

Answer all questions.
Jawab semua soalan.

- 1 It is given that $\overbrace{(a \times a \times \dots \times a)}^{(p+q) \text{ times}} \overbrace{(a \times a \times \dots \times a)}^{q \text{ times}} = (\sqrt{a})^n$, where p , q and n are constants.
Express n in terms of p and q . [3 marks]

Diberi bahawa $\overbrace{(a \times a \times \dots \times a)}^{(p+q) \text{ kali}} \overbrace{(a \times a \times \dots \times a)}^{q \text{ kali}} = (\sqrt{a})^n$, dengan keadaan p , q dan n ialah pemalar.
Ungkapkan n dalam sebutan p dan q . [3 markah]

Answer / Jawapan:

$$(p+q) \times q = (\sqrt{a})^n$$

$$p^2 + q^2 = (a^{\frac{1}{2}})^n$$

$$(p^2 + q^2)^2 = (a^{\frac{n}{2}})^2$$

$$p^2 + q^2 = a^{\frac{n}{2}}$$

$$\log p^2 + \log q^2 + \log q = \log a^{\frac{n}{2}}$$

$$2 \log p + 2 \log q + \log q = \frac{n}{2} \log a$$

$$\frac{2 \log p + 3 \log q}{\log a} = \frac{n}{2}$$

$$n = \frac{2 \log p + 3 \log q}{\log a}$$

SULIT

6

3472/1

2 Given $\log_k 5 = t$, express $\log_5 \frac{5^{3n}}{k^2}$ in terms of n and t .

[3 marks]

Diberi $\log_k 5 = t$, ungkapkan $\log_5 \frac{5^{3n}}{k^2}$ dalam sebutan n dan t .

[3 markah]

Answer / Jawapan:

$$\log_k 5 = t$$

$$k^t = 5$$

$$\log_5 5^{3n} - \log_5 k^2$$

$$3n \log_5 5 - 2 \log_5 k$$

$$3n - 2 \log_5 k$$

$$3n - \left(\frac{2 \log_k k}{\log_k 5} \right)$$

$$3n - 2 \log_t k$$

3 Diagram 1 shows the relation between some x -coordinates and y -coordinates.

Rajah 1 menunjukkan hubungan antara beberapa koordinat x dan y .

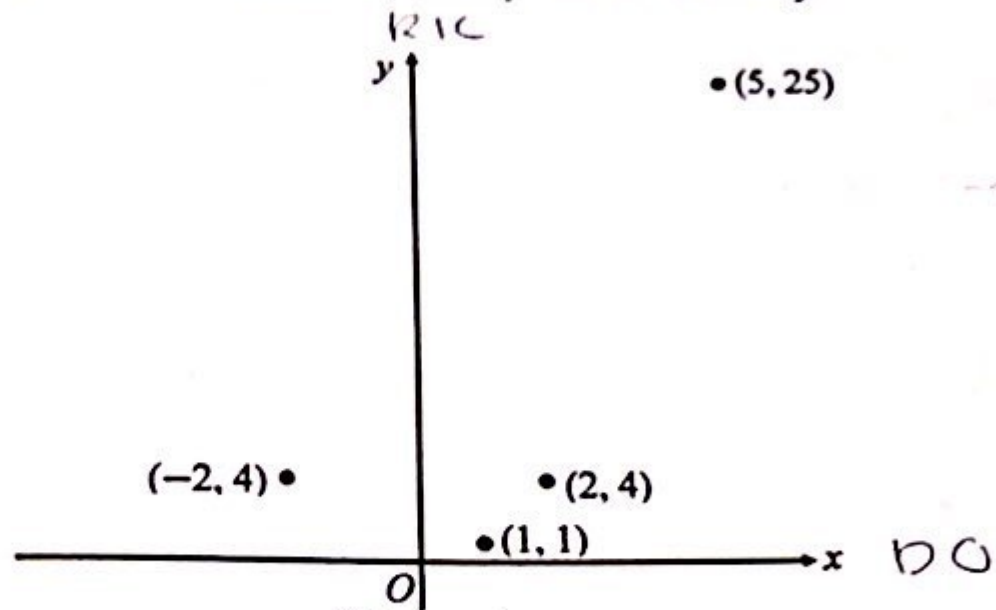


Diagram 1
Rajah 1

State

Nyatakan

- the type of relation between x -coordinates and y -coordinates,
jenis hubungan antara koordinat x dan y ,
- the function notation of the relation,
tatatanda fungsi bagi hubungan tersebut,
- the objects of 16.
objek-objek bagi 16.

Answer / Jawapan:

(a) many - to - one

It is given $f: x \rightarrow x+4$ and $fg: x \rightarrow 5-3x$. If $g(m) = n$, express m in terms of n .

[3 marks]

Diberi bahawa $f: x \rightarrow x+4$ dan $fg: x \rightarrow 5-3x$. Jika $g(m) = n$, ungkapkan m dalam sebutan n .

[3 markah]

Answer / Jawapan:

$$f(x) = x + 4$$

$$f^{-1}(fg(x)) = 5 - 3x$$

$$g(m) = n$$

$$x + 4 = f(x)$$

$$y = x + 4$$

$$f^{-1}(f)(g)$$

$$(x+4) + 4$$

$$(x+16)g(x)$$

$$x = \frac{5-3x}{4x+16}$$

$$m) = n$$

$$f(x) = x + 4$$

$$x - 4 = f(x)^{-1}$$

~~$$f(5-3x)$$~~

~~$$f g(x) = 5 - 3(x$$~~

~~$$= 5 - 3x -$$~~

$$g(x) = -3x -$$

$$g(m) = -3(m$$

$$n = -3m -$$

5 It is given that α and β are the roots of $x^2 + 2kx - 3 = 0$.

Form a quadratic equation with roots α^2 and β^2 in terms of k .

[3 marks]

Diberi bahawa α dan β adalah punca-punca bagi $x^2 + 2kx - 3 = 0$.

Bentukkan persamaan kuadratik dengan punca-punca α^2 dan β^2 dalam sebutan k .

[3 markah]

Answer / Jawapan:

α β roots

$$x^2 - \underset{1}{\text{SOR}}x + \underset{0}{\text{POR}} = 0$$

$$x^2 \left[- \left(\frac{2k}{2} \right)^2 + \left(\frac{2k}{2} \right)^2 - 3 \right] = 0$$

$$\text{SOR} = -\frac{b}{a}$$

$$(\alpha + \beta) = -\left(\frac{2k}{1}\right)$$

$$\alpha\beta = \frac{-3}{1}$$

$$\alpha\beta = -3$$

$$x^2 + \left(-\frac{2k}{1}\right)^2 + \left(\frac{-3}{2}\right)^2 - 3$$

$$(\alpha + \beta)^2 = (-2k)^2$$

$$\alpha^2 + \beta^2 = 4k^2$$

$$\alpha^2 \beta^2 = 9$$

$$x^2 - 4k^2 + -\frac{3}{4} = 0$$

~~so~~

$$x^2 - \text{SOR}x + \text{POR} = 0$$

- 6 The straight line $y = k + 1$ intersects the curve $3x^2 + xy = -3$ at two points.
Find the range of values of k .

Garis lurus $y = k + 1$ bersilang dengan lengkung $3x^2 + xy = -3$ pada dua titik.
Cari julat nilai-nilai k .

Answer / Jawapan:

$$3x^2 + x(k+1) = -3$$

$$(3x^2) + (kx + x) + 3 = 0$$

$$b^2 - 4ac > 0$$

$$(k+1)^2 - 4(3)(x+3)$$

$$k^2 - 4(3x+9)$$

$$k^2 - 12x - 36 \geq 0$$

$$(k+1)^2 - 4(3)(x+3)$$

$$(k^2 + 2k + 1) - 36$$

$$k^2 + 2k - 35 > 0$$

$$k = 5 \quad k = -7$$

$$b^2 - 4ac > 0 \rightarrow 3472/1$$

[4 marks]

[4 markah]

7 It is given that a quadratic function $y = a(x-h)^2 + k$, where $a > 0$, has a negative discriminant.

$$\begin{matrix} a & x & y \\ b & s & t \end{matrix}$$

Diberi bahawa fungsi kuadrat $y = a(x-h)^2 + k$, di mana $a > 0$, mempunyai nilai pembezaan negatif

$$a(x^2 - 2xh + h^2)$$

(a) Sketch the possible quadratic graph.

$$ax^2 - 2axh + ah^2 + k$$

Lakarkan graf kuadrat yang mungkin.

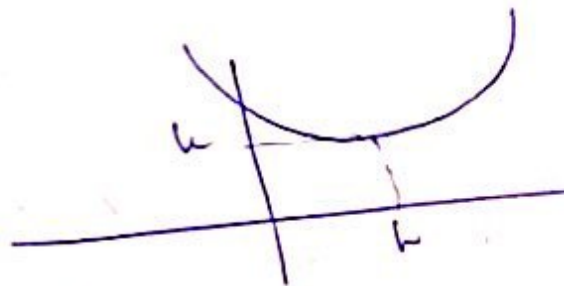
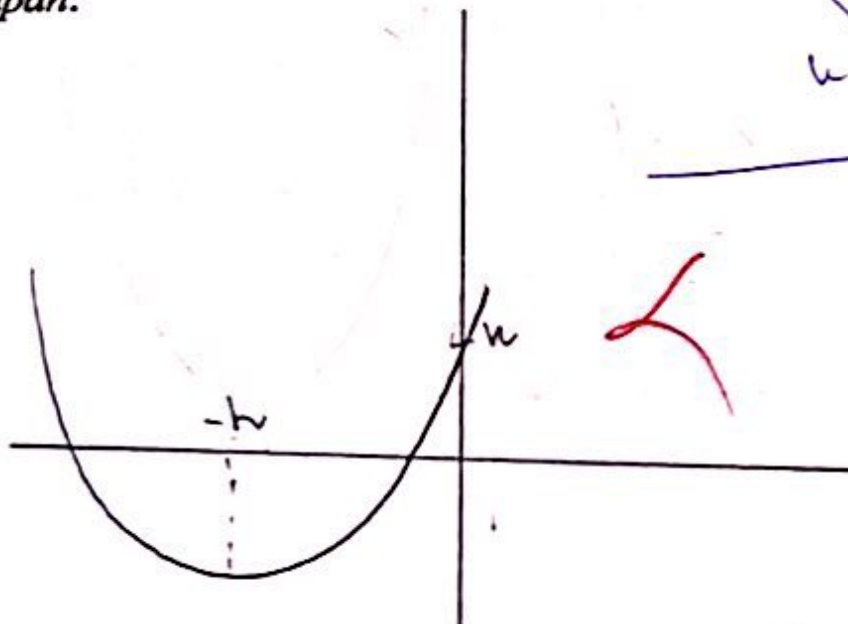
(b) Given that the quadratic graph is reflected at $y = b$, find the range of b such that the image of the graph has a positive discriminant.

Diberi bahawa graf kuadrat tersebut dipantulkan pada $y = b$, cari julat bagi b dengan keadaan imej graf tersebut mempunyai nilai pembezaan positif.

[2 marks]
[2 markah]

Answer / Jawapan:

(a)



(b)

Three consecutive terms of an arithmetic progression are $\frac{3m-2}{10}$, $\frac{m+3}{7}$ and $\frac{4}{4}$.
Find the value of m . [2 marks]

Tiga sebutan berturutan suatu jajang aritmetik ialah $3m-2$, $m+3$ dan 4 .
Cari nilai bagi m . [2 markah]

Answer / Jawapan:

$$T_2 - T_1 = T_3 - T_2$$

$$\frac{m+3}{7} - \frac{3m-2}{10} = \frac{4}{4} - \frac{m+3}{7}$$

$$\frac{m+3}{7} - 3m + 2 = 4 - m - 3$$

$$m + 5 = -m + 1$$

$$m = 1 - 5$$

4

9 Diagram 2 shows two salary schemes offered by a company.

Rajah 2 menunjukkan dua skim gaji yang ditawarkan oleh sebuah syarikat.

Scheme A	: Yearly increment of RM150.
Skim A	: Kenaikan gaji RM150 setahun.
Scheme B	: Yearly increment by 6%.
Skim B	: Kenaikan gaji tahunan sebanyak 6%.

Diagram 2

Rajah 2

$$S_n = a + (n-1)d$$

$$= 1600 + (n-1)150$$

$$150n - 150 = 900$$

$$150n > \frac{1050}{150}$$

$$n > 7$$

$$= ar^{n-1}$$

$$1600(1.06)^{n-1} > \frac{2500}{1600}$$

$$1.06^{n-1} > 1.5625$$

$$n-1 > 7.659$$

$$n > 8.659$$

$$n = 9$$

Amirul chose scheme A whilst Syafiq chose scheme B. It is given that both of them started to work at the company at the same time with the same starting salary of RM1 600. Given that both of them start to save 10% of their salary when it reaches RM2 500, find out who start to save first and how much is the total savings in his first 25 years of working.

Amirul memilih skim A manakala Syafiq memilih skim B. Diberi bahawa kedua-dua mereka mula bekerja pada waktu yang sama dengan gaji permulaan yang sama iaitu RM1 600. Diberi bahawa kedua-dua mereka mula menyimpan 10% dari gaji mereka apabila ia mencecah RM2 500, cari siapakah yang mula menyimpan terlebih dahulu dan berapakah jumlah simpanannya sepanjang 25 tahun pertama dia bekerja.

$$S_{25} = 2500 = 73150 + 0.1 \times 12$$

$$= \underline{RM 87700}$$

belum start 20 x/nh

[4 marks]
[4 marks]

Answer / Jawapan:

Amirul = $1,600 + 150 \dots = 2500$
 $150 \times 6 = 6 \text{ years}$

Syafiq = $1,600 \times 1.06 = 1696$

- 10 In a geometric progression, the common ratio is 3 and the sum of the first three terms is 65.
Find the sum of two consecutive terms after the third term of the progression.

$$S_5 - S_3$$

[3 marks]

Dalam suatu jangjang geometri, nisbah sepunya ialah 3 dan hasil tambah tiga sebutan pertama ialah 65.

Cari hasil tambah dua sebutan berturut-turut selepas sebutan ketiga bagi jangjang itu.

[3 markah]

Answer / Jawapan:

$$\frac{T_2}{T_1} = (3)^r \quad S_3 = 65$$

$$S_3 = \frac{a(3^3 - 1)}{3 - 1}$$

$$S_3 = \frac{a(26)}{2}$$

$$65 = \frac{a(26)}{2}$$

$$\frac{130}{26} = a$$

$$a = 5$$

$$S_5 = \frac{5(3^5 - 1)}{3 - 1}$$

$$S_5 = 605$$

$$S_5 - S_3$$

$$605 - 65 = 540$$

- 11 The variables x and y are related by the equation $\frac{y}{4} = x + \frac{3}{x}$. The equation is reduced into linear form $Y = 4X + 12$. Express X and Y in terms of x and/or y . [3 marks]

Pemboleh ubah x dan y dihubungkan oleh persamaan $\frac{y}{4} = x + \frac{3}{x}$. Persamaan tersebut ditukar kepada bentuk linear $Y = 4X + 12$. Ungkapkan X dan Y dalam sebutan x dan/atau y . [3 markah]

Answer / Jawapan:

$$\frac{y}{4} = \left(x + \frac{3}{x}\right) 4$$

$$\frac{y}{4} = \left(\frac{x}{1} + \frac{3}{x}\right)$$

$$\frac{y}{4} = \frac{x^2 + 3}{x}$$

$$y = 4x + 12$$

$$\left(y = 4x + \frac{12}{x}\right) \times x$$

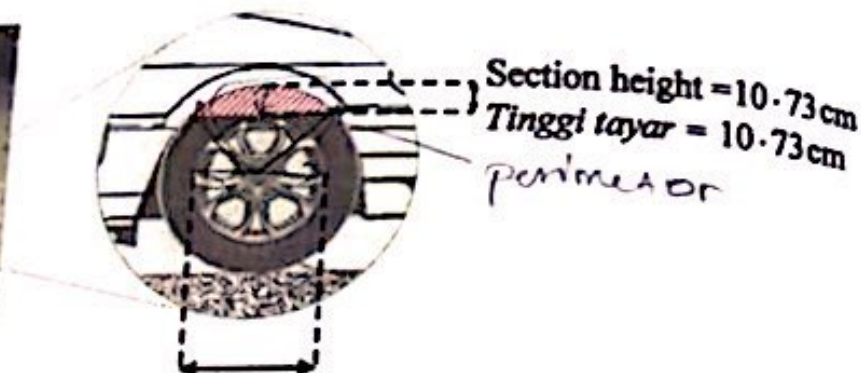
$$yx + 4x^2 + 12$$

$$y = yx$$

$$x = x^2$$

- 12 Diagram 3 shows a car submerge in water during a flood and the side view of the car tyre.

Rajah 3 menunjukkan sebuah kereta yang tenggelam di dalam air semasa banjir dan pandangan sisi tayar kereta tersebut.



Rim diameter = 40.64 cm

Diameter rim = 40.64 cm

Diagram 3

Rajah 3

Find the perimeter, in cm, of the red shaded region.

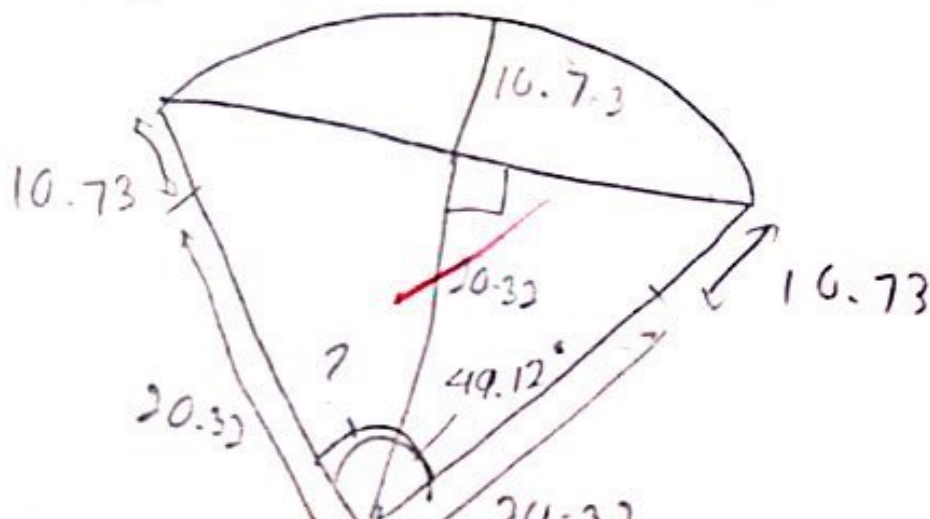
Cari perimeter, dalam cm, bagi kawasan berlorek berwarna merah.

[Use / Guna $\pi = 3.142$]

[4 marks]

[4 markah]

Answer / Jawapan:



13 Diagram 4 shows a straight line PQ.

Rajah 4 menunjukkan suatu garis lurus PQ.

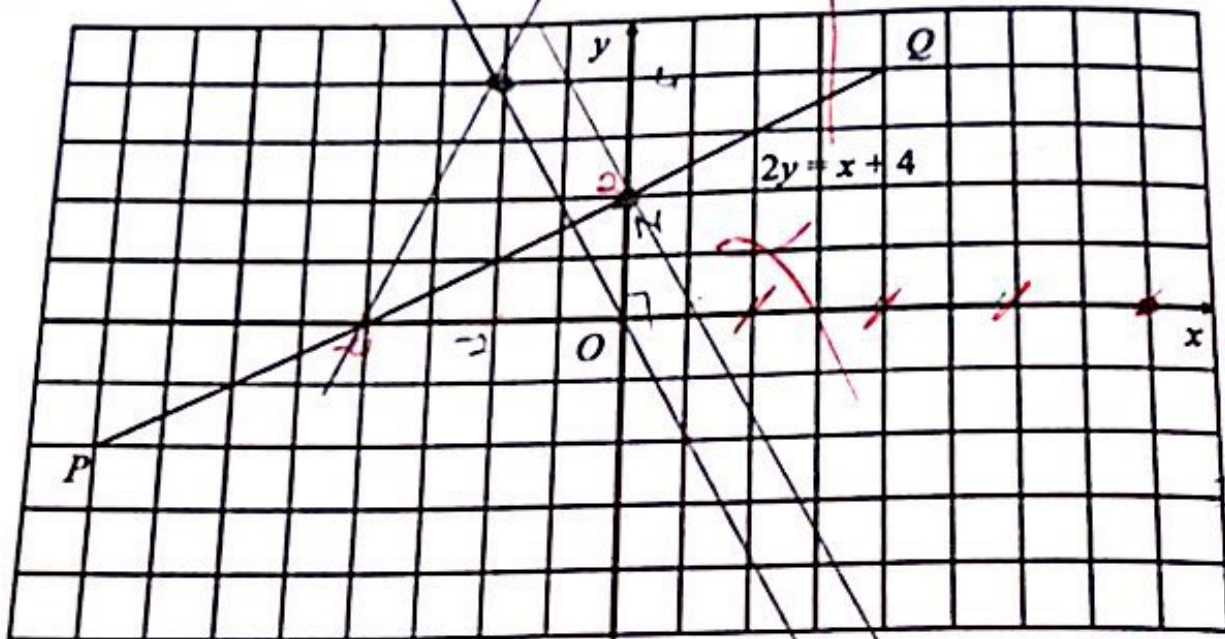


Diagram 4
Rajah 4

$y = \frac{2}{2}x + 2 = y = mx$
 $y = -2x + c$

$\frac{1}{m}x = \frac{2x + 8}{8}$

$y = -2x + c$
 $12 = -4$
 $mx = 2x + 8$ $c = 16$

It is given that the straight line $y = mx$, where m is a constant, is perpendicular to line PQ and intersect the straight line $y = 2x + 8$ at point N.

Find the coordinates of N; then on the Diagram 4, mark and label the point N.

$x \text{ int} = y = 0$
 $y \text{ int} = x = 0$

Diberi bahawa garis lurus $y = mx$, dengan keadaan m ialah pemalar, berserenjang dengan garis PQ dan memotong garis lurus $y = 2x + 8$ pada titik N.

Cari koordinat N, kemudian pada Rajah 4, tanda dan label titik N.

$y = 2(-2) + 8$
 $y = 12$

$y = 4$ $(-2, 12)$
 $(-2, 4)$

$N = (-2, 4)$ [4 marks]
 [4 markah]

Answer / Jawapan:

$y = mx + c$ \perp to pa

$y = -2x + c$

$y = -2x + c = y = 2x + 8$

- 14 Diagram 4 shows a straight line graph passing through x-axis and y-axis.
Rajah 4 menunjukkan satu graf garis lurus yang melalui paksi-x dan paksi-y.

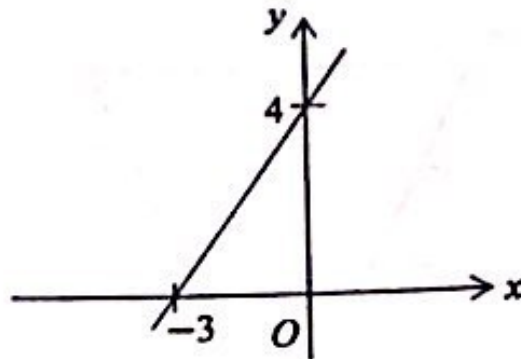


Diagram 4
Rajah 4

Find the equation of the straight line in general form.

[2 marks]

Cari persamaan garis lurus dalam bentuk am.

[2 marks]

Answer / Jawapan:

$$y = mx + c \quad \text{y increase}$$

$$\left(y = \frac{4}{3}x + 4 \right) \times 3$$

$$3y = 4x + 12$$



$$(0, 4)$$

$$(-3, 0)$$

$$\frac{4 - 0}{0 + 3} = \frac{4}{3}$$

15 Diagram 6 shows a triangle OPQ , such that R is the midpoint of PQ .

Rajah 6 menunjukkan sebuah segi tiga OPQ , dengan keadaan R ialah titik tengah PQ .

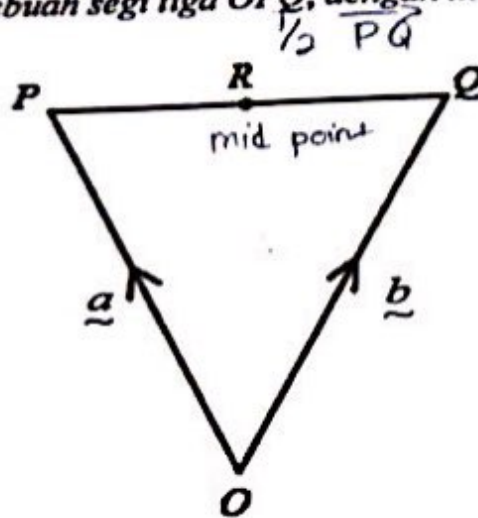


Diagram 6
Rajah 6

Given $\vec{OP} = \underline{a}$ and $\vec{OQ} = \underline{b}$, express \vec{OR} in terms of \underline{a} and \underline{b} .

[3 marks]

Diberi $\vec{OP} = \underline{a}$ dan $\vec{OQ} = \underline{b}$, ungkapkan \vec{OR} dalam sebutan \underline{a} dan \underline{b} .

[3 markah]

Answer / Jawapan:

$$\vec{OR} = \vec{OP} + \vec{PR}$$

$$\vec{OR} = \underline{a} + \frac{1}{2} \vec{PQ}$$

$$\vec{OR} = \underline{a} + \frac{1}{2} (-\underline{a} + \underline{b})$$

$$\vec{OR} = \underline{a} - \frac{1}{2} \underline{a} + \frac{1}{2} \underline{b}$$

SULIT

16

Diagram 7 shows two points, P and Q on a Cartesian plane.

Rajah 7 menunjukkan dua titik, P dan Q pada suatu satah Cartes.

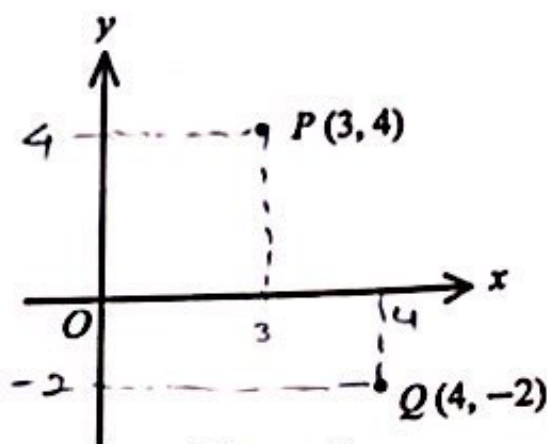


Diagram 7
Rajah 7

- (a) Express \vec{PQ} in the form $\begin{pmatrix} x \\ y \end{pmatrix}$.

Ungkapkan \vec{PQ} dalam bentuk $\begin{pmatrix} x \\ y \end{pmatrix}$.

- (b) Find the unit vector in the direction of \vec{PQ} .

Cari vektor unit dalam arah \vec{PQ} .

[4 mar

[4 mark

Answer / Jawapan:

(a) $\vec{PQ} = \begin{pmatrix} 1 \\ -6 \end{pmatrix}$ ✓

$$|a| = \sqrt{1^2 + (-6)^2} = \sqrt{37}$$

$$\frac{a}{|a|} = \frac{1}{\sqrt{37}} \begin{pmatrix} 1 \\ -6 \end{pmatrix}$$

$$\frac{a}{|a|} = \frac{1}{\sqrt{37}} \begin{pmatrix} 1 \\ -6 \end{pmatrix}$$

17 The variable u and v is related by the equation $v = \frac{36}{u^3}$. It is given that u changes from 2 to $2 - k$.

Pembolehlah u dan v dihubungkan dengan persamaan $v = \frac{36}{u^3}$. Diberi bahawa u berubah dari 2 ke $2 - k$.

Find in terms of k ,

Cari dalam sebutan k ,

(a) the corresponding small change in v ,
perubahan kecil yang setara bagi v ,

$$\frac{dv}{du} = 36 u^{-3}$$

$$= -\frac{108}{u^4}$$

$$\frac{dy}{dx} = \frac{\partial y}{\partial x}$$

(b) the approximate value of v .
nilai hampir bagi v .

[4 marks]

[4 marks]

Answer / Jawapan:

$$dy = \frac{\partial y}{\partial x} \times du$$

$$= \frac{-108}{u^4} \times (2 - k)$$

$$= \frac{-108}{2} \times (2 - k)$$

$$\frac{-108}{u^4} \times k$$

$$= -108$$

- 18 Diagram 8 shows the curve $y = f(x)$ with gradient function $2ax - 1$ and its minimum point is $(4, 3)$.

Rajah 8 menunjukkan lengkung $y = f(x)$ dengan fungsi kecerunan $2ax - 1$ dan titik minimumnya ialah $(4, 3)$.

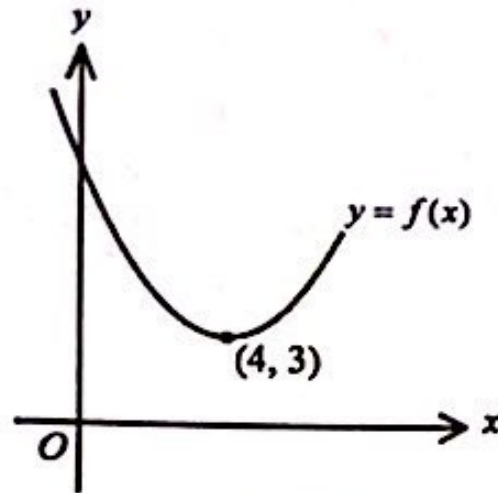


Diagram 8
Rajah 8

Find the equation of the curve.

[4 marks]

Cari persamaan lengkung.

[4 markah]

Answer / Jawapan:

$$\frac{dy}{dx} = 0$$

$$2ax - 1 = 0$$

$$2a(4) - 1 = 0$$

$$8a - 1 = 0$$

$$8a = 1$$

$$a = \frac{1}{8}$$

$$\frac{dy}{dx} = \frac{x}{4} - 1$$

$$y = \frac{\frac{1}{4}x^2}{2} - x + c$$

$$y = \frac{1}{8}x^2 - x + c$$

$$3 = \frac{1}{8}(4)^2 - (4) + c$$

$$c = 5$$

19 Diagram 9 shows part of the curve $y = g(x)$.

Rajah 9 menunjukkan sebahagian dari lengkung $y = g(x)$.

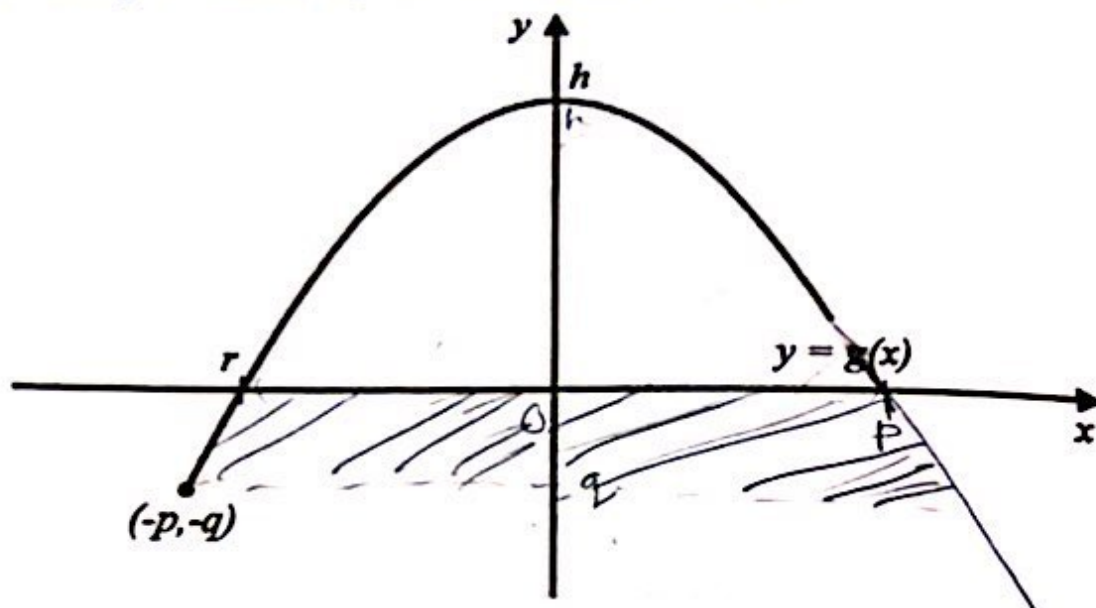


Diagram 9
Rajah 9

On the Diagram 9, shade the area that represented by the following:

Pada Rajah 9, lorekkan luas kawasan yang diwakili oleh yang berikut:

$$\int_{-q}^h -p \, dy - \left[\int_p^r g(x) \, dx \right] - \left[\int_0^r g(x) \, dx \right]$$

Answer / Jawapan:



(Handwritten red mark)

[2 m
[2 ma

20 Diagram 10 shows the position of point A on the Cartesian plane. It is given that \overline{OA} is a unit vector.

Rajah 10 menunjukkan kedudukan titik A pada satah Cartesian. Diberi bahawa \overline{OA} ialah suatu vektor unit.

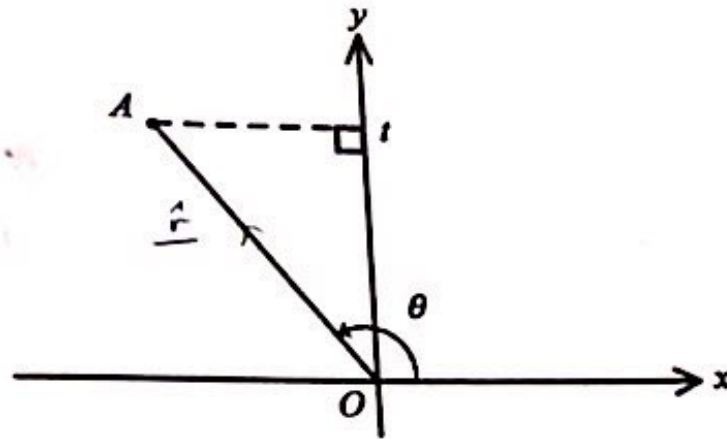


Diagram 10
Rajah 10

Find in terms of t ,

Cari dalam sebutan t ,

- (a) $\sin \theta$,
(b) $\tan 2\theta$.

[4 marks]
[4 markah]

Answer / Jawapan:

(a)



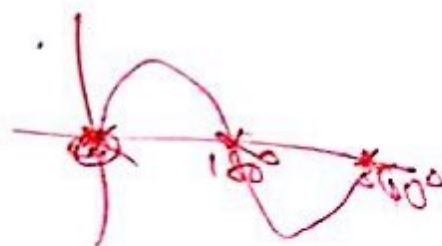
21 Solve the equation $2\sin^2 \theta \cos \theta = \cos^2 \theta - 1$ for $0^\circ \leq \theta \leq 360^\circ$.

Selesaikan persamaan $2\sin^2 \theta \cos \theta = \cos^2 \theta - 1$ untuk $0^\circ \leq \theta \leq 360^\circ$.

Answer / Jawapan:

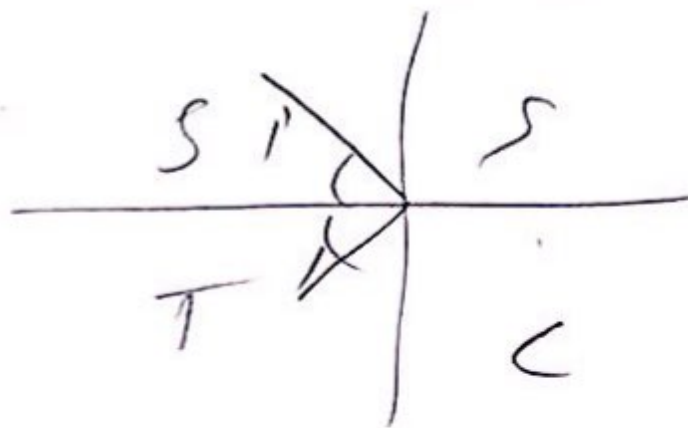
$$2\sin^2 \theta \cos \theta = \cos^2 \theta - 1$$

$$= -\sin^2 \theta$$



$$2\sin^2 \theta \cos \theta = \frac{-\sin^2 \theta}{2\sin^2 \theta}$$

$$\cos \theta = -\frac{1}{2}$$



$$\theta = \cos^{-1}\left(-\frac{1}{2}\right)$$

$$\theta = 60$$

$$180 - 60 = 120$$

$$2\sin^2 \theta \cos \theta = \cos^2 \theta - 1$$

$$2\sin^2 \theta \cos \theta + \sin^2 \theta = \cos^2 \theta + 1$$

$$\cancel{2\sin^2 \theta}$$

$$\cancel{2\sin \theta}$$

22 Table 1 shows the result of a formative test of nine students.

Jadual 1 menunjukkan keputusan satu ujian formatif bagi sembilan orang pelajar.

56	55	58	α	61	53	59	54	53
----	----	----	----------	----	----	----	----	----

Table 1
Jadual 1

It is given that 53 and 61 are the lowest and highest mark respectively. The interquartile range of the data is 6. Another student took the same test and scored β marks. Given that the new interquartile range of the data is 5, find the possible range of β .

Diberi bahawa 53 dan 61 adalah markah terendah dan tertinggi masing-masing. Julat antara kuartil bagi data tersebut ialah 6. Seorang pelajar lain telah mengambil ujian yang sama dan mendapat β markah. Diberi bahawa julat antara kuartil data yang baharu ialah 5, cari julat yang mungkin bagi β .

[3 marks]

[3 markah]

Answer / Jawapan:



- 23 Diagram 11 shows a spinner for bonanza prize. A customer will get a chance to spin once for every RM500 purchase.

Rajah 11 menunjukkan sebuah roda untuk hadiah bonanza. Seseorang pelanggan akan diberikan peluang untuk membuat satu putaran untuk setiap pembelian RM500.

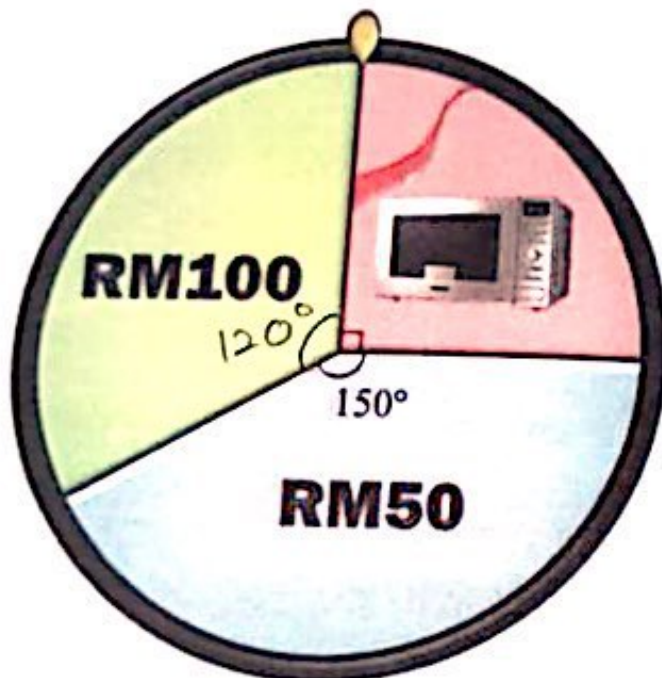


Diagram 11
Rajah 11

Given that Henry spend RM1 200, find the probability for him winning different prizes. [3 marks]

Diberi bahawa Henry berbelanja sebanyak RM1 200, cari kebarangkalian dia memenangi hadiah yang berbeza. [3 markah]

Answer / Jawapan:

$$\left(\frac{3}{3} + \frac{2}{3} \right) = \frac{2}{3}$$

24

It is given that $X \sim B(n, p)$ and $P(X=0) = P(X=1)$.
Find the mean in terms of p .

[3 marks]

Diberi bahawa $X \sim B(n, p)$ dan $P(X=0) = P(X=1)$.
Cari min dalam sebutan p .

[3 markah]

Answer / Jawapan:

X	Z	k	P
0	$Z = \frac{0-n}{\sqrt{p}}$		

$$Z = \frac{0-n}{\sqrt{p}}$$

$$\frac{0-n}{\sqrt{p}} = \frac{1-n}{\sqrt{p}}$$

$$Z = \frac{1-n}{\sqrt{p}}$$

$$\frac{0-n}{1-n} = 1$$

$$\frac{0-n}{\sqrt{p}} = \frac{1-n}{\sqrt{p}} \times \sqrt{p}$$

$$0-n = 1-n$$

$$\frac{0-n}{\sqrt{p}} = \frac{1-n}{\sqrt{p}}$$

$$1 = 2n$$

$$n = \frac{1}{2}$$

For
member's
Use

SULIT

- 25 Company XYZ is looking for 4 new employees among 7 candidates attending the interview. The company's policy does not allow husband and wife to work together. Given there is a couple of husband and wife amongst the candidates, find the number of different ways to select the new employees.

[3 marks]

Syarikat XYZ sedang mencari 4 orang pekerja baharu dalam kalangan 7 orang calon yang menghadiri temuduga. Polisi syarikat tersebut tidak membenarkan suami dan isteri bekerja bersama. Diberi bahawa terdapat sepasang suami isteri dalam kalangan calon, cari bilangan cara yang berbeza untuk memilih pekerja baharu.

[3 markah]

Answer / Jawapan:

$$\frac{2 \times 1}{2} - \frac{5 \times 4 \times 3 \times 2 \times 1}{2}$$

$$120 - 2 = \underline{118 \text{ ways}}$$

9