM}5\,300 - \text{RM}3\,000 - \text{RM}2\,400$$

$$- \text{RM}4\,000 - \text{RM}8\,000$$

$$= \text{RM}95\,500$$

Cukai bagi 70 000 pertama/*On the first 70 000*

$$= \text{RM}4\,600$$

Cukai atas baki berikutnya

Tax on the next balance

$$= (\text{RM}95\,500 - \text{RM}70\,000) \times \frac{21}{100}$$

$$= \text{RM}5\,355$$

Cukai pendapatan yang perlu dibayar

Payable income tax

$$= \text{RM}4\,600 + \text{RM}5\,355 - 2(\text{RM}590)$$

$$= \text{RM}8\,775$$

- 6 $2(\text{RM}12.90) + \text{RM}12.10 + 4(\text{RM}4.60) + 3(\text{RM}8.90)$
 $= \text{RM}83$

Cukai perkhidmatan/*Service tax*

$$= \frac{6}{100} \times \text{RM}83$$

$$= \text{RM}4.98$$

$$\therefore \text{RM}83 + \text{RM}4.98 = \text{RM}87.98$$

- 7 Cukai jalan/*Road tax*

$$= \text{RM}280 + [(1\,988 - 1\,800) \times \text{RM}0.50]$$

$$= \text{RM}280 + \text{RM}94$$

$$= \text{RM}374$$

Encik Khairul bekerja di Jabatan Pengangkutan Jalan (JPJ).

Encik Khairul works at the Road Transport Department.



Kekongruenan, Pembesaran, dan Gabungan Transformasi Congruency, Enlargement and Combined Transformations

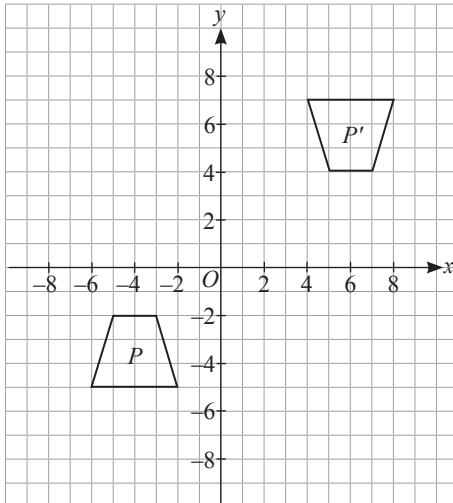
Soalan Objektif

- 1 A 2 C 3 D 4 D 5 B

Soalan Subjektif

- 1 (a) Pola bagi bentuk berulang yang memenuhi suatu satah tanpa ruang kosong atau pertindihan.
A pattern of recurring shapes that fills a plane without leaving empty or overlapping.
- (b) (i) $(4, -3)$
 (ii) $(2, 4) \rightarrow (4, 3)$

- 2 (a) (i) $(-4, -4)$
 (ii) $(8, 4) \rightarrow (8, -2)$
 (b)



- 3 (a) **N**: Pantulan pada garis $x = 7$.
Reflection in the line $x = 7$.
 (b) Putaran 180° pada titik $(7, 6)$.
Rotation of 180° at the point $(7, 6)$.
- 4 (a) (i) **W**: Pembesaran pada pusat $J(9, 5)$ dengan faktor skala $\frac{1}{2}$.
Enlargement at centre $J(9, 5)$ with scale factor $\frac{1}{2}$.
 (ii) **V**: Pantulan pada garis $y = 6$.
Reflection in the line $y = 6$.
- (b) $3^2 = \frac{x}{40}$
 $x = 360$
 Luas kawasan berlorek/Area of shaded region
 $= 360 - 40$
 $= 320 \text{ cm}^2$
- 5 (a) Dua segi tiga kongruen mempunyai panjang sisi sepadan dan sudut sepadan yang sama.
Two congruent triangles have equal corresponding sides and angles.
 (b) (i) **H**: Putaran 90° lawan arah jam pada pusat $(3, 5)$.
A rotation of 90° anticlockwise at centre $(3, 5)$.
 (ii) **G**: Pembesaran dengan faktor skala 2 pada pusat $P(3, 11)$
An enlargement with scale factor 2 at centre $P(3, 11)$.
- (c) Luas/Area $JKLMN$
 $= \frac{150}{2^2}$
 $= 37.5 \text{ cm}^2$



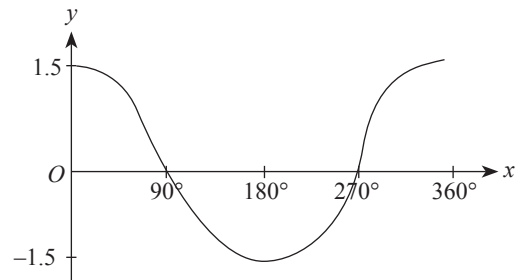
Nisbah dan Graf Fungsi Trigonometri Ratios and Graphs of Trigonometric Functions

Soalan Objektif

- | | | | | |
|------|-----|-----|-----|------|
| 1 C | 2 B | 3 A | 4 C | 5 D |
| 6 C | 7 A | 8 C | 9 A | 10 B |
| 11 C | | | | |

Soalan Subjektif

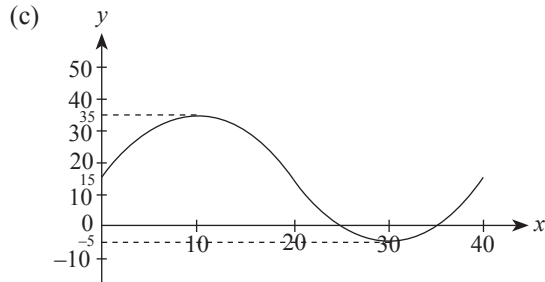
1 (a)



- (b) (i) $PR = \sqrt{30^2 + 15^2}$
 $= 33.54 \text{ cm atau/or } 15\sqrt{5} \text{ cm}$
 (ii) $\cos y^\circ = -\frac{30}{15\sqrt{5}}$
 $= -\frac{2}{\sqrt{5}} \text{ atau/or } -0.894$
- 2 $\alpha = \sin^{-1} 0.8660 = 60^\circ$
 $\theta = 180^\circ + 60^\circ = 240^\circ$
 $\theta = 360^\circ - 60^\circ = 300^\circ$
 $\therefore \theta = 240^\circ, 300^\circ$
- 3 (a) Nilai a /Value of a
 $= \frac{(18 - 2)}{2}$
 $= 8$
 Nilai b /Value of b
 $= \frac{360^\circ}{60^\circ}$
 $= 6$
 (b) $y = -8 \cos 6(85) + 10$
 $= 16.93 \text{ m}$
- 4 $y = \sin x$
 $0.5736 = \sin P$
 $P = 35^\circ$
 $\cos P = \cos 35^\circ$
 $= 0.8192$
- 5 (a) $\tan x^\circ = \frac{3}{4} = \frac{6}{ST}$
 $ST = \frac{6 \times 4}{3}$
 $= 8 \text{ cm}$
 $RT = \sqrt{6^2 + 8^2}$
 $= 10 \text{ cm}$
 (b) $\angle RMS = 180^\circ - 90^\circ - 30^\circ$
 $= 60^\circ$
 $\cos \angle RMT = -\cos 60^\circ$
 $= -0.5$
- 6 (a) (i) 8
 (ii) 4
 (iii) 60°
 (b) $y = 8 \cos 6x + 4$
 (c) $y = 8 \cos 6x + 4$
 $y = 8 \cos 6(25) + 4$
 $= -2.93$

- 7 (a) (i) 15 (ii) 10 (iii) 25

(b) $y = 15 \cos 36x + 25$



Sukatan Serakan Data Terkumpul Measures of Dispersion for Grouped Data

Soalan Subjektif

1 (a)

Markah Marks	Kekerapan Frequency	Titik tengah Midpoint
30 – 39	5	39.5
40 – 49	7	49.5
50 – 59	8	59.5
60 – 69	5	69.5
70 – 79	3	79.5
80 – 89	2	89.5

- (b) 50 – 59

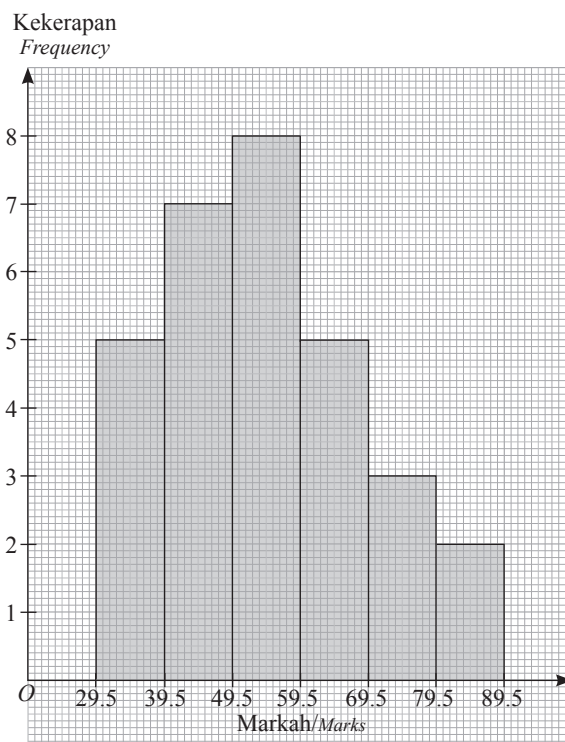
$$34.5(5) + 44.5(7) + 54.5(8) + 64.5(5)$$

$$(c) \ x = \frac{+ 74.5(3) + 84.5(2)}{5 + 7 + 8 + 5 + 3 + 2}$$

$$= \frac{1\ 635}{30}$$

$$= 54.5$$

- (d)



- (e) Bentuk loceng/ Bell shape

2 (a)

Bil (RM) Bills (RM)	Sempadan atas Upper boundary	Kekerapan longgokan Cumulative frequency
50 – 59	59.5	8
60 – 69	69.5	22
70 – 79	79.5	38
80 – 89	89.5	62
90 – 99	99.5	74
100 – 109	109.5	80

$$54.5(8) + 64.5(14) + 74.5(16)$$

$$(b) \ \bar{x} = \frac{+ 84.5(24) + 94.5(12) + 104.5(6)}{8 + 14 + 16 + 24 + 12 + 6}$$

$$= \frac{6\ 320}{80}$$

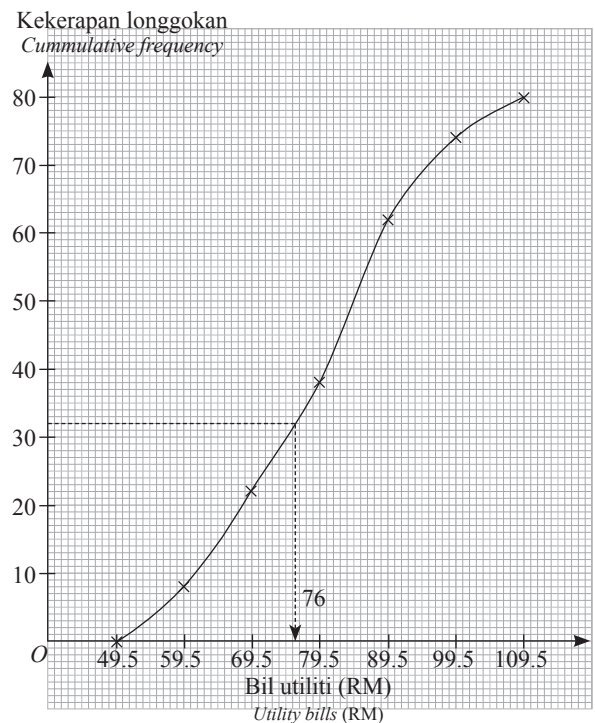
$$= 79$$

$$\sigma = \sqrt{\frac{(54.5)^2 \times 8 + (64.5)^2 \times 14 + (74.5)^2 \times 16}{8 + 14 + 16 + 24 + 12 + 6} - 79^2}$$

$$= \sqrt{194.75}$$

$$= 13.96$$

- (c)

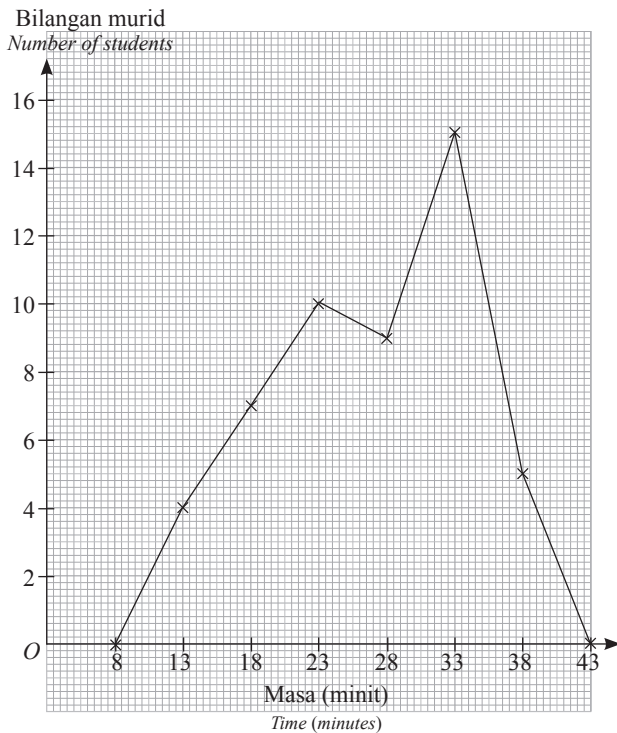


- (d) RM76

3 (a)

Masa (minit) Time (minutes)	Titik tengah Midpoint	Kekerapan yang direkod Recorded frequency	Kekerapan sebenar Actual frequency
11 – 15	13	4	4
16 – 20	18	6	7
21 – 25	23	10	10
26 – 30	28	9	9
31 – 35	33	14	15
36 – 40	38	5	5

(b)



Pemodelan Matematik Mathematical Modelling

Soalan Objektif

1 C 2 C 3 D 4 D 5 A

Soalan Subjektif

- kefahaman secara kualitatif; kualitatif; masalah dunia sebenar
qualitative; quantitative understanding; real-world problems
- Mengenal pasti dan mendefinisi masalah
Identifying and defining problems
 - Mengaplikasi matematik untuk menyelesaikan masalah
Applying mathematics to solve problems
 - Menentukan dan mentafsir penyelesaian dalam konteks masalah berkenaan
Verifying and interpreting solution in the context of the problem
 - Memurnikan model matematik
Refining the mathematical model
 - Melaporkan dapatan
Reporting the findings

Kertas Model SPM

Kertas 1

1 D	2 B	3 D	4 C	5 C
6 B	7 B	8 B	9 A	10 C
11 A	12 D	13 C	14 B	15 C
16 B	17 A	18 B	19 C	20 C
21 C	22 C	23 D	24 B	25 A
26 B	27 A	28 A	29 B	30 B
31 D	32 B	33 C	34 D	35 B
36 B	37 C	38 D	39 B	40 A

Kertas 2

Bahagian A

1 Sains/Science:

$$152_6 = 1 \times 6^2 + 5 \times 6^1 + 2 = 68$$

Bahasa Melayu:

$$126_8 = 1 \times 8^2 + 2 \times 8^1 + 6 = 86$$

Matematik/Mathematics:

$$101101_2 = 1 \times 2^5 + 1 \times 2^3 + 1 \times 2^2 + 1 = 45$$

Beza markah antara mata pelajaran Sains dan Matematik

The difference in marks between Science and Mathematics subjects

$$= 68 - 45$$

$$= 23$$

$$= 27_8$$

2 (a) $x^2 - 15x + 50 = 0$

$$(x - 10)(x - 5) = 0$$

$$x = 10, x = 5$$

(b) (i) Panjang /Length = 10 m, Lebar/Width = 5 m

Perimeter/Perimeter

$$= 2(10 + 5)$$

$$= 30 \text{ m}$$

(ii) Pita keselamatan mencukupi untuk mengelilingi padang permainan.

The safety tape is sufficient to surround the playground.

3 (a) Segi tiga sama kaki/Isosceles triangle

(b) $\tan 45^\circ = \frac{h}{20}$

$$h = 20$$

Tinggi bangunan/Building height, $h = 20 + 1 = 21 \text{ m}$

4 (a) (i) Pernyataan/Statement

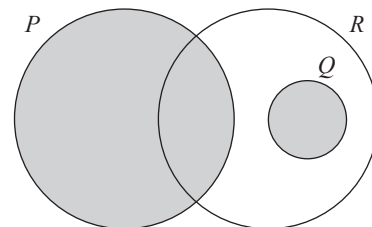
(ii) Bukan pernyataan/Not a statement

(b) (i) Jika $5 + 5 \neq 5 \times 5$, maka $2 + 2 \neq 2 \times 2$

$$\text{If } 5 + 5 \neq 5 \times 5, \text{ then } 2 + 2 \neq 2 \times 2$$

(ii) Palsu/False

5 (a)



(b) $6m + m + 1 + 4 = 54$

$$m = \frac{54 - 1 - 4}{7}$$

$$m = 7$$

6 (a) Pendapatan bercukai/Chargeable income

$$= \text{RM}74\,200 - \text{RM}6\,794 - \text{RM}1\,300 - \text{RM}9\,000$$

$$- \text{RM}2\,250 - \text{RM}3\,200 - \text{RM}6\,000$$

$$= \text{RM}45\,656$$

(b) Cukai pendapatan/Income tax

$$= 600 + (45\,656 - 35\,000) \times \frac{6}{100} - 480$$

$$= \text{RM}759.36$$

- 7 (a) RM243.90
 (b) Premium asas/*Basic premium*

$$= 243.90 + \frac{(100\,000 - 1\,000)}{1\,000} \times 20.30$$

$$= \text{RM2 } 253.60$$
- 8 (a) 20 m s^{-1}
 (b) Jarak keseluruhan/*Total distance*

$$= \left(\frac{1}{2} \times 5 \times 20\right) + (5 \times 20) + \left(\frac{1}{2} \times 2 \times 20\right)$$

$$= 170 \text{ m}$$
- 9 (a) $\tan 40^\circ = \frac{h - 1.5}{12}$

$$h = 11.569 \text{ m}$$

 (b) $11.569 : 12$

- 10 Kebarangkalian pasukan lelaki menang
The probability of boys' team wins

$$= \left(\frac{2}{5} \times \frac{7}{15}\right) + \left(\frac{3}{5} \times \frac{8}{15}\right) + \left(\frac{2}{5} \times \frac{8}{15}\right)$$

$$= \frac{54}{75}$$

Kebarangkalian pasukan perempuan menang
The probability of girls' team wins

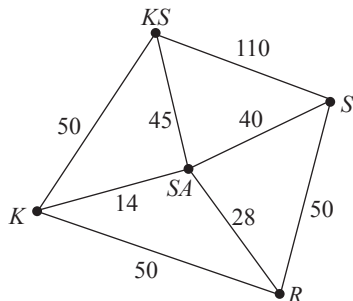
$$= \left(\frac{3}{7} \times \frac{5}{8}\right) + \left(\frac{4}{7} \times \frac{3}{8}\right) + \left(\frac{3}{7} \times \frac{3}{8}\right)$$

$$= \frac{36}{56}$$

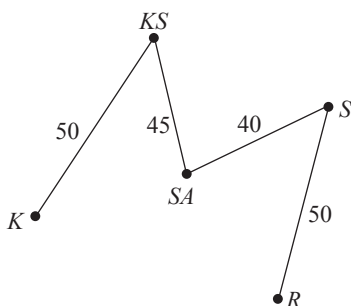
Pasukan lelaki akan mendapat peluang ke peringkat seterusnya.
Boy team will get the chance to the next level.

Bahagian B

11 (a)



(b)

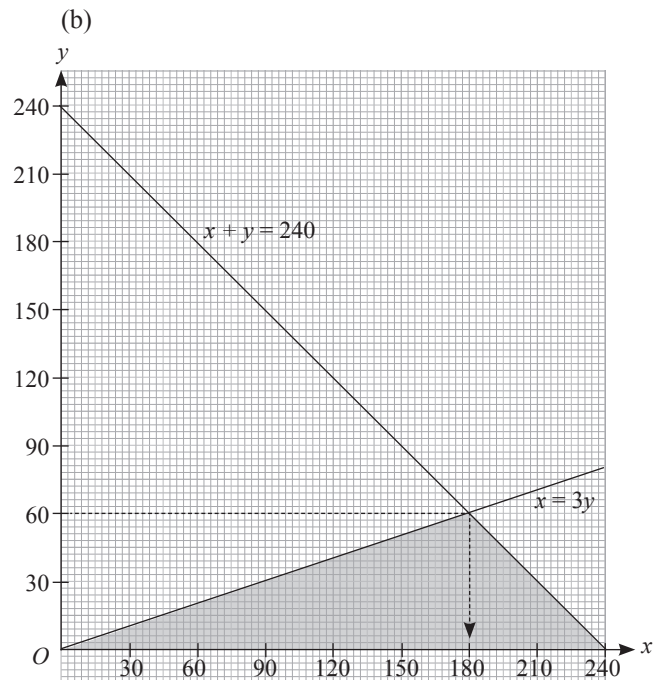


- (c) $50 + 45 + 40 + 50$

$$= 185 \text{ km}$$

- 12 (a) $x + y \leq 240$

$$x \geq 3y$$



- (c) (i) $x = 180$
 (ii) Jumlah yuran maksimum/*Maximum total fees*

$$= 200x + 100y$$

$$= 200(180) + 100(60)$$

$$= \text{RM42 } 000$$

- 13 (a) Andaikan/*Let*
 x = harga sepinggan nasi goreng
price of a plate of fried rice
 y = harga segelas jus oren
price of a glass of orange juice

$$x + y = 11$$

$$3x - 2y = 9$$

$$\begin{bmatrix} 1 & 1 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 11 \\ 9 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-2-3} \begin{bmatrix} -2 & -1 \\ -3 & 1 \end{bmatrix} \begin{bmatrix} 11 \\ 9 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-5} \begin{bmatrix} -31 \\ -24 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6.2 \\ 4.8 \end{bmatrix}$$

$$\therefore x = \text{RM6.20}, y = \text{RM4.80}$$

- (b) $\begin{bmatrix} 5 & 4 \end{bmatrix} \begin{bmatrix} 6.2 \\ 4.8 \end{bmatrix}$

$$= 5(6.20) + 4(4.80)$$

$$= \text{RM50.20}$$

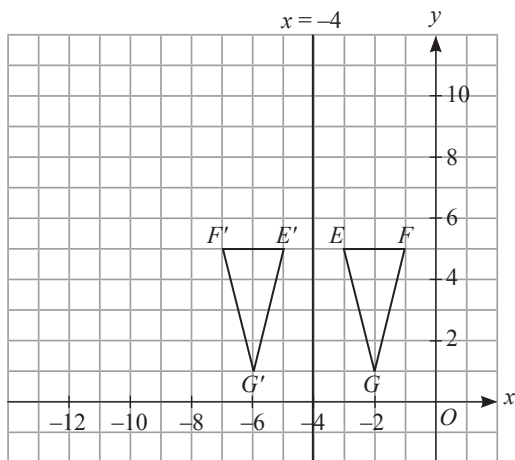
$\therefore$ Wang Alia mencukupi untuk membeli 5 pinggan nasi goreng dan 4 gelas jus oren kerana $\text{RM50.20} < \text{RM60.00}$.
Alia has enough money to buy 5 plates of fried rice and 4 glasses of orange juice because $\text{RM50.20} < \text{RM60.00}$.

- 14 (a) Jangka panjang dan jangka pendek
Short term and long term
- (b) (i) Dividen dan sewa diterima
Dividend and rental received
- (ii) $2\,500 + 500 + 1\,022 + 300 + 250 + 250$
 $- 1\,000 - 500 - 200 - 150 - 580 - 300 - 250$
 $= \text{RM}1\,842$

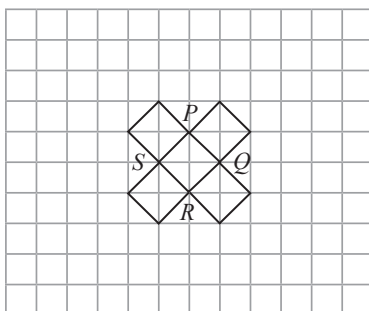
Aliran tunai positif
Positive cash flow

- (iii) (a) $\left(\frac{10\,850 + 13\,000}{12}\right) + 1\,842$
 $= \text{RM}3\,829.50$
- (b) Mengurangkan mana-mana perbelanjaan tidak tetap bulanan.
Reduce any monthly variable expenses.
 Meningkatkan pendapatan.
Increase income.

- 15 (a) (i)



- (ii)



- (b) (i) (a) **V** = Pantulan pada paksi-y
Reflection in the y-axis
- (b) **W** = Pembesaran dengan faktor skala 2 pada pusat $J(-1, 2)$.
An enlargement with scale factor 2 at centre $J(-1, 2)$.
- (ii) Luas/Area $PQRHJ = 2^2 \times 85$
 $= 340 \text{ m}^2$

Bahagian C

- 16 (a) (i) $N \propto PH$
 $N = kPH$

$$360 = k(30)(2)$$

$$k = 6$$

$$\therefore N = 6PH$$

(ii) $1\,920 = 6(40)(P)$
 $P = 8$

(b) (i) $24x + 21y = 774$
 atau/or
 $8x + 7y = 258$

$$16x + 20y = 624$$

$$\text{atau/or}$$

$$8x + 10y = 312$$

- (ii) Kaedah penghapusan:
Elimination method

$$8x + 10y = 312 \quad \dots\dots ①$$

$$8x + 7y = 258 \quad \dots\dots ②$$

$$① - ②$$

$$3y = 54$$

$$y = 18.00$$

$$8x + 7(18) = 258$$

$$x = 16.50$$

atau/or

- Kaedah penggantian:
Substitution method

$$8x + 10y = 312$$

$$x = \frac{(312 - 10y)}{8}$$

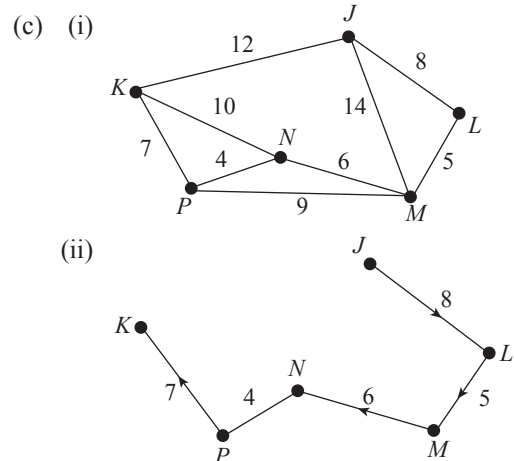
$$8\left(\frac{(312 - 10y)}{8}\right) + 7y = 258$$

$$-3y = -54$$

$$y = 18.00$$

$$x = \frac{(312 - 10(18))}{8}$$

$$x = 16.50$$



Jarak terpendek/Shortest distance
 $= 8 + 5 + 6 + 4 + 7$
 $= 30$

17 (a) $4x + 2y = 30$
 $2x + 6y = 30$

$$\begin{bmatrix} 4 & 2 \\ 2 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 30 \\ 30 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{4(6) - 2(2)} \begin{bmatrix} 6 & -2 \\ -2 & 4 \end{bmatrix} \begin{bmatrix} 30 \\ 30 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{20} \begin{bmatrix} 6(30) + (-2)(30) \\ (-2)(30) + 4(30) \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{20} \begin{bmatrix} 120 \\ 60 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \end{bmatrix}$$

$\therefore x = \text{RM}6, y = \text{RM}3$

(b) $C \propto \frac{N}{2D}$

$$C = k \frac{N}{2D}$$

$$150 = k \frac{6}{2(2)}$$

$$k = 100$$

$$C = \frac{50N}{D} \quad \text{atau/or} \quad C = \frac{100N}{2D}$$

$$C = \frac{50(4)}{5}$$

$$C = \text{RM}40$$

(c) (i) $\bar{x}_{Alpha} = \frac{80 + 85 + 90 + 95 + 100}{5}$
 $= 90$

$$\bar{x}_{Beta} = \frac{60 + 75 + 90 + 105 + 120}{5}$$

$$= 90$$

(ii) $\sigma_{Alpha} = \sqrt{\frac{80^2 + 85^2 + 90^2 + 95^2 + 100^2}{5} - 90^2}$
 $= 7.1$

$$\sigma_{Beta} = \sqrt{\frac{60^2 + 75^2 + 90^2 + 105^2 + 120^2}{5} - 90^2}$$

$$= 21.2$$

$\therefore$ Kumpulan Alpha lebih konsisten kerana sisihan piawainya lebih kecil berbanding Kumpulan Beta.

Alpha Group is more consistent because its standard deviation is smaller compared to Beta Group.



KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI SELANGOR



PROGRAM TUISYEN RAKYAT SELANGOR



KATA ALUAN YAB DATO' MENTERI BESAR SELANGOR

Program Tuisyen Rakyat Selangor (PTRS) terus menjadi antara intervensi pendidikan strategik Kerajaan Negeri Selangor dalam memperkukuh prestasi akademik pelajar sekolah menengah, khususnya bagi menghadapi peperiksaan Sijil Pelajaran Malaysia (SPM).

Memasuki tahun 2026, pelaksanaan PTRS memberi tumpuan kepada pendekatan berasaskan hasil (outcome-based intervention) dengan sasaran meningkatkan penguasaan lapan (8) mata pelajaran teras iaitu Bahasa Melayu, Bahasa Inggeris, Matematik, Sejarah, Sains, Matematik Tambahan, Fizik dan Kimia dalam kalangan pelajar Tingkatan 4 dan Tingkatan 5.

Bagi tahun ini, program menyasarkan manfaat kepada sekurang-kurangnya 150,000 pelajar di seluruh Negeri Selangor, dengan penekanan kepada akses saksama, peningkatan kompetensi subjek kritikal serta pengurangan jurang pencapaian akademik antara sekolah dan daerah.

Sejak diperkenalkan pada tahun 2009 dan melalui fasa transformasi digital pascapandemik, modul latihan PTRS kini distrukturkan dalam bentuk hibrid; fizikal dan dalam talian bagi memastikan keberkesanan penyampaian serta kebolehcapaian yang lebih meluas. Platform digital yang dibangunkan telah membolehkan lebih ramai pelajar mengakses bahan pembelajaran secara fleksibel melalui peranti mudah alih, selaras dengan aspirasi pendigitalan pendidikan negeri.

Bagi memastikan kejayaan pelaksanaan PTRS tahun ini, Kerajaan Negeri Selangor telah memperuntukkan sebanyak RM11 juta, dengan pembiayaan serta pelaksanaan bersama oleh Jawatankuasa Tetap Pendidikan dan Modal Insan Negeri Selangor, Menteri Besar Selangor (Pemerbadanan) MBI serta Jabatan Pendidikan Negeri Selangor.

Kerajaan Negeri yakin bahawa PTRS 2026 bukan sahaja meningkatkan pencapaian akademik, malah memperkukuh kesiapsiagaan pelajar untuk melangkah ke pendidikan tinggi dan pasaran kerja yang semakin kompetitif. Pembangunan modal insan berkualiti kekal menjadi teras kepada agenda menjadikan Selangor sebagai negeri termaju, berdaya tahan dan berdaya saing di peringkat nasional dan serantau.

Komitmen ini mencerminkan iltizam Kerajaan Negeri dalam memastikan setiap anak Selangor diberi peluang yang adil untuk berjaya.



YAB DATO' SERI AMIRUDIN BIN SHARI

DATO' MENTERI BESAR SELANGOR

ePTRS.my

Imbas kod QR
untuk ketahui lebih
lanjut tentang MBI



Imbas kod QR
untuk mendapatkan
jawapan



Koleksi
Video PdP



DIKUASAI OLEH:

