

SKEMA

NAMA : TINGKATAN:



KEMENTERIAN PENDIDIKAN MALAYSIA
Jabatan Pendidikan WP Putrajaya



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UNTUK ANALISIS & TIPS SPM 2026 !

PEPERIKSAAN PERCUBAAN SPM 2026 MATEMATIK TAMBAHAN

3472/1

Kertas 1

Ogos 2026

2jam

Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tuliskan nama dan tingkatan pada ruang yang disediakan
2. Kertas ini mengandungi dua bahagian iaitu **Bahagian A** dan **B**
3. Jawab semua soalan di **Bahagian A**, dan 2 soalan di **Bahagian B**
4. Tulis jawapan dan langkah kerja di ruang jawapan yang disediakan
5. Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan
6. Markah yang diperuntukkan bagi setiap soalan ditunjukkan dalam kurungan
7. Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan

Bahagian	Soalan	Markah Penuh	Markah diperoleh
A	1	5	
	2	6	
	3	3	
	4	3	
	5	6	
	6	6	
	7	4	
	8	8	
	9	5	
	10	6	
	11	4	
	12	8	
B	13	8	
	14	8	
	15	8	
Jumlah markah			

Kertas ini mengandungi 28 halaman bercetak

Jawapan / Answer:

$$2^{n+3} + 2^{n+1} - 2^n = 36$$

$$(2^n \cdot 2^3) + (2^n \cdot 2^1) - 2^n = 36 \quad \checkmark \text{ K1}$$

$$2^n (2^3 + 2^1 - 1) = 36$$

$$2^n (9) = 36$$

$$2^n = \frac{36}{9}$$

$$2^n = 4$$

$$2^n = 2^2 \quad \checkmark \text{ K1}$$

$$n = 2 \quad \checkmark \text{ N1}$$



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MATEMATIK TAMBAHAN KERTAS 1.

NO SOALAN : 2

Jawapan / Answer:

$$(a) \quad 80, 60, 45$$

$$r = \frac{60}{80} \quad \text{@} \quad r = \frac{45}{60}$$

$$r = 0.75$$

$$r = 0.75$$

✓

Pl a atau r

$$T_7 = 80 (0.75)^{7-1}$$

✓

kl

$$= 14.23$$

✓

Nl

$$(b) \quad S_{\infty} = \frac{80}{1 - 0.75}$$

✓

kl

$$= 320$$

✓

Nl

Jawapan / Answer:

$$\begin{aligned} \text{a) P. Longkok } ST &= (9.73 - 7)(0.803) \quad \checkmark_{KI} \\ &= 2.192 \quad \checkmark_{NI} \end{aligned}$$

$$\begin{aligned} \text{b) } \angle APR &= 44 \times \frac{3.142}{180} \quad \checkmark \\ &= 0.768 \quad \checkmark_{PI} \text{ (seen)} \end{aligned}$$

$$\begin{aligned} \text{Luas } \triangle PAR &= \frac{1}{2}(7)(9.73)\sin 44 \\ &= 23.657 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{Sektor RST} &= \frac{1}{2}(2.73)^2(0.803) \quad \checkmark \\ &= 2.992 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{Sektor PQS} &= \frac{1}{2}(7)^2(0.768) \quad \checkmark \\ &= 18.816 \quad \checkmark_{KI} \end{aligned}$$

$$\begin{aligned} \text{Luas kawasan berlerek} &= 23.657 - 2.992 - 18.816 \quad \checkmark_{KI} \\ &= 1.849 / 1.847 \quad \checkmark_{NI} \end{aligned}$$

Jawapan / Answer:

$$\sqrt{a+b\sqrt{5}} = \frac{4}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} \quad \checkmark K_1$$

$$= \frac{4(3+\sqrt{5})}{(3)^2 - (\sqrt{5})^2}$$

$$= \frac{12 + 4\sqrt{5}}{9-5}$$

$$= \frac{\cancel{4}(3+\sqrt{5})}{\cancel{4}}$$

$$\left(\sqrt{a+b\sqrt{5}}\right)^2 = \left(3+\sqrt{5}\right)^2$$

$$\begin{aligned} a+b\sqrt{5} &= (3+\sqrt{5})(3+\sqrt{5}) \\ &= 9 + 3\sqrt{5} + 3\sqrt{5} + (\sqrt{5})^2 \quad \checkmark K_1 \end{aligned}$$

$$a+b\sqrt{5} = 14 + 6\sqrt{5}$$

$$a = 14, \quad b = 6$$

$\checkmark N_1 \quad \checkmark N_1$

Jawapan / Answer:

a) $\log_8 235$

$$= \frac{\log_e 235}{\log_e 8} \quad \checkmark \quad @ = \frac{\ln 235}{\ln 8} \quad \checkmark \quad K_1$$

$$= 2.6256 \quad \checkmark \quad = 2.6255 \quad \checkmark \quad N_1$$

b) $x \log_{10} (1 - \frac{2}{y}) = \log_{10} h - \log_{10} k$

$$x \log_{10} (1 - \frac{2}{15}) = \log_{10} 45000 - \log_{10} 125000 \quad \checkmark \quad K_1$$

Penggantikan nilai y, h dan k

$$x \log_{10} (\frac{13}{15}) = \log_{10} (\frac{45000}{125000}) \quad \checkmark \quad K_1 \text{ hukum log}$$

$$x = 7.1393$$

$$x \approx 7 \text{ tahun} \quad \checkmark \quad N_1$$

Jawapan / Answer:

$$\begin{aligned} a) F &= F_1 + F_2 \\ &= (12\hat{i} + 4\hat{j}) + (20\hat{i} - 6\hat{j}) \quad \checkmark \text{ K1} \\ &= 12\hat{i} + 20\hat{i} + 4\hat{j} - 6\hat{j} \\ &= 32\hat{i} - 2\hat{j} \quad \checkmark \text{ N1} \end{aligned}$$

$$\begin{aligned} b) |F| &= \sqrt{(32)^2 + (-2)^2} \quad \checkmark \text{ K1} \\ &= 2\sqrt{257} \end{aligned}$$

$$\begin{aligned} \hat{F} &= \frac{32\hat{i} - 2\hat{j}}{2\sqrt{257}} \\ &= \frac{16}{\sqrt{257}}\hat{i} - \frac{1}{\sqrt{257}}\hat{j} \quad \checkmark \text{ N1} \end{aligned}$$

$$c) \tan \theta = \frac{-2}{32} \quad \checkmark \text{ K1}$$

$$\tan \theta = \frac{1}{16}$$

$$\theta = 3.5763^\circ / 3.58^\circ$$

bergerak ke kanan $\checkmark$ dan ke bawah $\checkmark$
dengan sudut 3.5763° merujuk $\checkmark$
gans mengufuk. $\checkmark$ (2)

N1

093.58°

Jawapan / Answer:

$$a) \quad p + q + (p + q) + (q + p) + 0.1 = 1$$

$$3p + 3q = 0.9$$

$$3(p + q) = 0.9$$

$$p + q = 0.3 \quad \text{--- ①}$$

(a)

K1

$$P(X=3) - P(X=1) = 0.1$$

$$(p + q) - q = 0.1$$

$$p = 0.1 \quad \text{--- ② NI}$$

Subs ② into ①

$$(0.1) + q = 0.3$$

$$q = 0.2 \quad \text{NI}$$

$$b) \quad P(X > 1)$$

$$= 1 - P(X=0) - P(X=1)$$

$$= 1 - 0.1 - 0.2$$

$$= 0.7 \quad \text{✓ NI}$$

Jawapan / Answer:

$$a) y = \frac{1}{3}x^3 - \frac{7}{2}x^2 + 10x$$

$$\frac{dy}{dx} = x^2 - 7x + 10$$

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

$$x^2 - 7x + 10 = 0 \quad \checkmark \quad K1$$

$$(x-2)(x-5) = 0$$

$$x_1 = 2 \quad \text{atau} \quad x_2 = 5$$

$$y_1 = \frac{1}{3}(2)^3 - \frac{7}{2}(2)^2 + 10(2) = \frac{26}{3}$$

$$y_2 = \frac{1}{3}(5)^3 - \frac{7}{2}(5)^2 + 10(5) = \frac{25}{6}$$

} atau K1

$$\therefore (2, \frac{26}{3}) \quad \text{atau} \quad (5, \frac{25}{6}) \quad \#$$

$$\frac{dy}{dx} = x^2 - 7x + 10$$

$$\frac{d^2y}{dx^2} = 2x - 7$$

atau

$$x_1 = 2$$

$$= 2(2) - 7 = -3 (< 0)$$

$$\therefore (2, \frac{26}{3}) \text{ titik maksimum}$$

~~NI~~ #

$$\frac{d^2y}{dx^2} = 2x - 7$$

$$x_2 = 5$$

$$\frac{d^2y}{dx^2} = 2(5) - 7$$

$$= 3 (> 0)$$

~~NI~~ K1

$$\therefore (5, \frac{25}{6}) \text{ titik minimum}$$

~~NI~~ #



Jawapan / Answer:

b) $P(3, 4)$ $y = 2x^2 + 3x + 7$

$$\frac{dy}{dx} = 4x + 3 \quad \checkmark \quad K1$$

$$\begin{aligned} x=3 &= 4(3) + 3 \\ &= 15 \end{aligned}$$

$$m_N m_T = -1$$

$$m_N(15) = -1$$

$$m_N = -\frac{1}{15}$$

$$y - y_1 = m(x - x_1)$$

$$y - 4 = -\frac{1}{15}(x - 3) \quad \checkmark \quad K1 \text{ \& ditihat } m_N(15) = -1$$

$$y = -\frac{1}{15}x + \frac{21}{5} \quad \checkmark \quad N1$$

terima kaedah setang
 $y = mx + c$

Jawapan / Answer:

$$\begin{aligned}
 a) L &= \frac{1}{2} \begin{vmatrix} 1 & 6 & 3 & 1 \\ 4 & 10 & -4 & 4 \end{vmatrix} \\
 &= \frac{1}{2} \left[(1 \times 10) + (6 \times -4) + (3 \times 4) \right] - \left[(4 \times 6) + (3 \times 10) + (1 \times -4) \right] \quad \checkmark \text{ K1} \\
 &= \frac{1}{2} \begin{vmatrix} -52 \end{vmatrix} \\
 &= \frac{1}{2} (52) \\
 &= 26 \quad \checkmark \text{ N1}
 \end{aligned}$$

$$\begin{aligned}
 b) m_{PQ} &= \frac{10 - (-4)}{6 - 3} \quad \checkmark \\
 &= \frac{14}{3}
 \end{aligned}$$

$k(3, -4) \quad \alpha(6, 10)$

$$\begin{aligned}
 \frac{14}{3} \times m_2 &= -1 \quad \checkmark \text{ K1} \\
 m_2 &= \frac{-3}{14}
 \end{aligned}$$

$$P(1, 4)$$

$$y - 4 = -\frac{3}{14}(x - 1) \quad \checkmark \text{ K1}$$

$$y = -\frac{3}{14}x + \frac{3}{14} + 4$$

$$= -\frac{3}{14}x + \frac{59}{14} \quad \checkmark \text{ N1}$$

Jawapan / Answer:

(a)

$$\int (3x+2)^n dx = a (3x+2)^{-2} + C$$

$$\frac{(3x+2)^{n+1}}{(3)(n+1)} + C \quad / \text{kl}$$

$$n+1 = -2$$

$$n = -3 \quad / \text{NI}$$

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

$$= \frac{1}{3(-2)}$$

$$= \frac{-1}{6} \quad / \text{NI}$$

Jawapan / Answer:

$$(b) \quad \frac{d}{dx} \left(\frac{2x}{2x^2+3} \right) = g(x)$$

$$\int g(x) dx = \frac{2x}{2x^2+3}$$

$$\int_0^2 \frac{g(x)}{2} dx - \int_0^2 2x dx$$

$$= \frac{1}{2} \int_0^2 g(x) - \int_0^2 2x dx$$

$$= \frac{1}{2} \left[\frac{2x}{2x^2+3} \Big|_0^2 \right] - \left[\frac{2x^2}{2} \Big|_0^2 \right] / K1$$

$$= \frac{1}{2} \left[\frac{2(2)}{2(2)^2+3} - \frac{2(0)}{2(0)^2+3} \right] - \left[(2)^2 - (0)^2 \right] / K1$$

$$= -\frac{42}{11} / N1$$

Jawapan / Answer:

$$a) \quad m = -\frac{7}{7} = -1 \quad \checkmark \text{ P.1}$$

$$\log_{10} y = (-1)x + 7 \quad \checkmark \text{ K.1}$$
$$= 7 - x$$

$$\therefore y = 10^{7-x} \quad \checkmark \text{ N.1}$$

$$b) \quad y = 10^{7-3}$$
$$= 10^4 \text{ atau}$$
$$= 10000 \quad \checkmark \text{ N.1}$$

MATEMATIK TAMBAHAN KERTAS 1.

NO SOALAN : 12

Jawapan / Answer:

$$a) i) {}^nC_r = \frac{n!}{(n-r)!r!}$$

$$\begin{aligned} {}^nC_{n-r} &= \frac{n!}{(n-(n-r))!(n-r)!} \quad \checkmark K1 \\ &= \frac{n!}{r!(n-r)!} \\ &= {}^nC_r \quad \checkmark N1 \end{aligned}$$

ii) 6B, 5M

P(sekurang-keray 3B)

3B 2M atau 4B 1M atau 5B 0M

$${}^6C_3 \times {}^5C_2 + {}^6C_4 \times {}^5C_1 + {}^6C_5 \times {}^5C_0 \quad \checkmark K1$$

$$= 200 + 15 + 6$$

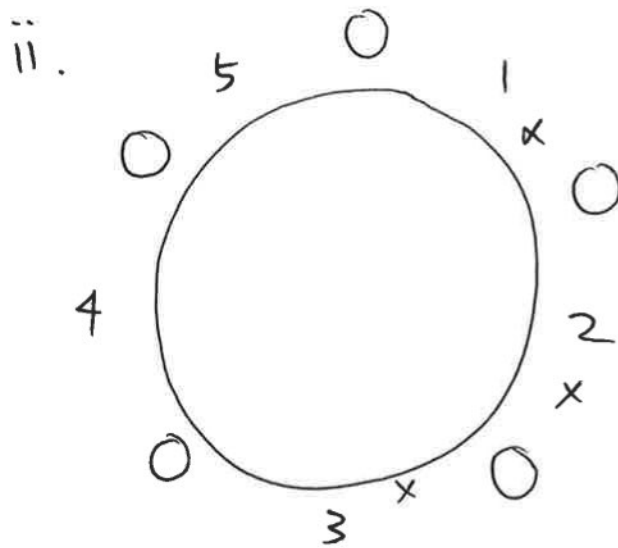
$$= 281 \quad \checkmark N1$$

Jawapan / Answer:

b) i. $7! 2!$ ✓ P1

$= 10080$ ✓ N1

Terima kaedah setora



$= (5-1)! {}^5P_3$ ✓ K1

$= 1440$ ✓ N1

Jawapan / Answer:

a) $f(x) = \frac{5x-1}{10}$ $gf(x) = 5x+2$

i) $g\left(\frac{5x-1}{10}\right) = 5x+2$

Katakan $y = \frac{5x-1}{10}$

$x = \frac{10y+1}{5}$ ✓_{K1}

$g(y) = 5\left(\frac{10y+1}{5}\right) + 2$ ✓_{K1}
 $= 10y + 3$

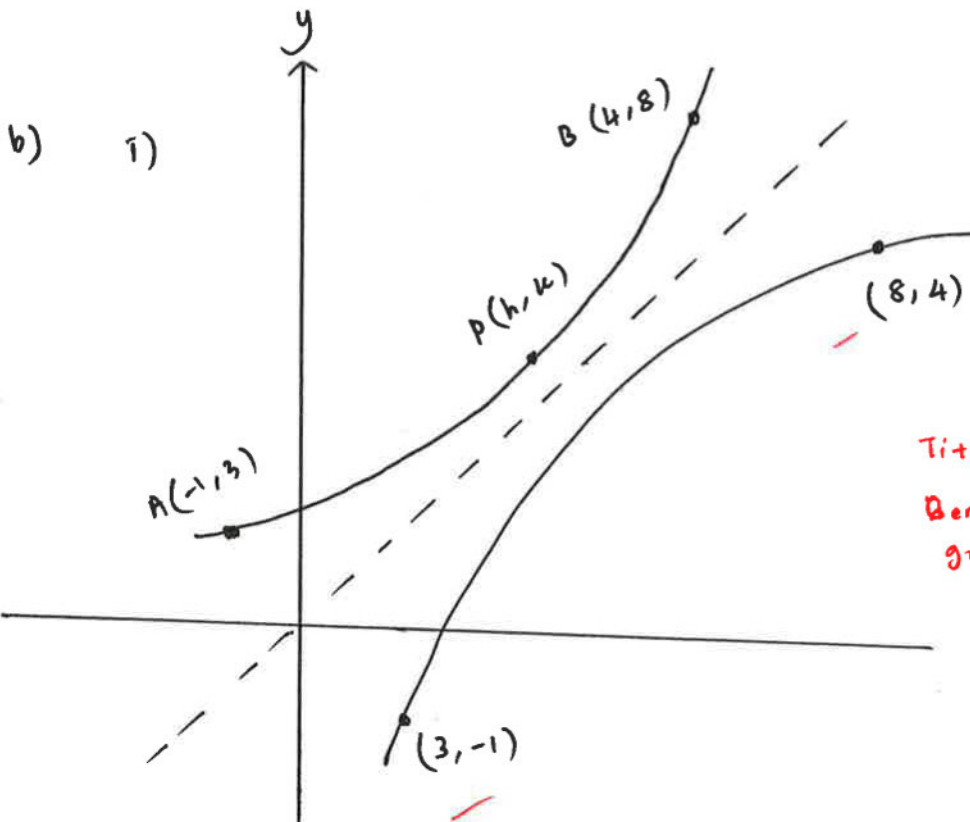
$g(x) = 10x + 3$ ✓_{N1}

kaedah songsangan

$g(x) = gff^{-1}(x)$ ✓_{K1}
 $= gf\left(\frac{10x+1}{5}\right)$ ✓_{K1}
 $= 5\left(\frac{10x+1}{5}\right) + 2$ ✓_{K1}

$g(x) = 10x + 3$ ✓_{N1}

ii) $10x + 3 = x$ ✓_{K1}
 $10x - x = 3$
 $9x = 3$
 $x = \frac{1}{3}$ ✓_{N1}



ii) $(2, 5)$ ✓_{N1}

Titik A & B ✓_{K1}
 Bentuk graf ✓_{N1}

Jawapan / Answer:

$$a) f(x) = -2x^2 + 8x - 3$$

$$f(x) = -2 \left[x^2 - 4x + \frac{3}{2} \right]$$

$$= -2 \left[x^2 - 4x + \left(-\frac{4}{2}\right)^2 - \left(-\frac{4}{2}\right)^2 + \frac{3}{2} \right] \text{---KI}$$

$$= -2 \left[(x - 2)^2 - \frac{5}{2} \right]$$

$$f(x) = -2(x - 2)^2 + 5 \text{---NI}$$

Lakukan graf rujuk lampiran.

Bentuk ---IM ---PI

Titik max ---IM ---NI

Puncak / Puntasan y ---IM ---NI

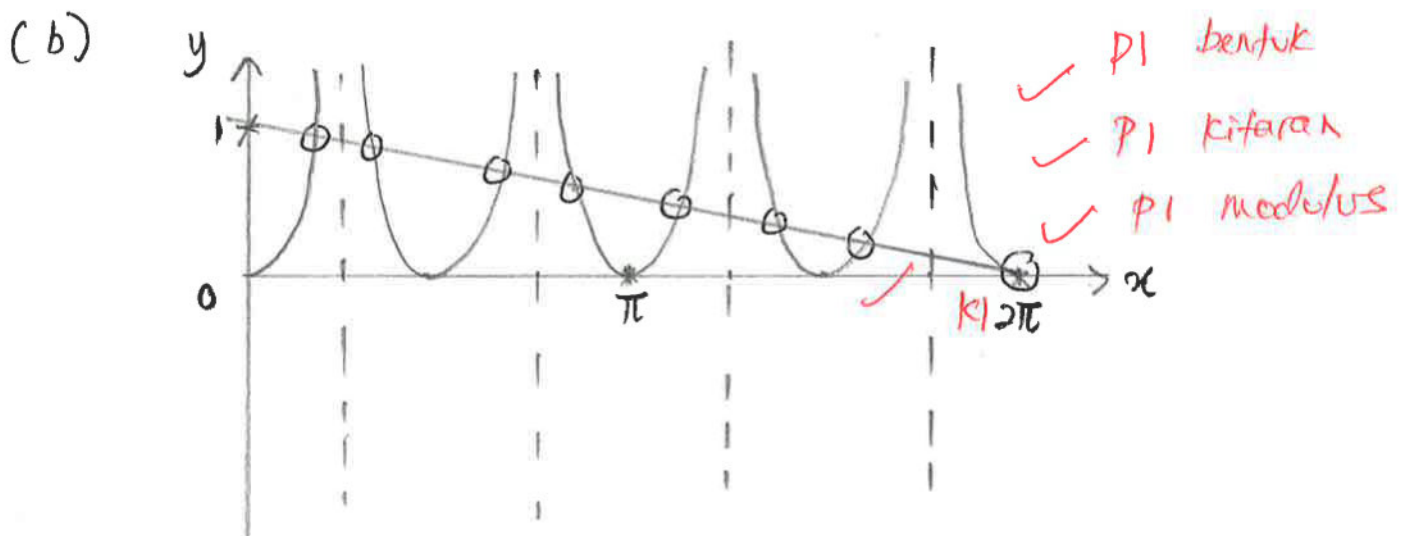
$$b) i) f(x) = 2(x - 2)^2 - 5 \text{---NI}$$

ii) Bentuk : IM ---NI

Titik min : IM ---NI

Jawapan / Answer:

$$\begin{aligned}
 (a) \quad & \frac{1 + \sin 2x}{1 - 2(1 - \cos^2 x)} - \frac{1}{\cos 2x} \\
 &= \frac{1 + \sin 2x}{2 \cos^2 x - 1} - \frac{1}{\cos 2x} \\
 &= \frac{1 + \sin 2x - 1}{\cos 2x} \\
 &= \frac{\sin 2x}{\cos 2x} \\
 &= \tan 2x
 \end{aligned}$$



$$\begin{aligned}
 \tan 2x + \frac{\pi}{2\pi} &= 1 \\
 y &= 1 - \frac{x}{2\pi}
 \end{aligned}$$

$\ast$ lukis garis lurus dan persamaan garis lurus
 $\checkmark$

Bilangan penyelesaian = 8 $\checkmark$ NI

SKEMA

NAMA : TINGKATAN:



KEMENTERIAN PENDIDIKAN MALAYSIA
Jabatan Pendidikan WP Putrajaya



PEPERIKSAAN PERCUBAAN SPM 2026 MATEMATIK TAMBAHAN

3472/2

Kertas 2

Ogos 2026

$2\frac{1}{2}$ jam

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tuliskan nama dan tingkatan pada ruang yang disediakan
2. Kertas ini mengandungi tiga bahagian iaitu **Bahagian A**, **B** dan **C**
3. Jawab semua soalan di **Bahagian A**, 3 soalan di **Bahagian B** dan 2 soalan di **Bahagian C**
4. Tulis jawapan dan langkah kerja di ruang jawapan yang disediakan
5. Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan
6. Markah yang diperuntukkan bagi setiap soalan ditunjukkan dalam kurungan
7. Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan

Bahagian	Soalan	Markah Penuh	Markah diperoleh
A	1		
	2		
	3		
	4		
	5		
	6		
	7		
B	8	10	
	9	10	
	10	10	
	11	10	
C	12	10	
	13	10	
	14	10	
	15	10	
Jumlah markah			

Kertas ini mengandungi 38 halaman bercetak

Jawapan / Answer:

a) $|4p - 8| = 0$ $q = |4(0) - 8|$

$p = 2$ $q = 8$

✓ NI ✓ NI

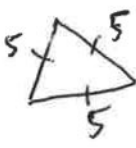
 SERTAI TELEGRAM @exercise_students

c) $4x - 8 = 12$ ✓ dan $4x - 8 = -12$ ✓ NI

$4x = 20$ $4x = -4$

$x = 5$ ✓ dan $x = -1$ ✓ NI

Jawapan / Answer:

a) $120 \times \frac{3.142}{180} = 2.095$ 

✓_{K1} ✓_{N1}

b) $Lilitan bulatan = 2 \times 3.142 \times 5$
 $= 31.42$

✓
ⓐ

P. Lengkok $= 2 \times 5 \times 2.095$
 $= 20.95$

✓_{K1}

perimeter $= 31.42 + 20.95 + 4(5)$ ✓_{K1}
 $= 72.37$

✓_{N1}

c) $\text{Luas kaw. berlerek} = \text{Luas bulatan} - 2(\text{Luas Sektor})$
 $= 3.142 (5)^2 - 2 \left(\frac{1}{2} \times 5^2 \times 2.095 \right)$ ✓_{K1}
 $= 26.175 \quad 78.55 - 52.375$ ✓_{K1}
 $= 26.175$

✓_{N1}

Jawapan / Answer:

$$\begin{aligned}
 a) \quad & \lim_{k \rightarrow 2} \frac{k^2 - 81}{k - 9} \\
 &= \lim_{k \rightarrow 2} \frac{(k-9)(k+9)}{(k-9)} \\
 &= \lim_{k \rightarrow 2} k+9 \\
 &= 2+9 \\
 &= 11 \quad \checkmark \text{ NI}
 \end{aligned}$$

atau

$$\begin{aligned}
 & \frac{2^2 - 81}{2 - 9} \\
 &= \frac{-77}{-7} \\
 &= 11 \quad \checkmark \text{ NI}
 \end{aligned}$$

$$b) \quad V = 3r^2 - \frac{1}{3}r^3$$

$$i) \quad \frac{dr}{dt} = 0.05$$

$$V = 3r^2 - \frac{1}{3}r^3$$

$$\frac{dV}{dr} = 6r - r^2 \quad \checkmark \text{ NI}$$

$$\frac{dV}{dt} = ?$$

$$\begin{aligned}
 r=2 \quad &= 6(2) - (2)^2 \\
 &= 8
 \end{aligned}$$

$$\frac{dV}{dt} = \frac{dV}{dr} \times \frac{dr}{dt}$$

$$= 8 \times 0.05 \quad \checkmark \text{ NI}$$

$$= 0.4 \quad \checkmark \text{ NI}$$

$$\begin{aligned}
 ii) \quad \delta r &= 1.98 - 2 \\
 &= -0.02
 \end{aligned}$$

$$\begin{aligned}
 V &= 3(2)^2 - \frac{1}{3}(2)^3 \\
 &= \frac{28}{3}
 \end{aligned}$$

$$\frac{\delta V}{\delta r} = \frac{dV}{dr}$$

$$\frac{\delta V}{-0.02} = 8 \quad \checkmark \text{ NI}$$

$$\delta V = -0.16 \quad \checkmark \text{ NI}$$

Peratus perubahan :

$$\frac{\delta V}{V} \times 100$$

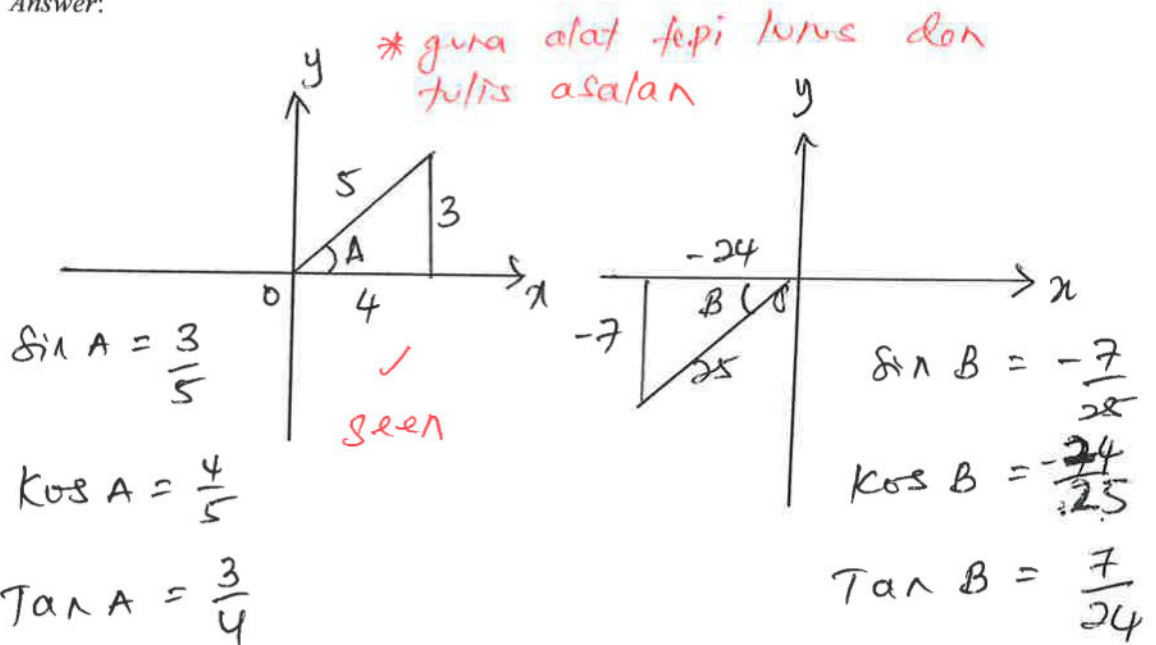
$$= \frac{-0.16}{\left(\frac{28}{3}\right)} \times 100$$

$$= -1.714\% \quad \checkmark \text{ NI}$$

atau menyusut
1.714% / 7

Jawapan / Answer:

(a) (i)



(i) $\frac{1}{\cot A} = \tan A$

$= \frac{3}{4}$ ✓ NI

ii) $\cos (B - A)$

$= \cos B \cos A + \sin A \sin B$

$= \left(-\frac{24}{25}\right)\left(\frac{4}{5}\right) + \left(\frac{3}{5}\right)\left(-\frac{7}{25}\right)$ ✓ NI

$= -\frac{117}{125}$ ✓ NI

(b) $2 \cos^2 x - 3 \cos x - 2 = 0$

$(\cos x - 2)(2 \cos x + 1) = 0$ ✓ NI

$\cos x = 2$, $\cos x = -\frac{1}{2}$ ✓ NI (sudut rujukan)

abaikan $x = 60^\circ, 120^\circ, 240^\circ$ ✓ NI

Jawapan / Answer:

a) i) $\vec{SB} = \vec{SP} + \vec{PB}$ * either PI
 $\vec{SB} = \vec{v} + 6\vec{u}$ e (Hukum Segitiga)
 ✓ NI

ii) $\vec{AQ} = \vec{AR} + \vec{RQ}$ *
 $\vec{AQ} = 2\vec{u} + \vec{v}$ ✓ NI

$$\vec{SB} = 2\vec{BC}$$

$$\vec{BC} = \frac{1}{2}(\vec{v} + 6\vec{u})$$

$$\vec{BC} = \frac{1}{2}\vec{v} + 3\vec{u}$$

$$\vec{SC} = \vec{SB} + \vec{BC}$$

$$= \vec{v} + 6\vec{u} + \frac{1}{2}\vec{v} + 3\vec{u} \quad \text{K1}$$

$$\vec{SC} = \frac{3}{2}\vec{v} + 9\vec{u}$$

$$\vec{AQ} = \lambda \vec{AC}$$

$$2\vec{u} + \vec{v} = \lambda (\vec{AS} + \vec{SC})$$

$$2\vec{u} + \vec{v} = \lambda (-6\vec{u} + \frac{3}{2}\vec{v} + 9\vec{u})$$

$$2\vec{u} + \vec{v} = 3\lambda\vec{u} + \frac{3}{2}\lambda\vec{v}$$

$$1 = \frac{3}{2}\lambda \quad 2 = 3\lambda \quad \text{K1}$$

$$\frac{2}{3} = \lambda \quad \frac{2}{3} = \lambda$$

$$\vec{AQ} = \frac{2}{3} \vec{AC} \quad \text{NI}$$

A, Q, C adalah segaris.

$$\frac{\vec{AR}}{\vec{SR}} = \frac{1}{3}$$

$$\frac{\vec{AR}}{6\vec{u}} = \frac{1}{3}$$

$$\vec{AR} = \frac{1}{3}(6\vec{u})$$

$$\vec{AR} = 2\vec{u}$$

b) $|\vec{AQ}| = 2\vec{u} + \vec{v}$

$$= 2(3\vec{i}) + (2\vec{i} + 5\vec{j}) \quad \text{K1}$$

$$= 6\vec{i} + 2\vec{i} + 5\vec{j}$$

$$= 8\vec{i} + 5\vec{j}$$

$$|\vec{AQ}| = \sqrt{8^2 + 5^2}$$

$$= \sqrt{89} \quad \text{NI}$$

a)

Jawapan / Answer:

$$\text{SOR} = \alpha + \beta = -\left(\frac{-5}{2}\right) = \frac{5}{2} \quad \text{POR} = \alpha\beta = \frac{6}{2} = 3$$

② K1

NEW ROOT(S) SOR₁

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

$$= (\beta + \alpha) + \frac{(\beta + \alpha)}{(\alpha\beta)}$$

$$= \frac{5}{2} + \frac{\frac{5}{2}}{3}$$

$$= \frac{5}{2} + \frac{5}{6} = \frac{10}{3}$$

POR₁

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

$$= 3 + 2 + \frac{1}{3}$$

$$= \frac{16}{3}$$

② K1

NEW EQ₁

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

$$x^2 - \frac{10}{3}x + \frac{16}{3} = 0 \quad \text{NI}$$

atau

$$3u^2 - 10u + 16 = 0$$



MATEMATIK TAMBAHAN KERTAS 2

NO SOALAN : 6

Jawapan / Answer:

(b)

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

$$k - x = -2x^2 + 8x - 3 \quad \checkmark \quad K1$$

$$-2x^2 + 8x - 3 - k + x = 0$$

$$-2x^2 + 8x + x - 3 - k = 0$$

$$-2x^2 + 9x - 3 - k = 0$$

$$a = -2$$

$$b = 9$$

$$c = -3 - k$$

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

$$(9)^2 - 4(-2)(-3 - k) < 0 \quad \checkmark \quad K1$$

$$81 - 4(6 + 2k) < 0$$

$$81 - 24 - 8k < 0$$

$$-8k < -57$$

$$k > \frac{57}{8} \quad \checkmark \quad N1$$

Jawapan / Answer:

$$2x - y + 3z = 1 \quad \text{--- (1)}$$

$$3x + 2y - z = 9 \quad \text{--- (2)}$$

$$x + 3y - 2z = 4 \quad \text{--- (3)}$$

Dari (3)

$$x + 3y - 2z = 4$$

$$x = 4 - 3y + 2z \quad \text{--- (4)}$$

Masukkan (4) dlm (1)

$$2(4 - 3y + 2z) - y + 3z = 1$$

$$8 - 6y + 4z - y + 3z = 1$$

$$7z - 7y = -7$$

$$z - y = -1 \quad \text{--- (5)}$$

Masukkan (4) dlm (2)

$$3(4 - 3y + 2z) + 2y - z = 9$$

$$12 - 9y + 6z + 2y - z = 9$$

$$5z - 7y = -3 \quad \text{--- (6)}$$

Dari (5)

$$z = y - 1 \quad \text{--- (7)}$$

Masukkan 7 dlm (6)

$$5(y - 1) - 7y = -3 \quad \text{--- KI}$$

$$5y - 5 - 7y = -3$$

$$-2y = 2$$

$$y = -1 \quad \text{--- NI}$$

Dari (7)

$$z = y - 1$$

$$= -1 - 1$$

$$z = -2 \quad \text{--- M}$$

Dari (4)

$$x = 4 - 3y + 2z$$

$$x = 4 - 3(-1) + 2(-2)$$

$$x = 4 + 3 - 4$$

$$x = 3 \quad \text{--- NI}$$

Jawapan / Answer:

$$T_3 = 60$$

$$\frac{3}{2} [2a + (3-1)d] = 60$$

$$3a + 3d = 60 \quad \text{--- ①}$$

$$T_n = 148$$

$$a + (18-1)d = 148$$

$$a + 17d = 148 \quad \text{--- ②} \times 3$$

Salah satu
persamaan
betul

Selesaikan pers. Serentak

$$3a + 51d = 444 \quad \text{--- ③}$$

$$\text{③} - \text{①} : \quad 48d = 384 \quad \text{--- KI}$$

$$d = 8$$

$$3a + 3(8) = 60$$

$$a = 12$$

@ NI

$$S_{18} = \frac{18}{2} [2(12) + (18-1)8] \quad \text{KI (guna a, d)}$$

$$= 1440$$

NI

Jawapan / Answer:

$$(a) \frac{dx}{dy} = \frac{2}{3}y$$

$$\begin{aligned} \int dx &= \int \frac{2}{3}y dy \\ &= \frac{2}{3} \int y dy \\ x &= \frac{2}{3} \left(\frac{y^2}{2} \right) + C \end{aligned}$$

atau

$$\begin{aligned} x &= \int \frac{2}{3}y dy \\ x &= \frac{\frac{2y^2}{3}}{2} + C \end{aligned}$$

— K1

$$x = \frac{1}{3}y^2 + C \dots \text{from point } (1,0) \quad \begin{matrix} x=1 \\ y=0 \end{matrix}$$

$$\begin{aligned} (1) &= \frac{1}{3}(0)^2 + C \\ \therefore C &= 1 \end{aligned}$$

$$x = \frac{1}{3}y^2 + 1 \quad \text{— N1}$$

(b) Luas permukaan.

$$\text{Had pada paksi } -y = \int_{-3}^3$$

$$\begin{aligned} \text{Luas } \square &= (4-1) \times (3-(-3)) \\ &= 3 \times 6 \quad \text{— K1} \\ &= 18 \end{aligned}$$

Luas dibawah lengkung (terhadap -y)

$$L = \int_{-3}^3 \left[\frac{1}{3}y^2 + 1 \right] dy$$

$$= \left[\frac{1}{3} \left[\frac{y^3}{3} \right] + y \right]_{-3}^3$$

$$= \left[\frac{y^3}{9} + y \right]_{-3}^3$$

Jawapan / Answer:

$$\begin{aligned}
 &= \left[\frac{(-3)^3}{9} + 3 \right] - \left[\frac{(-3)^2}{9} + (-3) \right] \quad \text{--- KI} \quad \left[\begin{array}{l} \text{kamir dan} \\ \text{masukkan} \\ \text{nilai} \end{array} \right] \\
 &= 6 - (-6) \\
 &= 12.
 \end{aligned}$$

∴ Luas kawasan berlorek,

$$= 18 - 12 \quad \text{--- KI}$$

$$= 6 \text{ unit}^2. \quad \text{--- NI}$$

Jawapan / Answer:

$$c) \quad V_{\text{glass}} = V_{\text{cilinder}} - V_{\text{kanta}}$$

$$\begin{aligned} V_{\text{cilinder}} &= \pi r^2 h \\ &= \pi (4)^2 (6) \quad \text{--- KI} \\ &= 96\pi \end{aligned}$$

$$\begin{aligned} V_{\text{kanta}} &= \pi \int_{-3}^3 \left[\left(\frac{1}{3} \right) y^2 + 1 \right]^2 dy \\ &= \pi \int_{-3}^3 \left[\left(\frac{1}{3} y^2 + 1 \right) \left(\frac{1}{3} y^2 + 1 \right) \right] dy \end{aligned}$$

$$= \pi \int_{-3}^3 \left[\frac{y^4}{9} + \frac{2}{3} y^2 + 1 \right] dy$$

$$= \pi \left[\frac{y^5}{45} + \frac{2y^3}{9} + y \right]_{-3}^3$$

$$= \pi \left[\left(\frac{(3)^5}{45} + \frac{2(3)^3}{9} + 3 \right) - \left(\frac{(-3)^5}{45} + \frac{2(-3)^3}{9} + (-3) \right) \right] \quad \text{--- KI [kamin dan masukkenntai]}$$

$$= \frac{144}{5} \pi$$

$$V_{\text{glass}} = 96\pi - \frac{144}{5}\pi = 67.2\pi \quad \text{--- KI --- NI}$$

Jawapan / Answer:

a)

$x\sqrt{x}$	0.03	0.16	0.35	0.59	0.85
$y\sqrt{x}$	-1.75	-0.68	0.83	2.69	4.83

* graf $\rightarrow$ seperti lampiran

b) i. $\sqrt{x} (y = ax + \frac{b}{\sqrt{x}})$

$y\sqrt{x} = ax\sqrt{x} + b$ ✓ PI

$a = \frac{4.83 - 0.83}{0.85 - 0.35}$ ✓ K1 [semak titik pada garis]

$a = 8$ ✓ N1 (kirakan jawapan murid)

ii. -2 (rujuk graf) ✓ N1 $[-1.9 \leq c \leq -2.1]$

iii. $y\sqrt{x} = 2$
 $x\sqrt{x} = 0.495$; $x^{\frac{3}{2}} = 0.495$ ✓ K1

Alternatif 1

$x = 0.495^{\frac{2}{3}}$
 $= 0.6258$ ✓ N1

Terima

$u\sqrt{u} = 0.5$
 $u^{\frac{3}{2}} = 0.5$
 $u = 0.5^{\frac{2}{3}} = 0.6300$

Alternatif 2

$\frac{3}{2} \log_{10} x = \log_{10} 0.495$
 $\log_{10} x = \frac{2}{3} \log 0.495$
 $x = 0.6258$ ✓ N1
 atau

$y\sqrt{x}$



SERTAI TELEGRAM @exercise_students

9

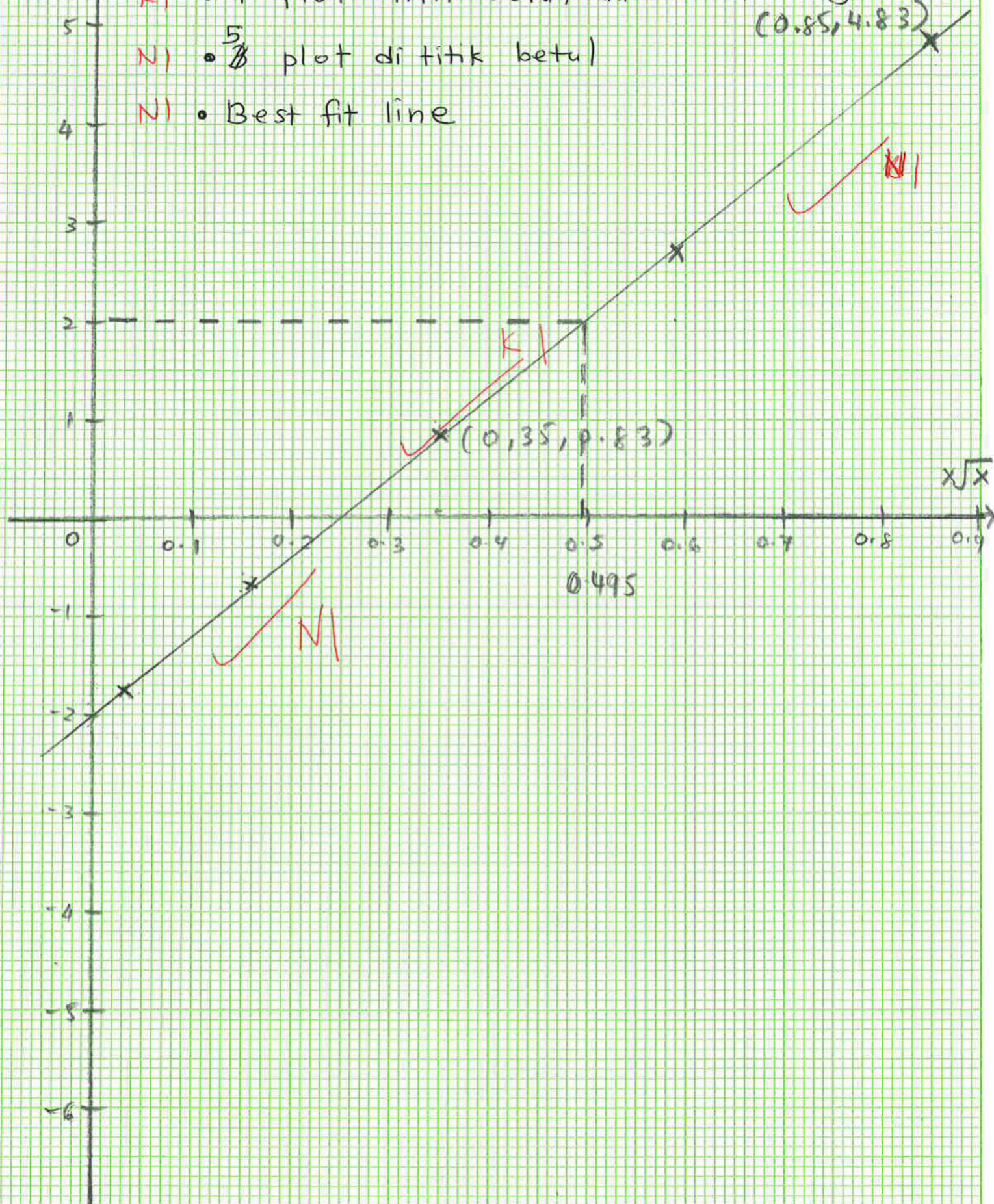
Name:

Date:

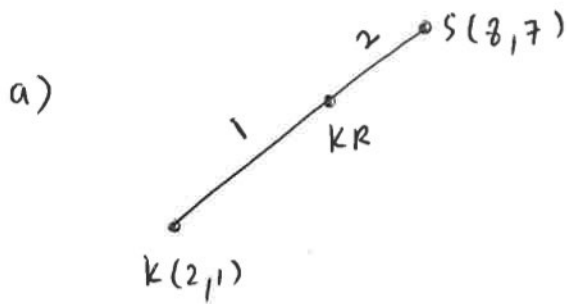
K1 • 1 plot titik betul dan skala seragam
(0.85, 4.83)

N1 • $\frac{5}{8}$ plot di titik betul

N1 • Best fit line



Jawapan / Answer:



$$\begin{aligned} \text{Kedai Runcit} &= \left(\frac{1(8) + 2(2)}{1+2}, \frac{1(7) + 2(1)}{1+2} \right) \checkmark K1 \\ &= (4, 3) \checkmark N1 \end{aligned}$$

$$\begin{aligned} b) m_1 &= \frac{5-3}{-2-4} \quad (-2,5) \quad (4,3) \\ &= -\frac{1}{3} \end{aligned}$$

$$\begin{aligned} * -\frac{1}{3} \times m_2 &= -1 \quad \checkmark K1 \quad (\text{tecerunaan munel}) \\ m_2 &= 3 \end{aligned}$$

$$(8,7)$$

$$y - 7 = 3(x - 8) \quad \checkmark K1$$

$$y = 3x - 24 + 7$$

$$y = 3x - 17 \quad \checkmark N1$$

Jawapan / Answer:

c) $L(x, y)$ $R(-2, 5)$ $S(8, 7)$

$$LS : LR = 3 : 2$$

$$\frac{LS}{LR} = \frac{3}{2}$$

$$2LS = 3LR$$

$$\left(2\sqrt{(x-8)^2 + (y-7)^2} = 3\sqrt{(x-(-2))^2 + (y-5)^2} \right)$$

$$4[x^2 - 16x + 64 + y^2 - 14y + 49] = 9[x^2 + 4x + 4 + y^2 - 10y + 25]$$

$$4x^2 - 64x + 256 + 4y^2 - 56y + 196 = 9x^2 + 36x + 36 + 9y^2 - 90y + 225$$

$$5x^2 + 5y^2 + 100x - 34y - 191 = 0$$

Nota:

K1 - ganti dalam rumus jarak

K1 - guna nisbah dan samakan persamaan

d) Gantikan $(2, 1)$

$$5(2)^2 + 5(1)^2 + 100(2) - 34(1) - 191 = 0$$

$$0 = 0$$

$0 = 0$, maka klinik termasuk dalam litar laluan 'drone' Azim.

Jawapan / Answer:

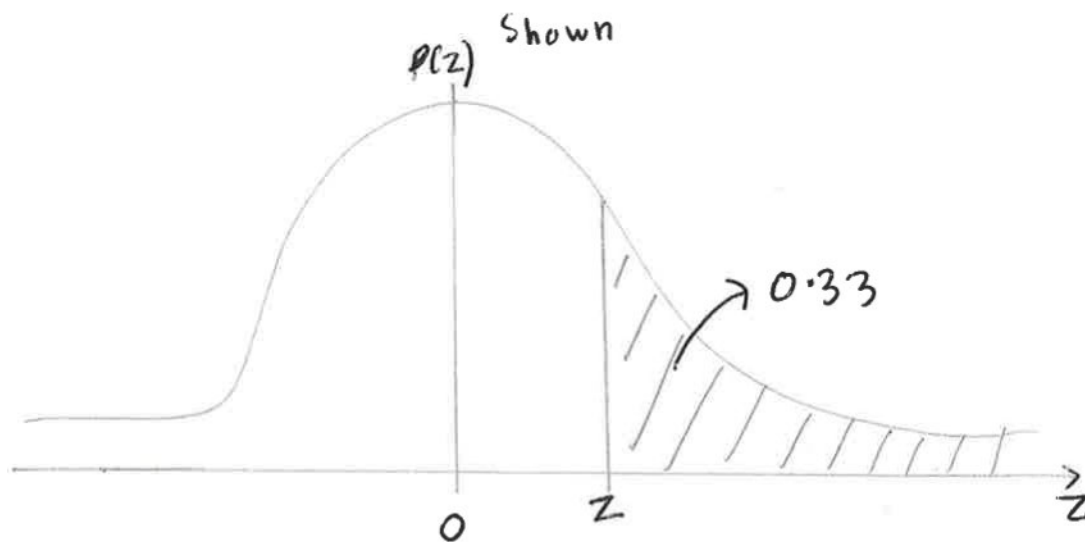
$$P(X > 300) = 0.33$$

$$P\left(Z > \frac{300 - \mu}{120}\right) = 0.33$$

$$Z = 0.44 \quad \text{NI}$$

$$\frac{300 - \mu}{120} = 0.44 \quad \text{KI}$$

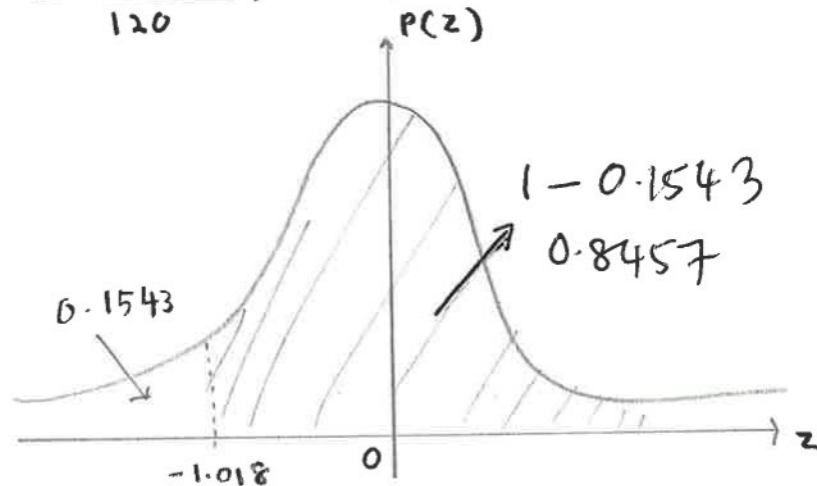
$$\mu = 247.2 \quad \text{NI}$$



Jawapan / Answer:

$$P(X > 125)$$

$$P\left(Z > \frac{125 - 247.2}{120}\right) = P(Z > -1.018)$$



$$P(Z > -1.018) = 1 - P(Z \leq -1.018)$$

$$= 0.8457$$

or seen
at graph

NI

Jawapan / Answer:

$$\begin{aligned} \text{C(i)} \quad P(X=6) &= {}^{10}C_6 (0.33)^6 (0.67)^{10-6} \quad \text{K1} \\ &= 0.0547 \quad \text{N1} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad P(X \leq 2) &= P(X=0) + P(X=1) + P(X=2) \\ &= {}^{10}C_0 (0.33)^0 (0.67)^{10} + {}^{10}C_1 (0.33)^1 (0.67)^9 + \\ &\quad {}^{10}C_2 (0.33)^2 (0.67)^8 \quad \text{K1K1} \\ &= 0.0182 + 0.0898 + 0.1990 \\ &= 0.3070 \quad \text{N1} \end{aligned}$$

masukkan
nilai dlm rumus
Salah satu betul

Semua betul
(ketiga-tiga)

Jawapan / Answer:

a) i) $v = -t^2 + ht - 4$, $t = 0$

$$v = -(0)^2 + h(0) - 4$$

$$v = -4 \quad \checkmark \text{ NI}$$

ii) $0 = -(1)^2 + h(1) - 4$ *

$$0 = -1 + h - 4$$

$$h = 5 \quad \checkmark \text{ NI}$$

$$0 = -(k)^2 + h(k) - 4$$
 *

$$0 = -k^2 + hk - 4$$

$$k^2 - hk + 4 = 0$$

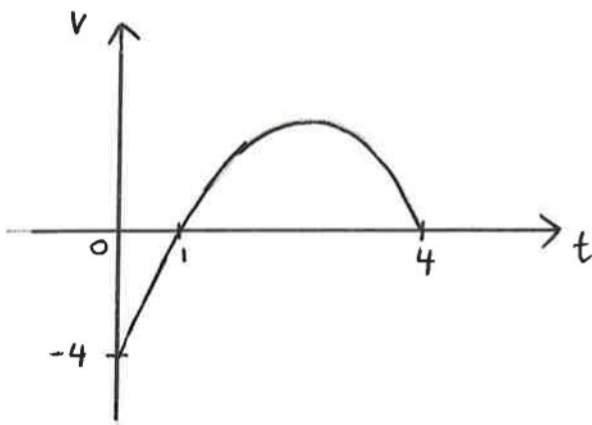
$$k^2 - 5k + 4 = 0$$

$$(k - 4)(k - 1) = 0$$

$$k = 4, k = 1$$

$$k = 4 \quad \checkmark \text{ NI}$$

b) $v = -t^2 + 5t - 4$



Graf : i) Guna alat tepi lurus, paksi-x & y & asalan & bentuk graf $\cap$ (NI)

ii) pintasan-x & y (NI)

c) $\int_1^4 -t^2 + 5t - 4 \, dt$

$$= \left[-\frac{t^3}{3} + \frac{5t^2}{2} - 4t \right]_1^4 \quad \checkmark \text{ KI}$$

$$= \left[-\frac{(4)^3}{3} + \frac{5(4)^2}{2} - 4(4) \right] - \left[-\frac{(1)^3}{3} + \frac{5(1)^2}{2} - 4(1) \right] \quad \checkmark \text{ KI}$$

$$= \frac{9}{2} \quad \checkmark \text{ NI}$$

Jawapan / Answer:

a) $x + y \leq 80$ ✓ NI

$y \leq 3x$ ✓ NI

$100x + 120y \geq 5000$
 $5x + 6y \geq 250$ } @ NI

b) Satu garis betul ✓ K1

Semua garis betul ✓ NI

Rantau ✓ NI

Jika No pada graf, semua jawapan selepas juga ialah No

c) nilai maksimum : (20, 60)

Pakej Elit = 60 ✓ NI

d)

$k = 20x + 30y$

(11, 33) titik min ✓ NI

katilkan $k \leq 600$

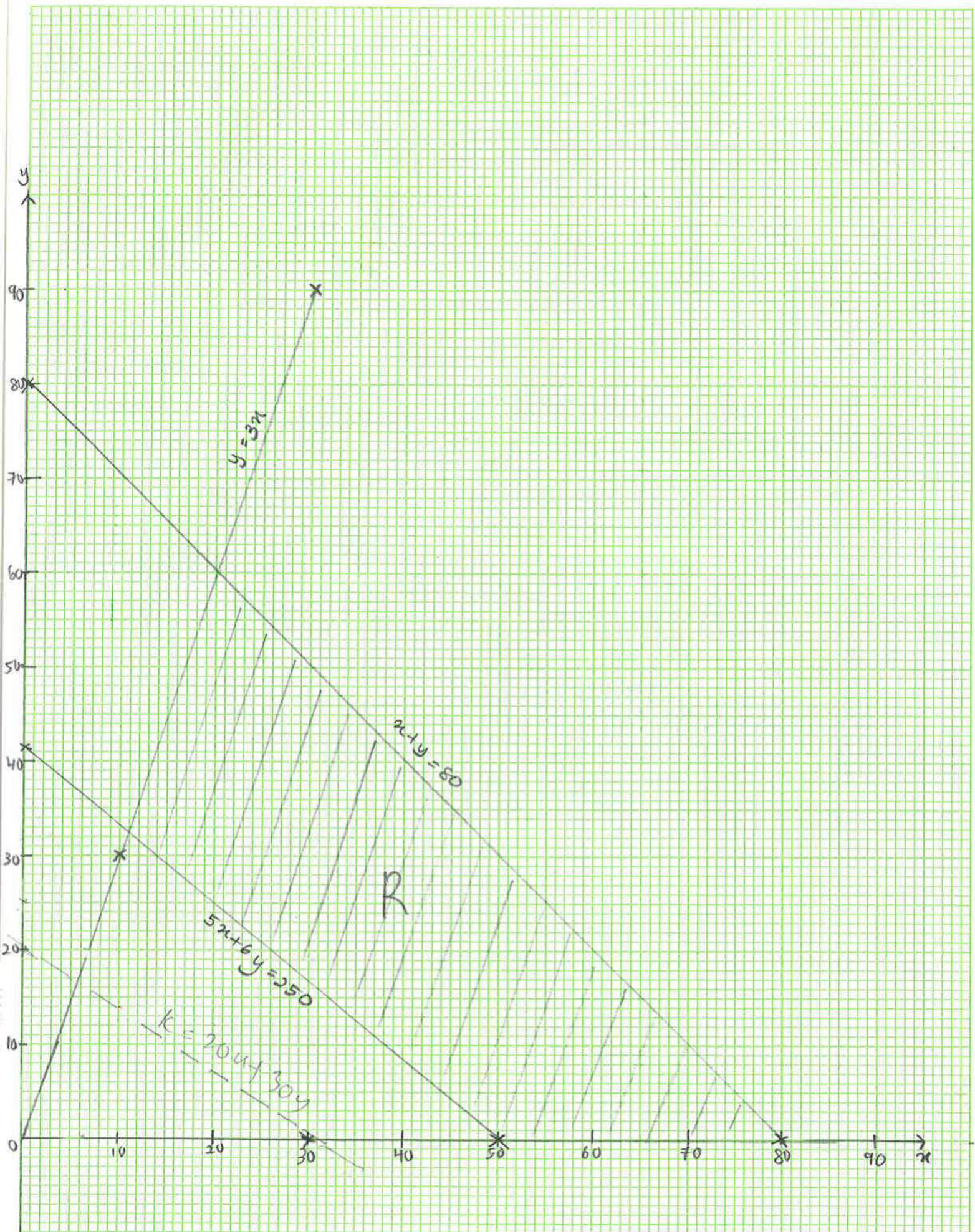
$20x + 30y = 600$

$k = 20(11) + 30(33)$ ✓ K1

$k = 1210$ ✓ NI

x	0	30
y	20	0

[seen
fungsi garis
objektif]



Jawapan / Answer:

panjang SU

$$a) \frac{SU}{\sin 105} = \frac{12.5}{\sin 31} \quad \text{K1}$$

$$SU = 23.4431 \quad \text{N1}$$

panjang TU

$$b) TU^2 = (5.4)^2 + 23.4431^2 - 2(5.4)(23.4431) \cos 44 \quad \text{K1}$$

$$TU^2 = 396.6125$$

$$TU = 19.9151 \quad \text{N1} \quad (49.5) \text{ fenne}$$

c) sudut STU

$$23.4431^2 = 5.4^2 + 19.9151^2 - 2(5.4)(19.9151) \cos STU \quad \text{K1}$$

$$\angle STU = 125.14^\circ \quad \text{N1}$$

atau

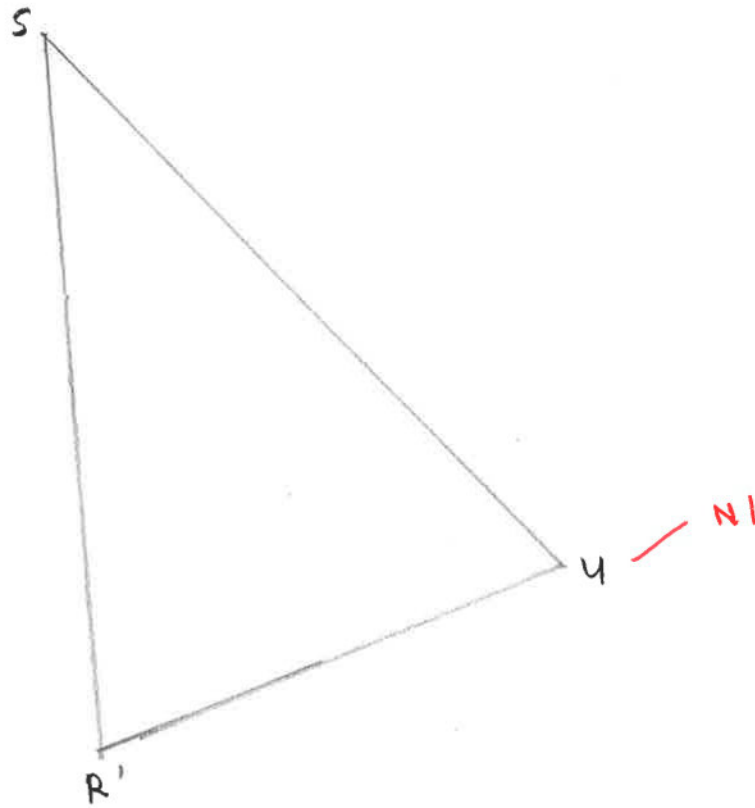
$$\frac{\sin STU}{23.4431} = \frac{\sin 44}{19.9151} \quad \text{K1}$$

$$\angle STU = 54.86$$

$$\angle STM = 180 - 54.86$$

$$= 125.14^\circ \quad \text{N1}$$

Jawapan / Answer:



$$\angle SUR' = 74^\circ \quad \text{PI}$$

$$\text{Area} = \frac{1}{2} (23.4431)(12.5) \sin 74^\circ \quad \text{KI}$$

$$= 140.84 \quad \text{NI}$$

Jawapan / Answer:

(a).

$$130 = \frac{x}{75} \times 100$$

$$x = \frac{130(75)}{100}$$

$$= 97.5$$

$$135 = \frac{81}{y} \times 100$$

$$y = \frac{81}{135} \times 100$$

$$= 60$$

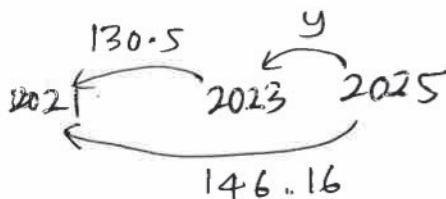
(b).

$$I_{23} = \frac{120(144) + 130(108) + 150(72) + 135(36)}{144 + 108 + 72 + 36}$$

$$= \frac{46980}{360}$$

$$= 130.5$$

(c).



$$146.16 = \frac{130.5 y}{100}$$

$$y = \frac{146.16(100)}{130.5}$$

$$I_1 = 112$$

$$p = 112 - 100$$

$$= 12$$

[Terima kasih seters]

(d).

$$112 = \frac{Q_1}{600} \times 100$$

$$Q_1 = \frac{112(600)}{100}$$

$$= 672$$

$$\frac{127}{100} \times 672 = \text{RM } 853.44$$

$$\begin{aligned} & @ \frac{27}{100} \times 672 = \text{RM } 181.44 \\ & 672 + 181.44 = \text{RM } 853.44 \end{aligned}$$