

- 1 (a) Diberi bahawa fungsi $f: x \rightarrow x-5$ dan $g: x \rightarrow \frac{2}{x-1}, x \neq 1$.

74 Cari nilai bagi fungsi gubahan $gf(10)$. [2 markah]

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It is given that the functions $f: x \rightarrow x-5$ and $g: x \rightarrow \frac{2}{x-1}, x \neq 1$.

Find the value of composite function $gf(10)$. [2 marks]

$$f(10) = 10 - 5 = 5$$

$$gf(10) = g(5) = \frac{2}{5-1}$$

$$= \frac{2}{4}$$

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

2

- (b) Rajah 1 menunjukkan graf bagi fungsi $y = k(x)$ bagi domain $x \geq p$.

Diagram 1 shows the graph of function $y = k(x)$ for domain $x \geq p$.

- (i) Diberi fungsi $y = h(x)$ ialah songsangan bagi fungsi $k(x)$, lakarkan graf bagi fungsi $h(x)$ pada Rajah 1.

Seterusnya, nyatakan domain bagi $h(x)$.

Given that the function $y = h(x)$ is an inverse function of $k(x)$, sketch the graph of function $h(x)$ on Diagram 1.

Hence, state the domain of $h(x)$.

$\leftarrow (8, a)$

- (ii) Diberi bahawa fungsi $k(x) = \sqrt{x-b}$ dan $(a, 8)$ berada pada lengkung $h(x)$.

Ungkapkan a dalam sebutan b .

It is given that the function $k(x) = \sqrt{x-b}$ and $(a, 8)$ lies on the curve $h(x)$.

Express a in terms of b .

[5 markah]

[5 marks]

(ii)

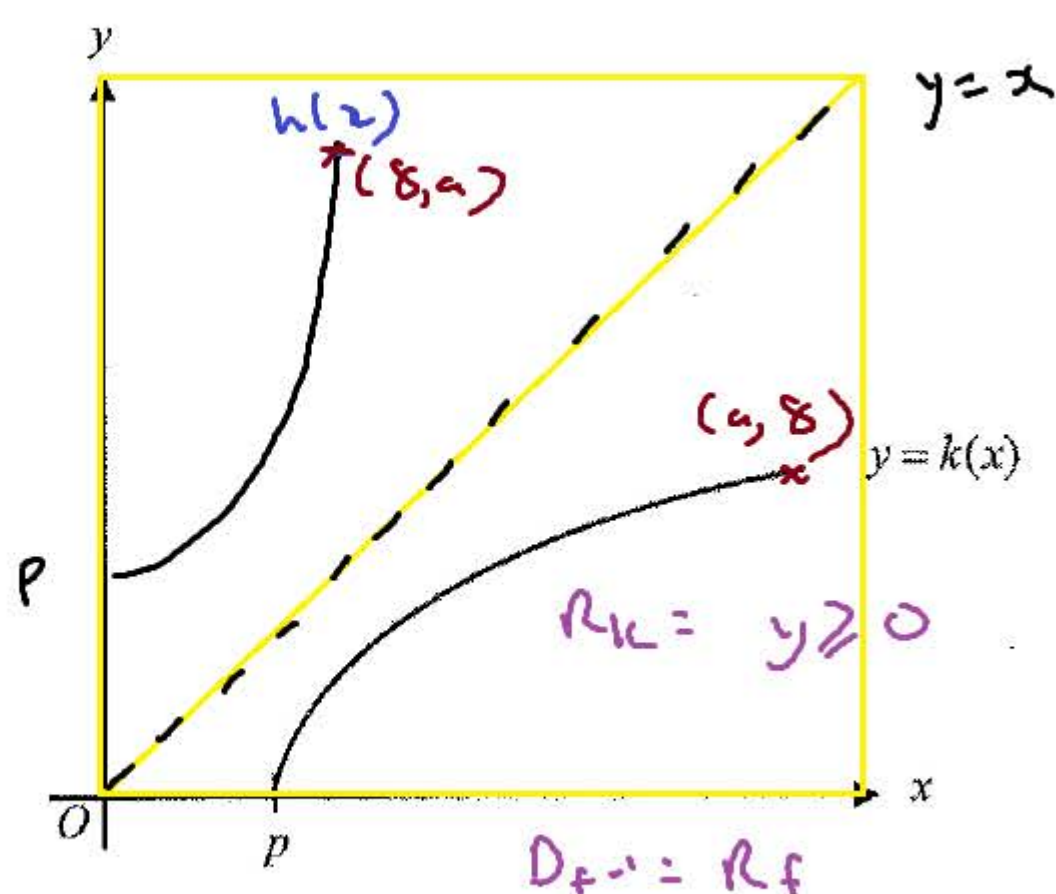
$$k(x) = \sqrt{x-b}$$

$$a = \sqrt{8-b}$$

$\begin{matrix} x & k(x) \\ (8, a) \end{matrix}$

2

(b) (i)



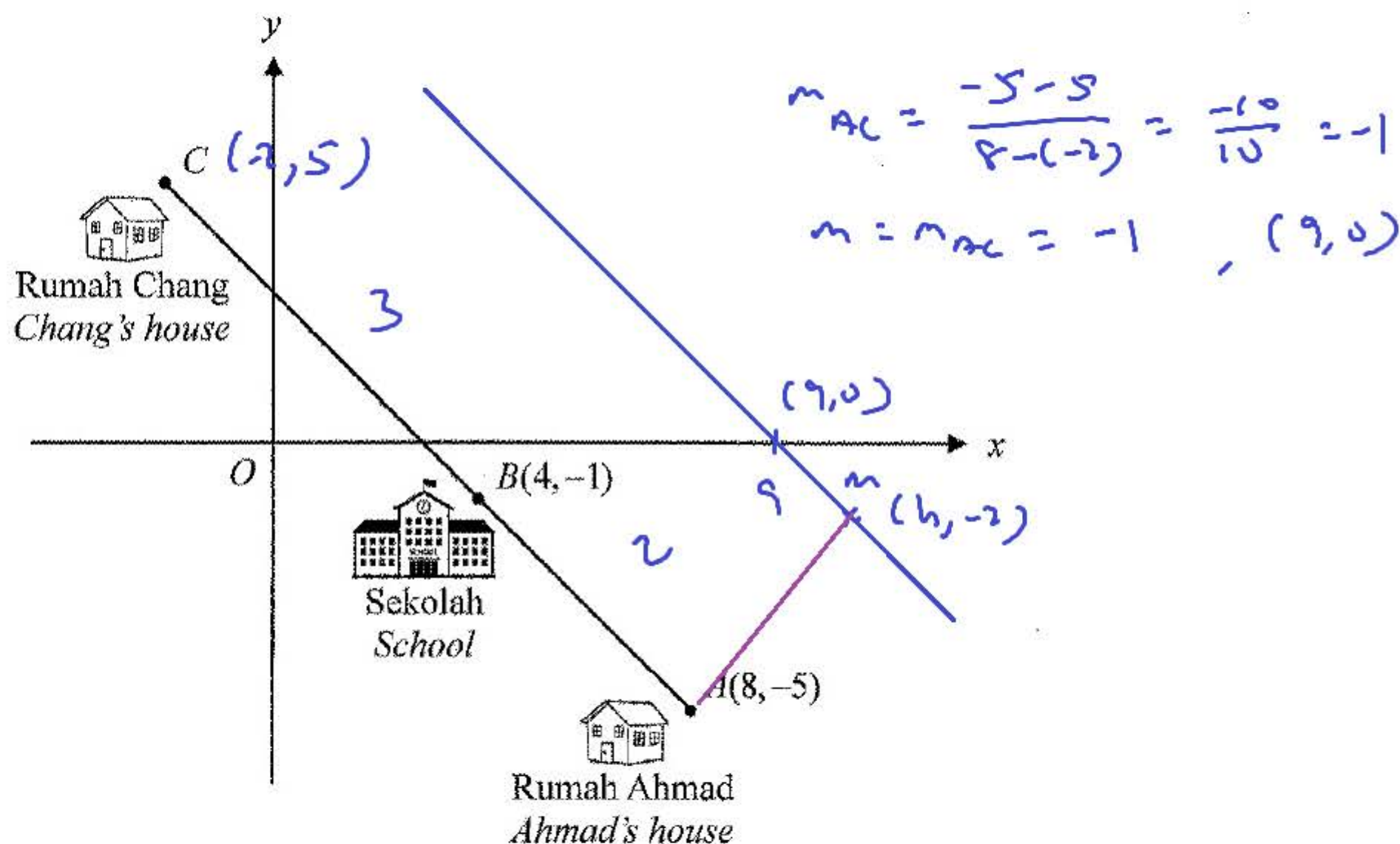
Domain $h(x)$: $x \geq 0$

2 Penyelesaian secara lukisan berskala **tidak** diterima.

14 Solution by scale drawing is **not** accepted.

87 Rajah 2 menunjukkan kedudukan rumah Ahmad, sekolah dan rumah Chang yang berada pada satu jalan yang lurus.

Diagram 2 shows the position of Ahmad's house, the school and Chang's house which are located on a straight road.



Rajah 2
Diagram 2

Ahmad dan Chang berbasikal dari rumah mereka ke sekolah melalui jalan tersebut dengan kelajuan masing-masing 14 km/j dan 21 km/j. Waktu mereka bertolak dari rumah masing-masing dan waktu mereka tiba di sekolah adalah sama.

Ahmad and Chang cycled from their houses to the school with a speed of 14 km/h and 21 km/h respectively. The time they left their house and the time they arrived at school are the same.

(a) Cari koordinat C.

Find the coordinates of C.

[3 markah]

[3 marks]

(b) Sebuah masjid terletak di Jalan Bakawali pada $(h, -2)$. Jalan tersebut adalah selari dengan jalan AC dan menyalang paksi-x pada $x = 9$. Sebuah laluan baharu akan dibina bagi menghubungkan masjid dan rumah Ahmad.

Tentukan sama ada laluan itu merupakan laluan terpendek antara masjid dan jalan AC.

[4 markah]

A mosque is located on Jalan Bakawali at $(h, -2)$. The road is parallel to the road AC and intersects the x-axis at $x = 9$. A new pathway will be built connecting the mosque and Ahmad's house.

Determine whether the pathway is the shortest pathway between the mosque and the road AC.

[4 marks]

$$d_1 = 3 \times t,$$

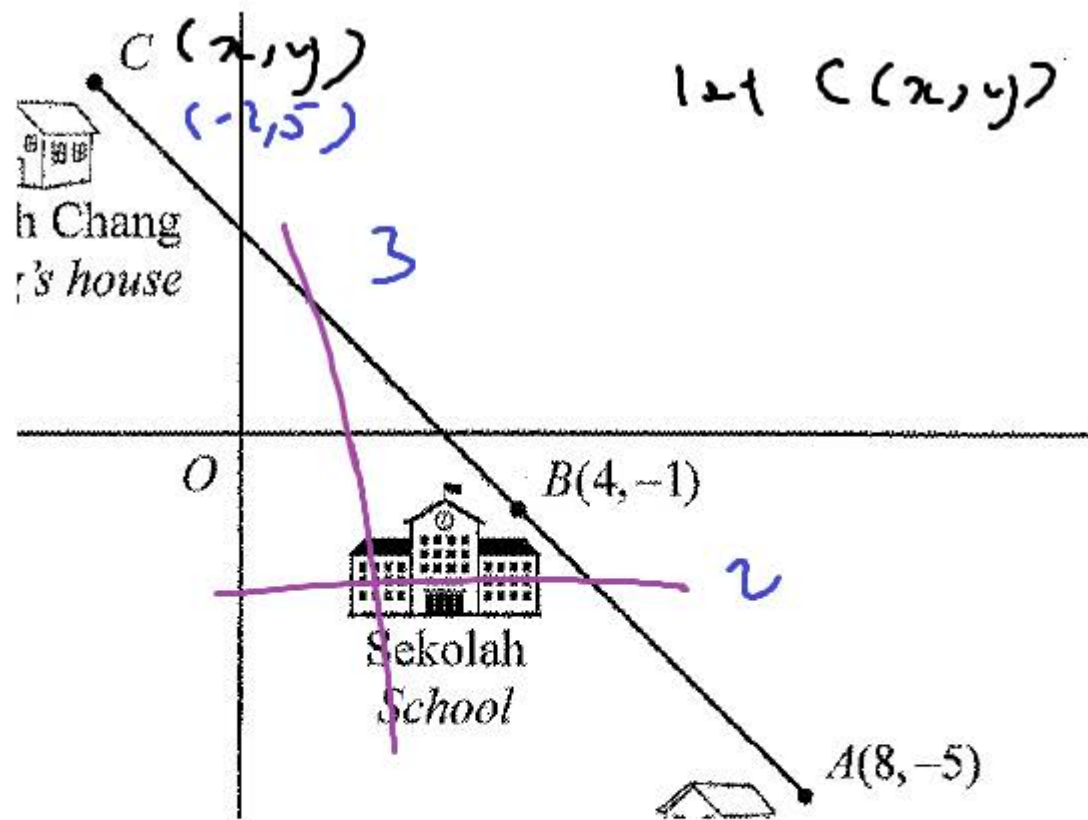
$$d_A = 14t$$

$$d_C = 21t$$

$$d_A : d_C$$

$$= 14t : 21t$$

$$= 2 : 3$$



$$121 C(x, y)$$

$$\frac{2x + 3(8)}{2+3} = 4$$

$$\frac{2y + 3(-5)}{2+3} = -1$$

$$2x + 24 = 20$$

$$2y - 15 = -5$$

$$2x = -4$$

$$2y = 10$$

$$x = -2$$

$$y = 5$$

$$C(-2, 5)$$

$$(b) \quad m_{AC} = \frac{-5-5}{8-(-2)} = \frac{-10}{10} = -1$$

$$m = m_{AC} = -1, (9, 0)$$

$$y - 0 = -1(x - 9)$$

$$y = -x + 9$$

$$m(11, -2) \quad A(8, -5)$$

$$m_{MA} = \frac{-2-(-5)}{11-8} = \frac{3}{3} = 1$$

$$m_{MA} \cdot m_{AC} = 1 \cdot (-1) = -1$$

$$\therefore \perp$$

$\therefore$ laluan itu merupakan laluan terpendek antara masjid dan jalan AC.

3 (a) Persamaan kuadrat $-2x^2 - 7x + 5 = 0$ mempunyai punca-punca α dan β .

A quadratic equation $-2x^2 - 7x + 5 = 0$ has roots of α and β .

$$a = -2, \quad b = -7, \quad c = 5$$

(i) Cari nilai $\alpha + \beta$ dan $\alpha\beta$.

Find the value of $\alpha + \beta$ and $\alpha\beta$.

(ii) Seterusnya, bentukkan persamaan kuadrat dengan punca-punca $\alpha + 3$ dan $\beta + 3$.

Hence, form the quadratic equation with roots $\alpha + 3$ and $\beta + 3$.

[3 markah]

[3 marks]

$$(i) \quad S.O.R. = -\frac{b}{a}$$

$$P.O.R. = \frac{c}{a}$$

$$\alpha + \beta = -\frac{-7}{-2}$$

$$\alpha\beta = \frac{5}{-2}$$

$$= -\frac{7}{2}$$

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

$$\alpha + 3, \quad \beta + 3$$

$$\text{new S.O.R.} = \alpha + 3 + \beta + 3$$

$$\text{new R.O.R.} = (\alpha + 3)(\beta + 3)$$

$$= \alpha + \beta + 6$$

$$= \alpha\beta + 3\alpha + 3\beta + 9$$

$$= -\frac{7}{2} + 6$$

$$= \alpha\beta + 3(\alpha + \beta) + 9$$

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

$$= -\frac{5}{2} + 3\left(-\frac{7}{2}\right) + 9$$

$$x^2 - S.O.R. x + P.O.R. = 0$$

$$= -4$$

$$x^2 - \frac{5}{2}x + 4 = 0$$

$$2x^2 - 5x + 8 = 0$$

- (b) Persamaan kuadrat $3x(2-3x) = m+n$ mempunyai dua punca yang nyata dan sama, dengan keadaan m dan n ialah pemalar.

74
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Ungkapkan m dalam sebutan n .

$$m = f(n)$$

[3 markah]

A quadratic equation $3x(2-3x) = m+n$ has two real and equal roots such that m and n are constants.

Express m in terms of n .

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

[3 marks]

$$3x(2-3x) = m+n$$

$$6x - 9x^2 = m+n$$

$$9x^2 - 6x + m+n = 0$$

$$a=9, \quad b=-6, \quad c=m+n$$

$$(-6)^2 - 4(9)(m+n) = 0$$

$$36 - 36m - 36n = 0$$

$$1 - m - n = 0$$

$$1 - n = m$$

$$\therefore m = 1 - n$$

$$ax^2 + bx + c$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac$$

> 0

= 0

< 0

2 R & D

2 R & E

no R.R.

≥ 0

tangen

has R.R.

- 4 (a) Dalam satu jangjang geometri, sebutan ke-7 ialah 3 kali sebutan ke-6.
Tunjukkan bahawa hasil tambah 4 sebutan yang pertama adalah 10 kali hasil tambah 2 sebutan yang pertama. [3 markah]

In a geometric progression, the 7th term is 3 times the 6th term.

Show that the sum of the first 4 terms is 10 times the sum of the first 2 terms.

[3 marks]

G.P. a, r , $T_n = ar^{n-1}$, $S_n = \frac{a(r^n - 1)}{r - 1}$

$$T_7 = 3 T_6$$

$$S_4 = \frac{a(3^4 - 1)}{3 - 1} = \frac{a(80)}{2}$$

$$= 40a$$

$$\cancel{a}r^{7-1} = 3 \cancel{a}r^{6-1}$$

$$\cancel{r^6} = 3 \cancel{r^5}$$

$$r = 3$$

$$S_2 = a + a(3)$$

$$= 4a$$

$$* T_2 = ar^{2-1} = ar$$

$$S_2 = \frac{a(3^2 - 1)}{3 - 1} = \frac{8a}{2} = 4a$$

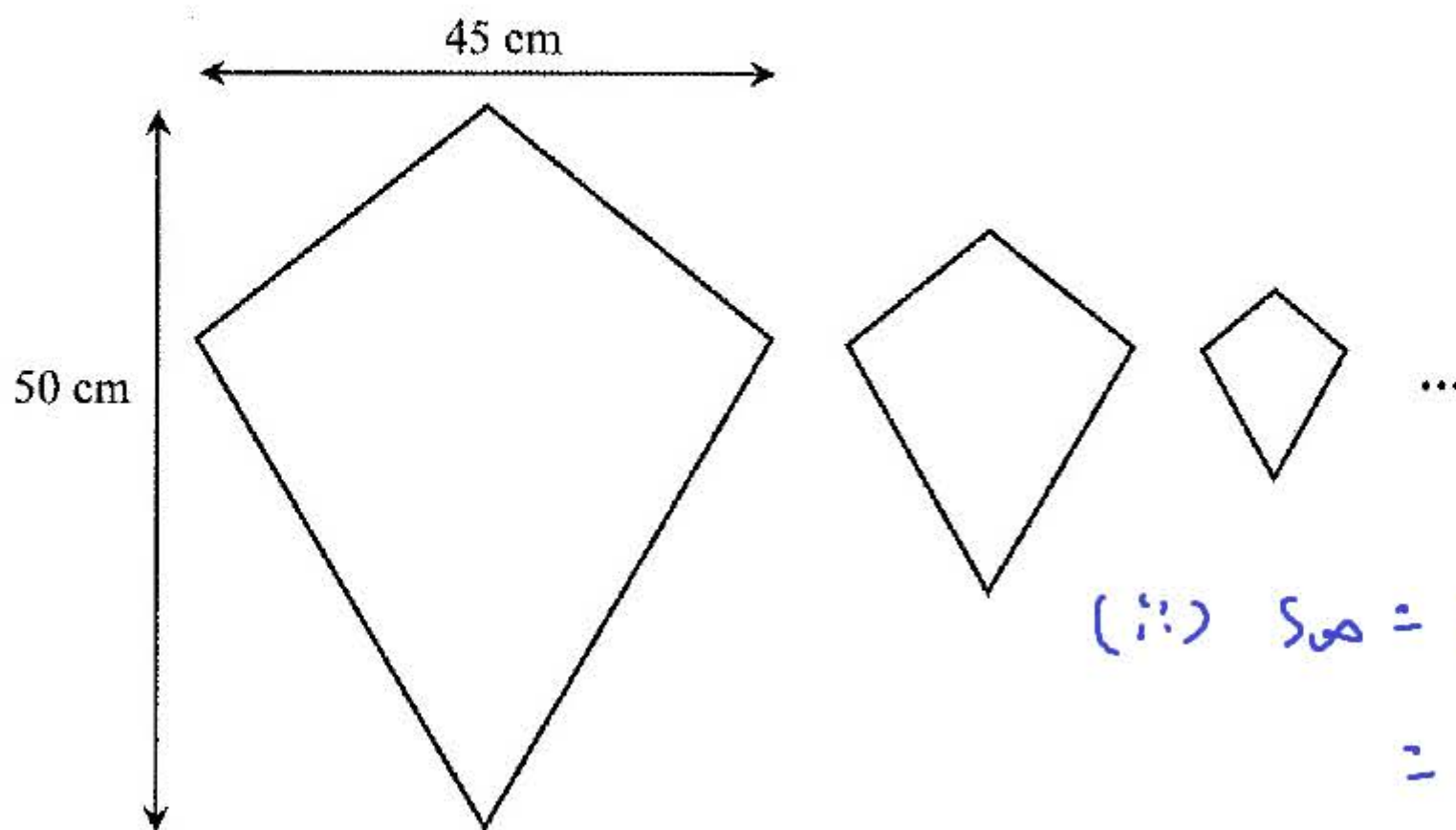
$$40a = 10(4a)$$

$$S_4 = 10 S_2$$

7

(b) Rajah 3 menunjukkan susunan tiga layang yang pertama daripada satu siri tak terhingga bagi layang yang serupa.

Diagram 3 shows the arrangement of the first three kites of an infinite series of similar kites.



Rajah 3
Diagram 3

Layang pertama mempunyai panjang pepenjuru 50 cm dan 45 cm. Ukuran pepenjuru bagi setiap layang berikutnya adalah separuh daripada ukuran sebelumnya. Luas layang itu membentuk satu jangjang geometri.

The first kite has length of diagonals of 50 cm and 45 cm. The measurements of the diagonals of each subsequent kite are half of the measurements of the previous one. The area of the kites formed a geometric progression.

$$\left[\text{Luas layang} = \frac{1}{2} \times \text{hasil darab panjang dua pepenjuru} \right]$$

$$\left[\text{Area of kite} = \frac{1}{2} \times \text{product of the lengths of two diagonals} \right]$$

(i) Nyatakan sebutan pertama dan nisbah sepunya bagi jangjang tersebut.
State the first term and the common ratio of the progression.

(ii) Seterusnya, cari hasil tambah ketakterhinggaan bagi luas, dalam cm^2 , bagi layang itu.

Hence, find the sum to infinity of the area, in cm^2 , of the kites.

[4 markah]

[4 marks]

$$A_1 = \frac{1}{2} (45)(50) = 1125$$

$$A_2 = \frac{1}{2} \left(\frac{45}{2} \right) \left(\frac{50}{2} \right) = \frac{1125}{4}$$

$$r = \frac{\frac{1125}{4}}{1125} = \frac{1}{4}$$

$$a = 1125, r = \frac{1}{4}$$

$$(\therefore) S_{\infty} = \frac{a}{1-r}$$

$$= \frac{1125}{1 - \frac{1}{4}}$$

$$= 1500 \text{ cm}^2$$

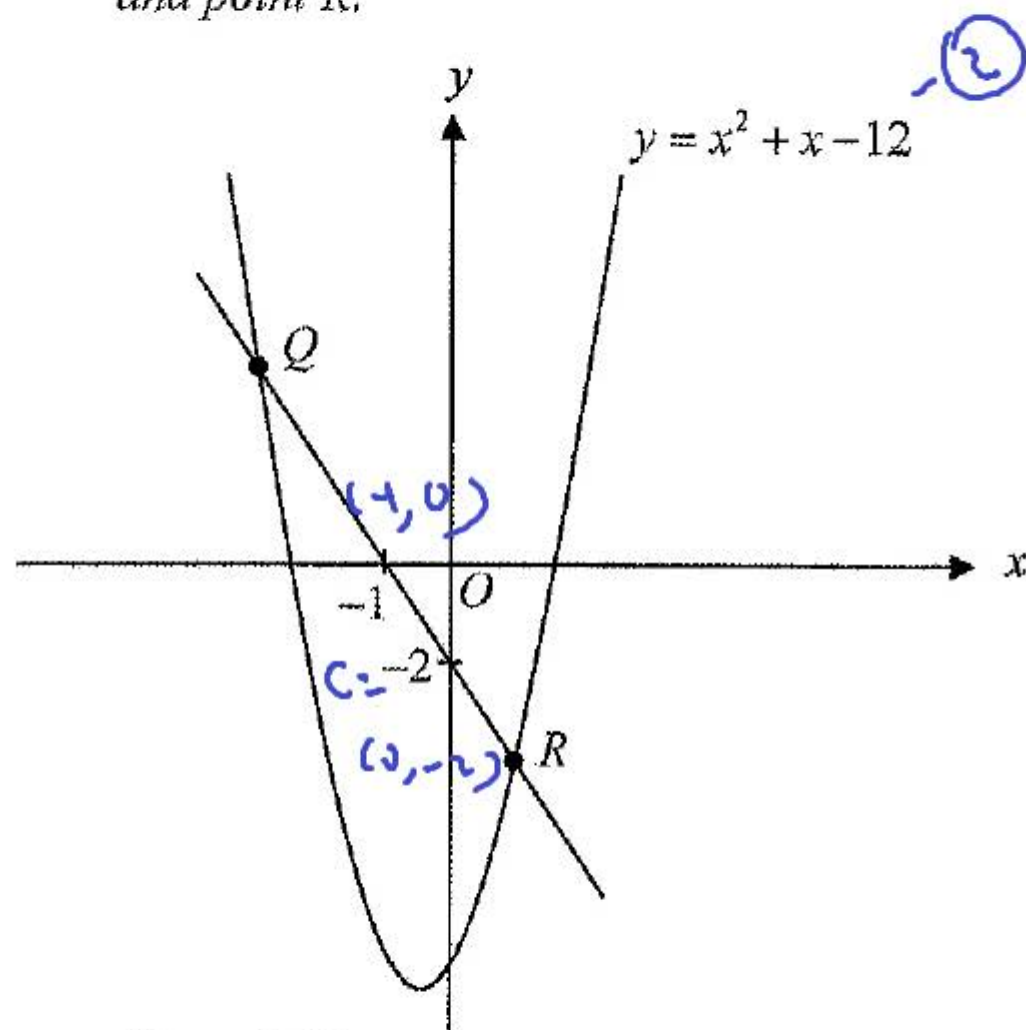
24

5 Penyelesaian secara lukisan berskala **tidak** diterima.

Solution by scale drawing is not accepted.

Rajah 4 menunjukkan satu lengkung $y = x^2 + x - 12$ yang menyilang suatu garis lurus pada titik Q dan titik R.

Diagram 4 shows a curve $y = x^2 + x - 12$ which intersects a straight line at point Q and point R.



[6 markah]

[6 marks]

Cari koordinat Q dan koordinat R.

Find the coordinates of Q and the coordinates of R.

$$m_{QR} = \frac{-2-0}{0-(-1)} = \frac{-2}{1} = -2$$

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

Sub (1) into (2)

$$-2x - 2 = x^2 + x - 12$$

$$x^2 + 3x - 10 = 0$$

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

$$x - 2 = 0$$

$$x = 2$$

$$x + 5 = 0$$

$$x = -5$$

Sub $x = 2$ into (1)

$$y = -2(2) - 2$$

$$= -6$$

$$R(2, -6)$$

$x \neq 0$

Sub $x = -5$ into (1)

$$y = -2(-5) - 2$$

$$= 8$$

$$Q(-5, 8)$$

- 6 (a) Buktikan bahawa $\sec \theta - \frac{\sin^2 \theta}{\cos \theta} = \cos \theta$.

[2 markah]

TS
BB

Prove that $\sec \theta - \frac{\sin^2 \theta}{\cos \theta} = \cos \theta$.

[2 marks]

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

= $\frac{\cancel{\cos^2 \theta}}{\cancel{\cos \theta}}$

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

= $\cos \theta$

= RHS

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

$s^2 + c^2 = 1$
 $c^2 = 1 - s^2$

- (b) (i) Lakarkan graf $y = \sec 2\theta - \frac{\sin^2 2\theta}{\cos 2\theta}$ untuk $0 \leq \theta \leq 2\pi$.

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

TS
BB

Sketch the graph of $y = \sec 2\theta - \frac{\sin^2 2\theta}{\cos 2\theta}$ for $0 \leq \theta \leq 2\pi$.

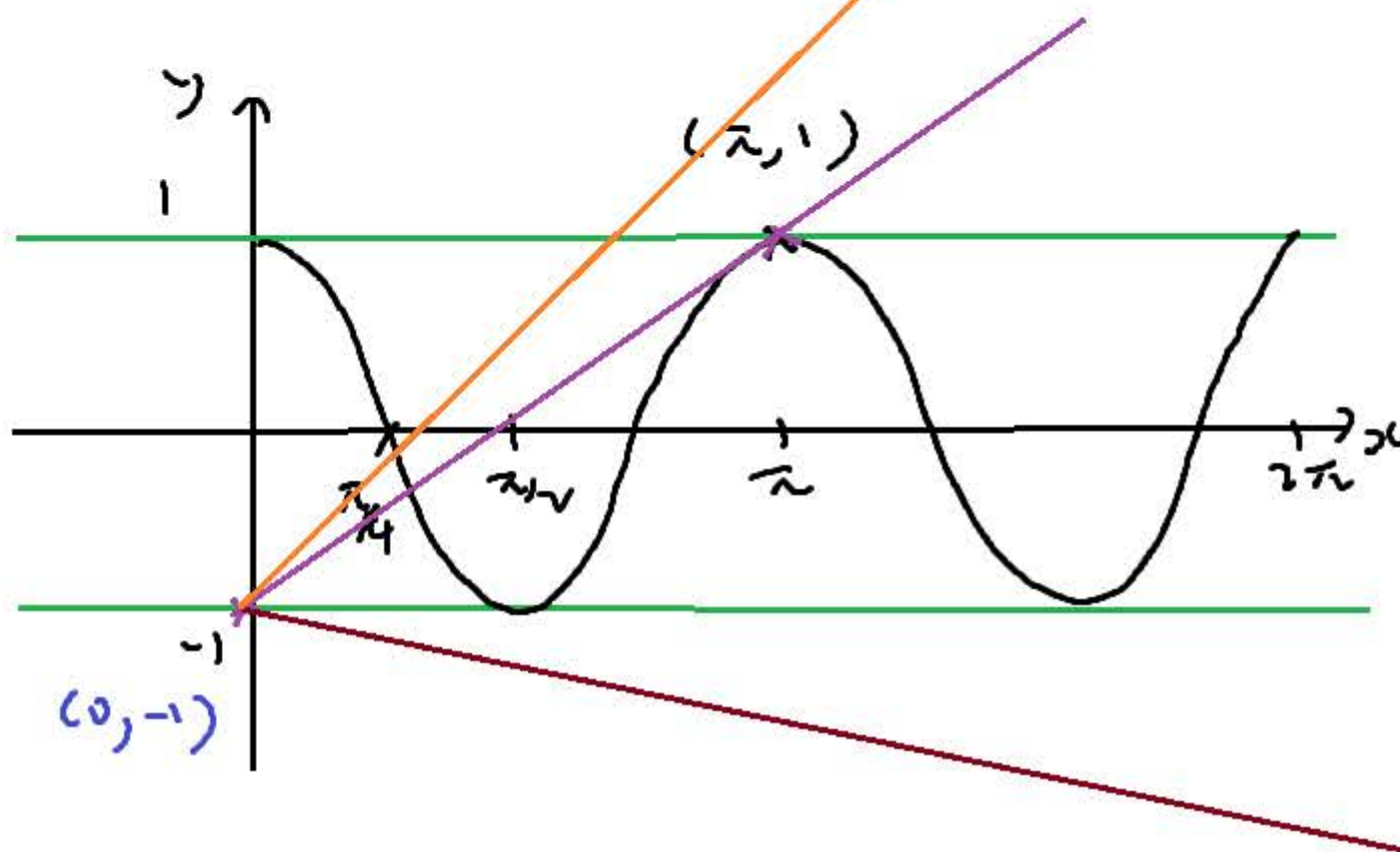
$y = \sec 2\theta - \frac{\sin^2 2\theta}{\cos 2\theta} = \cos 2\theta$

- (ii) Jika garis lurus $y = m\theta - 1$ tidak bertemu dengan graf anda di 6 (b)(i) untuk $\pi \leq \theta \leq 2\pi$, cari julat nilai m dalam sebutan π .

If the straight line $y = m\theta - 1$ does not meet your graph in 6 (b)(i) for $\pi \leq \theta \leq 2\pi$, find the range of values of m in terms of π .

[5 markah]

[5 marks]



$m = \frac{1 - (-1)}{\pi - 0} = \frac{2}{\pi}$

$m > \frac{2}{\pi}$

$m < 0$

$$t=0, T=180^{\circ}\text{C}$$

7 (a) Sebikar iodine bersuhu 180°C dibiarkan menyejuk pada kadar $\frac{dT}{dt} = -\frac{70}{(t+1)^2}$

TS

B3

dengan keadaan $T^{\circ}\text{C}$ ialah suhu iodine dan t ialah masa yang diambil, dalam saat, bagi proses penyejukan tersebut.

A beaker of iodine with temperature of 180°C is left to cool at the rate of

$$\frac{dT}{dt} = -\frac{70}{(t+1)^2} \text{ such that } T^{\circ}\text{C} \text{ is the temperature of the iodine and } t \text{ is the time}$$

taken, in seconds, for the cooling process.

(i) Cari persamaan T dalam sebutan t .

Find the equation of T in terms of t .

(ii) Iodin adalah satu elemen yang wujud dalam keadaan cecair apabila suhu melebihi 113°C .

Hitung masa minimum yang diambil, dalam saat, untuk iodine tersebut wujud dalam keadaan pepejal.

Iodine is an element that exists in a liquid state when temperature is above 113°C .

Calculate the minimum time taken, in seconds, for the iodine to exist in solid state.

[5 markah]

[5 marks]

$$\frac{dT}{dt} = -\frac{70}{(t+1)^2}$$

$$T = \int -70(t+1)^{-2} dt$$

$$= \frac{-70(t+1)^{-1}}{-1(1)} + C$$

$$\therefore T = \frac{70}{t+1} + 110$$

$$T = \frac{+70}{t+1} + C, (0, 180)$$

$$180 = \frac{+70}{0+1} + C$$

$$C = 180 - 70 \\ = 110$$

$$b) T = 113$$

$$113 = \frac{70}{t+1} + 110$$

$$3 = \frac{70}{t+1}$$

$$3(t+1) = 70$$

$$t+1 = \frac{70}{3}$$

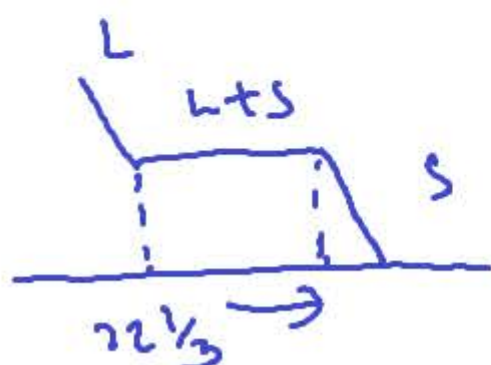
$$t = \frac{70}{3} - 1$$

$$= \frac{67}{3}$$

$$= 22\frac{1}{3} \text{ s}$$

$$Q = mL$$

$$L \rightarrow S$$



(b) Kos pembuatan, C dalam RM, bagi x helai kemeja di sebuah kilang ialah

TS

$C(x) = 100\,000 + 50x + 0.0025x^2$ dan harga jualannya ialah RM100 sehelai.

B2

Pihak pengurusan menetapkan sasaran keuntungan ialah RM200 000.

Dengan menggunakan kaedah pembezaan, tentukan sama ada kilang tersebut berjaya mencapai sasaran dan berikan justifikasi anda. [5 markah]

The manufacturing cost, C in RM, for x pieces of shirt at a factory is

$C(x) = 100\,000 + 50x + 0.0025x^2$ and its selling price is RM100 per piece.

The management sets the profit target of RM200 000.

By using the differentiation method, determine whether the factory is able to achieve the target and give your justification. [5 marks]

$$P(x) = 100x - C(x) = 100x - (100\,000 + 50x + 0.0025x^2)$$

$$P(x) = 50x - 100\,000 - 0.0025x^2$$

$$\frac{dP}{dx} = 50 - 0.005x$$

$$\frac{dP}{dx} = 0 \Rightarrow 50 - 0.005x = 0$$

$$50 = 0.005x$$

$$x = 10\,000$$

$50x - 100\,000 - 0.0025x^2$
$150\,000$

$$P(10\,000) = 50(10\,000) - 100\,000 - 0.0025(10\,000)^2$$

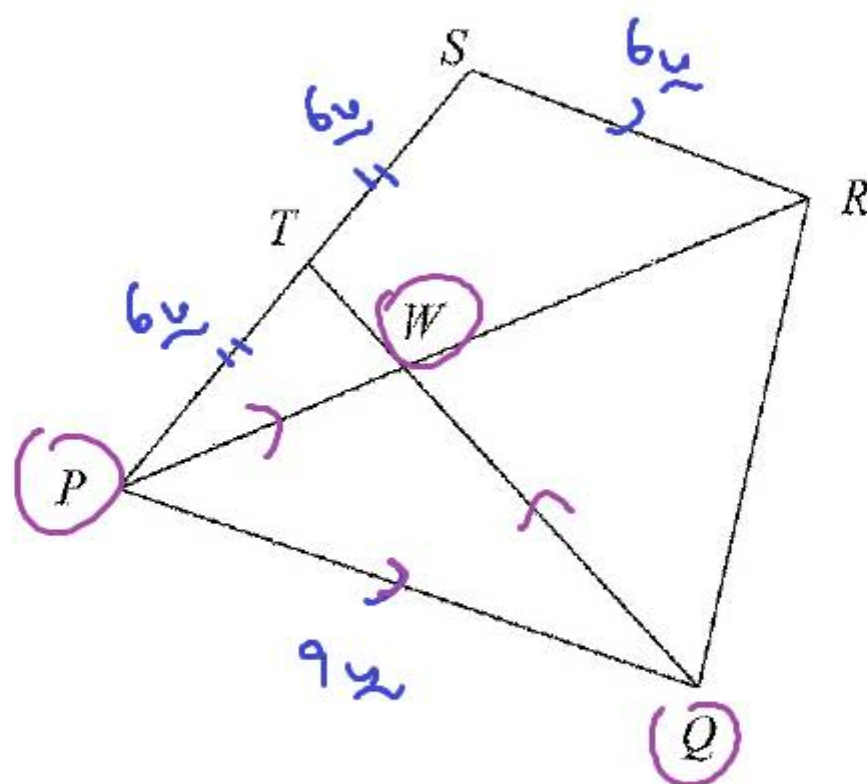
$$= 150\,000 < 200\,000$$

kilang tersebut **tidak** mencapai sasaran ,

8 Rajah 5 menunjukkan sisi empat PQRS.

74 Diagram 5 shows a quadrilateral PQRS.

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Titik T ialah titik tengah PS . PQ dan SR adalah selari dengan keadaan $\overrightarrow{SR} = \frac{2}{3}\overrightarrow{PQ}$.

Point T is the midpoint of PS . PQ and SR are parallel such that $\overrightarrow{SR} = \frac{2}{3}\overrightarrow{PQ}$.

(a) Diberi bahawa $\overrightarrow{PQ} = 9\underline{u}$ dan $\overrightarrow{PT} = 6\underline{v}$.

It is given that $\overrightarrow{PQ} = 9\underline{u}$ and $\overrightarrow{PT} = 6\underline{v}$.

Ungkapkan dalam sebutan $\underline{u}$ dan/atau $\underline{v}$

Express in terms of $\underline{u}$ and/or $\underline{v}$

(i) $\overrightarrow{QT}$,

(ii) $\overrightarrow{PR}$.

$$\begin{aligned}\vec{SR} &= \frac{2}{3}(9\underline{u}) \\ &= 6\underline{u}\end{aligned}$$

[3 markah]

[3 marks]

(b) Dengan menggunakan $\overrightarrow{PW} = k\overrightarrow{PR}$ dan $\overrightarrow{QW} = h\overrightarrow{QT}$, dengan keadaan h dan k ialah pemalar, cari nilai h dan nilai k .

[5 markah]

Using $\overrightarrow{PW} = k\overrightarrow{PR}$ and $\overrightarrow{QW} = h\overrightarrow{QT}$, such that h and k are constants, find the value of h and of k .

[5 marks]

(c) Diberi bahawa $|\underline{u}| = 5$ unit dan luas segi tiga PQW ialah 135 cm^2 , cari jarak terpendek dari titik W ke PQ .

[2 markah]

Given that $|\underline{u}| = 5$ units and the area of triangle PQW is 135 cm^2 , find the shortest distance from point W to PQ .

[2 marks]

$$\overrightarrow{SR} = \frac{2}{3} \overrightarrow{PQ}$$

$$\begin{aligned}\vec{SR} &= \frac{2}{3}(9\hat{u}) \\ &= 6\hat{u}\end{aligned}$$

$$\begin{aligned}\text{(a)} \quad \text{(i)} \quad \vec{QT} &= \vec{QP} + \vec{PT} \\ &= -9\hat{u} + 6\hat{v}\end{aligned}$$

$$\begin{aligned}\text{(ii)} \quad \vec{PR} &= \vec{PS} + \vec{SR} \\ &= 12\hat{u} + 6\hat{v}\end{aligned}$$

$$\overrightarrow{PW} = k \overrightarrow{PR}$$

$$\begin{aligned}\vec{PW} &= k(12\hat{u} + 6\hat{v}) \\ &= 6k\hat{u} + 12k\hat{v}\end{aligned}$$

$$\overrightarrow{QW} = h \overrightarrow{QT}$$

$$\begin{aligned}\vec{QW} &= h(-9\hat{u} + 6\hat{v}) \\ &= -9h\hat{u} + 6h\hat{v}\end{aligned}$$

$$\vec{PW} = \vec{PQ} + \vec{QW}$$

$$6k\hat{u} + 12k\hat{v} = 9\hat{u} + (-9h\hat{u} + 6h\hat{v})$$

$$6k\hat{u} + 12k\hat{v} = (9 - 9h)\hat{u} + 6h\hat{v}$$

$$12k = 6h$$

$$h = 2k \quad \text{--- (i)}$$

$$6k = 9 - 9h$$

$$2k = 3 - 3h \quad \text{--- (ii)}$$

Sub (i) into (ii)

$$2k = 3 - 3(2k)$$

$$2k + 6k = 3$$

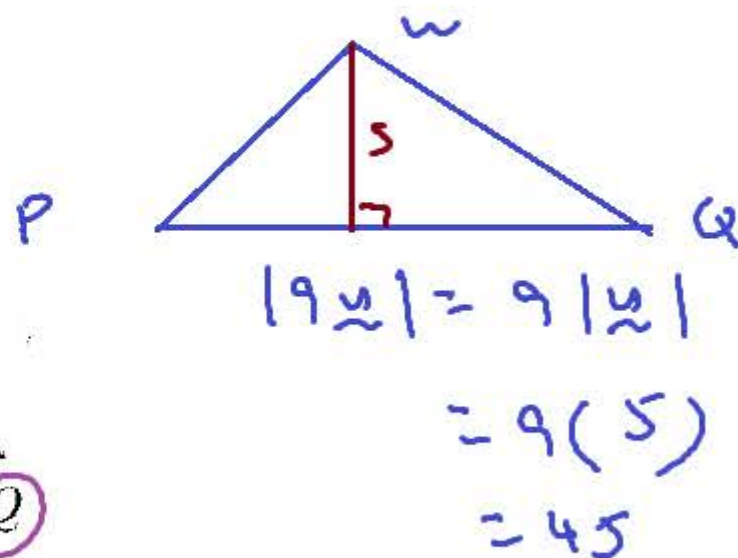
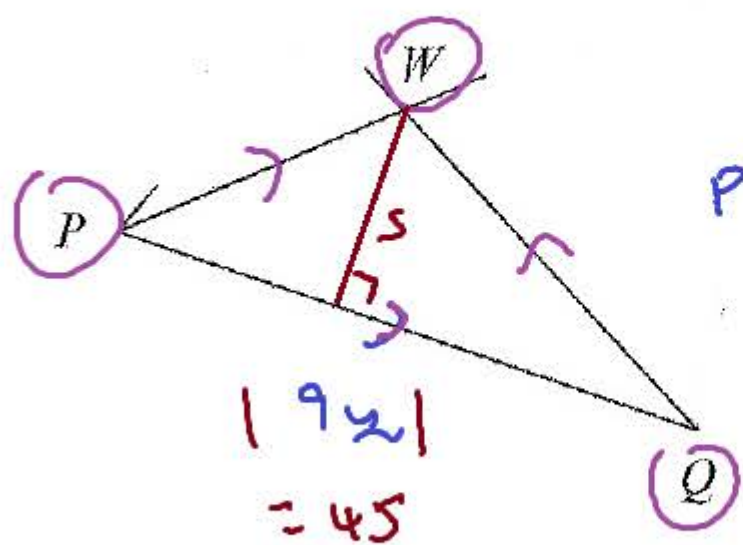
$$8k = 3$$

$$k = \frac{3}{8}$$

Sub $k = \frac{3}{8}$ into (i)

$$h = 2\left(\frac{3}{8}\right)$$

$$= \frac{3}{4}$$



$$A = 135 \text{ cm}^2$$

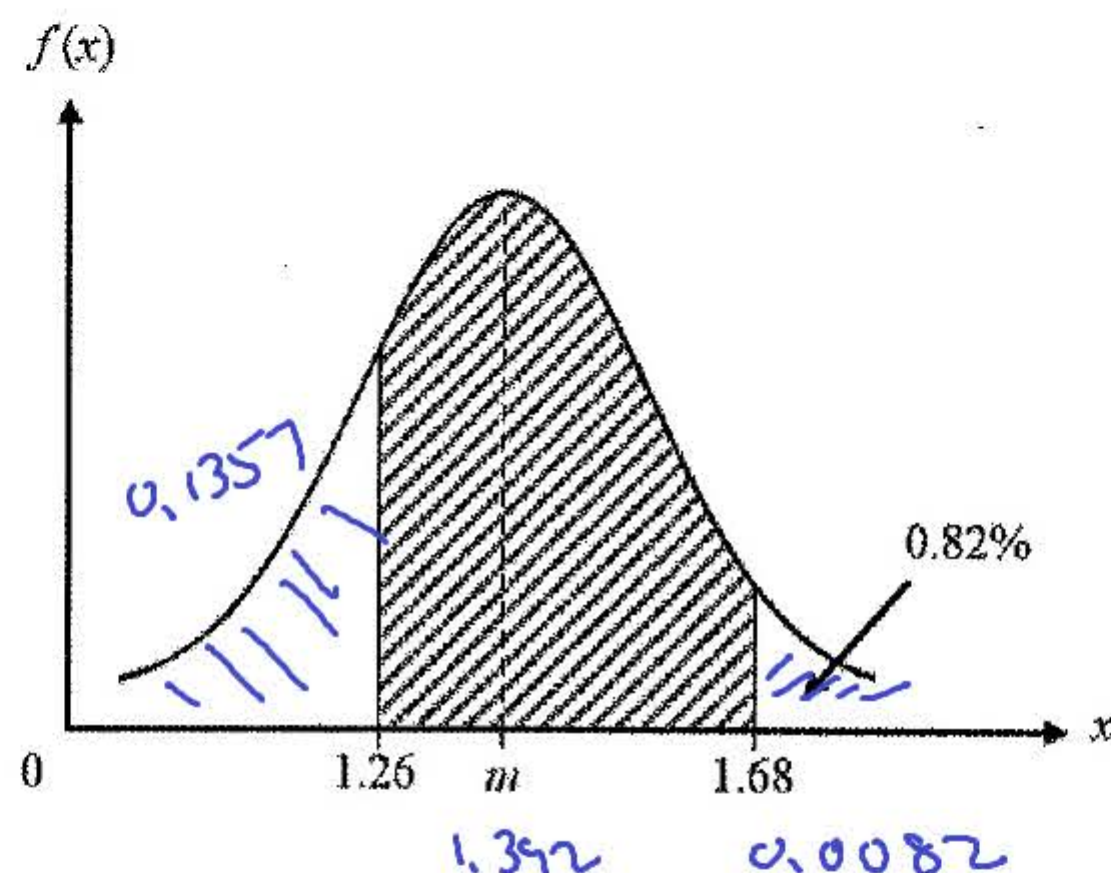
$$\frac{1}{2}(45)(s) = 135$$

$$s = \frac{135 \times 2}{45}$$

$$= 6 \text{ units}$$

- 9 (a) Rajah 6 menunjukkan graf taburan normal bagi berat, dalam kg, sebiji nanas yang dipetik dari sebuah ladang dengan min m kg dan sisihan piawai 0.12 kg. Nanas dengan berat dari 1.26 kg sehingga 1.68 kg akan dieksport ke luar negara dan bakinya akan dijual di pasaran tempatan.

Diagram 6 shows the normal distribution graph for the mass, in kg, of a pineapple harvested from an orchard with a mean of m kg and a standard deviation of 0.12 kg. Pineapples with mass from 1.26 kg to 1.68 kg will be exported overseas and the remaining will be sold at the local market.



Cari

Find

- nilai m apabila peratusan sebiji nanas yang dipilih secara rawak dengan berat lebih dari 1.68 kg adalah 0.82%,
the value of m when the percentage of a pineapple being chosen at random with mass greater than 1.68 kg is 0.82%,
- kebarangkalian sebiji nanas yang dipilih secara rawak akan dieksport ke luar negara,
the probability that a pineapple chosen at random to be exported overseas,
- bilangan nanas yang dijual di pasaran tempatan jika ladang menghasilkan 3000 biji nanas.
the number of pineapples sold in the local market if the orchard produces 3000 pineapples.

(i) $\mu = m$, $\sigma = 0.12$

$\frac{1.26 - 1.392}{0.12}$	[6 markah] [6 marks]
-1.1	

$P(X > 1.68) = 0.82\%$

$P(Z > \frac{1.68 - m}{0.12}) = 0.0082$

from table

$P(Z > 2.4) = 0.0082$

$\frac{1.68 - m}{0.12} = 2.4$

$1.68 - m = 2.4(0.12)$

$m = \frac{1.68 - 2.4 \times 0.12}{1}$
1.392

(ii) $P(X < 1.26)$

$= P(Z < \frac{1.26 - 1.392}{0.12})$

$= P(Z < -1.1)$

$= 0.1357$



$P(\text{ekspor}) =$

$1 - 0.1357 - 0.0082$
0.8561

(iii) $n \times p = 3000(0.8561) = 2568.3$

pasaran tempatan =

$3000 - \text{Ans}$
431.7

= 432 biji

THE UPPER TAIL PROBABILITY $Q(z)$ FOR THE NORMAL DISTRIBUTION $N(0, 1)$
KEBARANGKALIAN Hujung Atas $Q(z)$ BAGI TABURAN NORMAL $N(0, 1)$

z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											TOLAK								
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641	4	8	12	16	20	24	28	32	36
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247	4	8	12	16	20	24	28	32	36
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859	4	8	12	15	19	23	27	31	35
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483	4	7	11	15	19	22	26	30	34
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121	4	7	11	14	18	22	25	29	32
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776	3	7	10	14	17	20	24	27	31
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451	3	7	10	13	16	19	23	26	29
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148	3	6	9	12	15	18	21	24	27
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867	3	5	8	11	14	16	19	22	25
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611	3	5	8	10	13	15	18	20	23
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379	2	5	7	9	12	14	16	19	21
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170	2	4	6	8	10	12	14	16	18
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985	2	4	6	7	9	11	13	15	17
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823	2	3	5	6	8	10	11	13	14
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681	1	3	4	6	7	8	10	11	13
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559	1	2	4	5	6	7	8	10	11
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455	1	2	3	4	5	6	7	8	9
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367	1	2	3	4	4	5	6	7	8
1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294	1	1	2	3	4	4	5	6	6
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233	1	1	2	2	3	4	4	5	5
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183	0	1	1	2	2	3	3	4	4
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143	0	1	1	2	2	2	3	3	4
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110	0	1	1	1	2	2	2	3	3
2.3	.0107	.0104	.0102		.00990	.00964	.00939	.00914			0	1	1	1	1	2	2	2	2
								.00889	.00866	.00842	2	5	7	9	12	14	16	18	21
2.4	.00820	.00798	.00776	.00755	.00734						2	4	6	8	11	13	15	17	19
						.00714	.00695	.00676	.00657	.00639	2	4	6	7	9	11	13	15	17
2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480	2	3	5	6	8	9	11	12	14
2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357	1	2	3	5	6	7	8	9	10
2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264	1	2	3	4	5	6	7	8	9
2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193	1	1	2	3	4	4	5	6	6
2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139	0	1	1	2	2	3	3	4	4
3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100	0	1	1	2	2	2	3	3	4

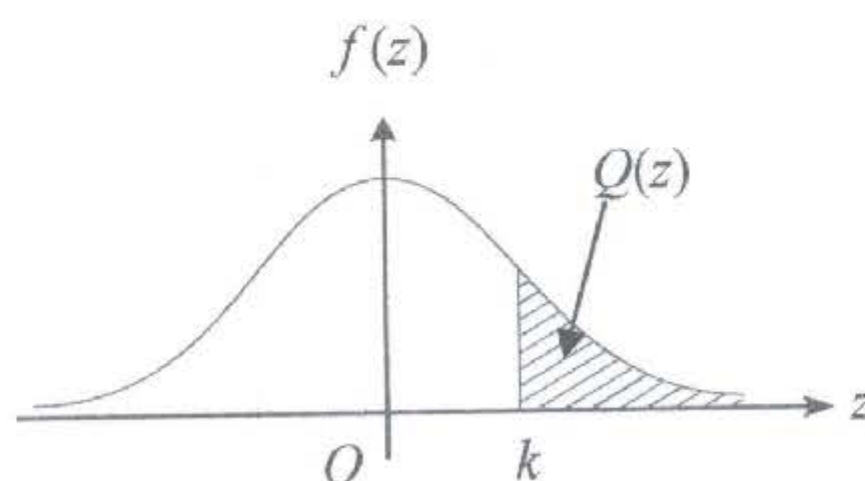
For negative z use relation:

Bagi z negatif guna hubungan:

$$Q(z) = 1 - Q(-z) = P(-z)$$

$$f(z) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}z^2\right)$$

$$Q(z) = \int_k^{\infty} f(z) dz$$



Example / Contoh :

If $X \sim N(0, 1)$, then

Jika $X \sim N(0, 1)$, maka

$$P(X > k) = Q(k)$$

$$P(X > 2.1) = Q(2.1) = 0.0179$$

- 9 (b) Dalam satu kajian terhadap sebilangan murid di dalam sebuah kelas, didapati bahawa 20 daripada 50 orang murid suka bermain bola sepak. Satu sampel yang terdiri daripada n orang murid dipilih secara rawak.

In a survey of a number of pupils in a class, it is found that 20 out of 50 pupils like to play football. A sample of n pupils are chosen at random.

- (i) Jika kebarangkalian bahawa tiada murid suka bermain bola sepak ialah

$$\frac{729}{15625}, \text{ cari nilai } n.$$

If the probability that none of the pupils like to play football is $\frac{729}{15625}$,

find the value of n .

- (ii) Seterusnya, cari kebarangkalian bahawa sekurang-kurangnya dua orang daripada mereka tidak suka bermain bola sepak.

Hence, find the probability that at least two of them do not like to play football.

[4 markah]

[4 marks]

$$\begin{aligned} (i) \quad p &= \frac{20}{50} \\ &= \frac{2}{5} \\ &= 0.4 \end{aligned}$$

$$x \sim B(n, 0.4)$$

$$P(x=0) = \frac{729}{15625}$$

$$x \sim B(6, 0.4)$$

$$\cancel{n} \cdot \cancel{0.4}^1 \cdot 0.6^n = \frac{729}{15625}$$

$$n \ln 0.6 = \ln \left(\frac{729}{15625} \right)$$

$$n = \frac{\ln \left(\frac{729}{15625} \right)}{\ln(0.6)}$$

$$\therefore n = 6$$

$$(ii) \quad P(x \geq 2) = P(x \leq 4)$$

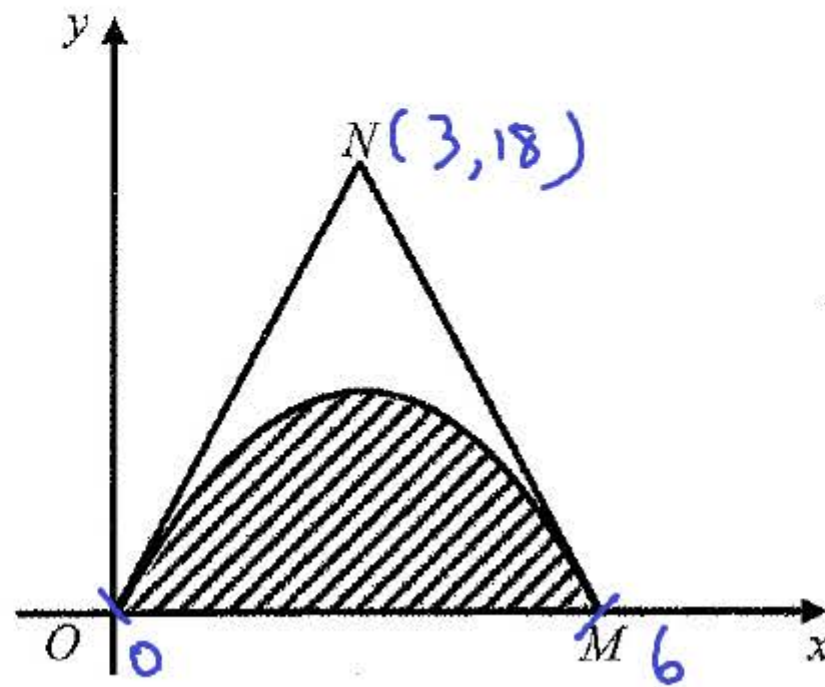
$$= 1 - P(x=5) - P(x=6)$$

$$= 1 - \frac{6C5 \times 0.4^5 \times 0.6^1}{15625} - \frac{6C6 \times 0.4^6 \times 0.6^0}{15625}$$

$$= 1 - \frac{576 + 64}{15625} = 1 - \frac{640}{15625} = 0.95904$$

$$\begin{array}{cccccc} 0.5 & 2 & 3 & 4 & 5 & 6 \\ 5 & 4 & 3 & 2 & 1 & 0 \end{array}$$

- 10 Rajah 7 menunjukkan satu lengkung $y = x(6-x)$. Garis lurus ON dan MN masing-masing ialah tangen kepada lengkung itu pada titik O dan titik M . $y = 6x - x^2$
- 75 $y = 6x - x^2$
- 133 Diagram 7 shows a curve $y = x(6-x)$. The straight lines ON and MN are tangents to the curve at point O and point M respectively.



Rajah 7
Diagram 7

Cari

Find

- (a) koordinat N , [3 markah]
the coordinates of N , [3 marks]
- (b) luas rantau berlorek, [3 markah]
the area of the shaded region, [3 marks]
- (c) isi padu janaan, dalam sebutan π , apabila rantau yang dibatasi oleh lengkung $y = x(6-x)$, garis lurus MN dan garis $x = 3$ dikisarkan melalui 360° pada paksi- x . [4 markah]
the volume generated, in terms of π , when the region bounded by the curve $y = x(6-x)$, the straight line MN and the line $x = 3$ is revolved through 360° about the x -axis. [4 marks]

$$y = x(6-x)$$

$$y = 6x - x^2$$

$$\frac{dy}{dx} = 6 - 2x$$

$$\frac{dy}{dx} \Big|_{x=0} = 6 - 0 = 6$$

$$(0, 0)$$

$$y - 0 = 6(x - 0)$$

$$y = 6x \quad \text{--- (1)}$$

$$\frac{dy}{dx} \Big|_{x=6} = 6 - 2(6) = -6$$

$$(6, 0)$$

$$y - 0 = -6(x - 6)$$

$$y = -6x + 36 \quad \text{--- (2)}$$

$$\text{Sub (1) into (2)}$$

$$6x = -6x + 36$$

$$12x = 36$$

$$x = 3$$

$$\text{Sub } x = 3 \text{ into (1)}$$

$$y = 6(3) = 18$$

$$\sim (3, 18)$$

(b)

$$A = \int_0^6 (6x - x^2) dx$$

$$= \left[3x^2 - \frac{x^3}{3} \right]_0^6$$

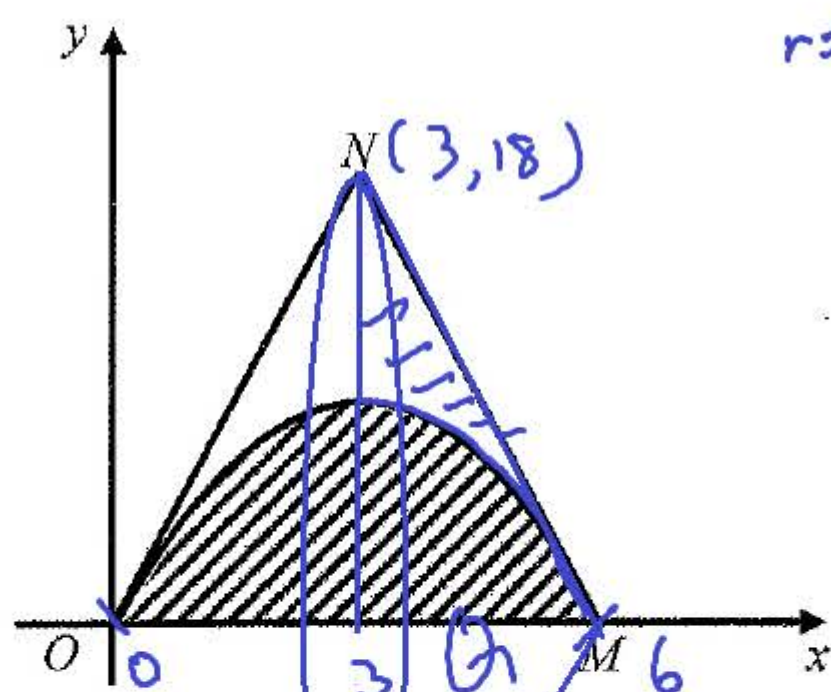
$$= \left[\left(3(6)^2 - \frac{6^3}{3} \right) - (0 - 0) \right]$$

$$= 36$$

$$\int_0^6 6x - x^2 dx$$

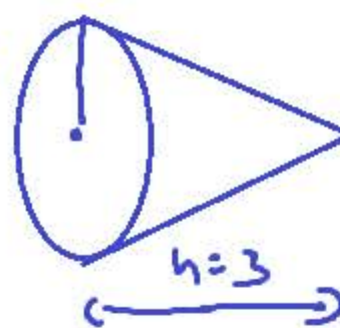
36

(c)



$$y = 6x - x^2$$

$$r = 18$$



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

$$= \frac{1}{3} \pi (18)^2 (3)$$

$$= 324 \pi$$

$$V_2 = \pi \int_3^6 y^2 dx$$

$$= \pi \int_3^6 (6x - x^2)^2 dx$$

$$= \pi \int_3^6 (36x^2 - 12x^3 + x^4) dx$$

$$= \pi \left[12x^3 - 3x^4 + \frac{x^5}{5} \right]_3^6$$

$$V_2 = \pi \left[\left(12(6)^3 - 3(6)^4 + \frac{6^5}{5} \right) - \left(12(3)^3 - 3(3)^4 + \frac{3^5}{5} \right) \right]$$

$$= \pi \left[\frac{1296}{5} - \frac{648}{5} \right] = \frac{648}{5} \pi$$

$$V = 324 \pi - \frac{648}{5} \pi$$

$$= \frac{972}{5} \pi$$

$$= 194.4 \pi \text{ units}^3$$

$$\pi \int_3^6 (6x - x^2)^2 dx$$

$\frac{648}{5} \pi$

$$324 - \text{Ans}$$

$\frac{972}{5}$

$$324 - \text{Ans}$$

194.4

- 11 Jadual 1 menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y , yang diperoleh daripada suatu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $x^k = \frac{y}{a}$, dengan keadaan a dan k ialah pemalar.

Table 1 shows the values of two variables, x and y , obtained from an experiment.

The variables x and y are related by the equation $x^k = \frac{y}{a}$, such that a and k are constants.

x	1.74	3.32	5.02	9.19	15.83	22.80
y	1.67	2.28	3.32	4.80	6.30	7.61

Jadual 1

Table 1

- (a) Berdasarkan Jadual 1, plot sebuah graf $\log_{10} y$ melawan $\log_{10} x$ dengan menggunakan skala 2 cm kepada 0.2 unit pada paksi- $\log_{10} x$ dan 2 cm kepada 0.1 unit pada paksi- $\log_{10} y$.

Seterusnya, lukis garis lurus penyuaian terbaik.

[5 markah]

Based on Table 1, plot a graph of $\log_{10} y$ against $\log_{10} x$ using a scale of 2 cm to 0.2 unit on the $\log_{10} x$ -axis and 2 cm to 0.1 unit on the $\log_{10} y$ -axis.

Hence, draw the line of best fit.

[5 marks]

- (b) Menggunakan graf di 11 (a), cari nilai

Using the graph in 11 (a), find the value of

(i) a ,

(ii) k .

[5 markah]

[5 marks]

$$x^k = \frac{y}{a}$$

$$ax^k = y$$

$$\lg y = \lg ax^k$$

$$= \lg a + k \lg x$$

$$\log_{10} y = k \log_{10} x + \log_{10} a$$

$$y = mx + c$$

$$(0, 0.075), (1.3, 0.86)$$

$$\log_{10} a = 0.075$$

$$a = 10^{0.075}$$

$$= 1.189$$

$$m = \frac{0.86 - 0.075}{1.3 - 0}$$

$$k = 0.6038$$

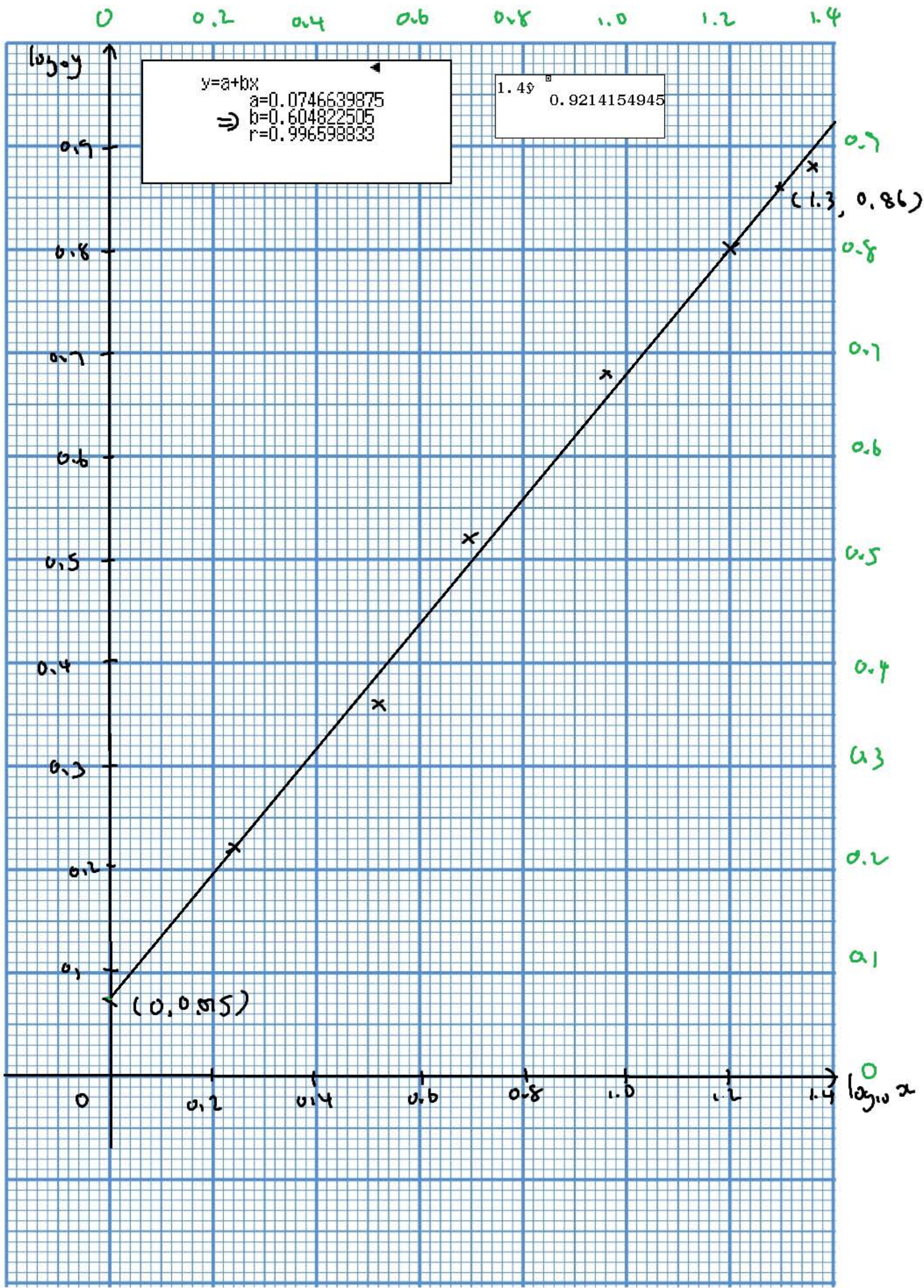
$$10^{0.075} = 1.188502227$$

$$\frac{0.86 - 0.075}{1.3} = 0.6038461538$$

skala 2 cm kepada 0.2 unit pada paksi- $\log_{10} x$ dan 2 cm kepada 0.1 unit pada paksi- $\log_{10} y$.

x	1.74	3.32	5.02	9.19	15.83	22.80
y	1.67	2.28	3.32	4.80	6.30	7.61

$\log(1.74)$ 0.24 0.2405492483	$\log(3.32)$ 0.52 0.5211380837	$\log(5.02)$ 0.70 0.7007037171	$\log(9.19)$ 0.96 0.9633155114	$\log(15.83)$ 1.20 1.199480915	$\log(22.8)$ 1.36 1.357934847
$\log(1.67)$ 0.22 0.2227164711	$\log(2.28)$ 0.36 0.357934847	$\log(3.32)$ 0.52 0.5211380837	$\log(4.8)$ 0.68 0.6812412374	$\log(6.3)$ 0.80 0.7993405495	$\log(7.61)$ 0.88 0.8813846568

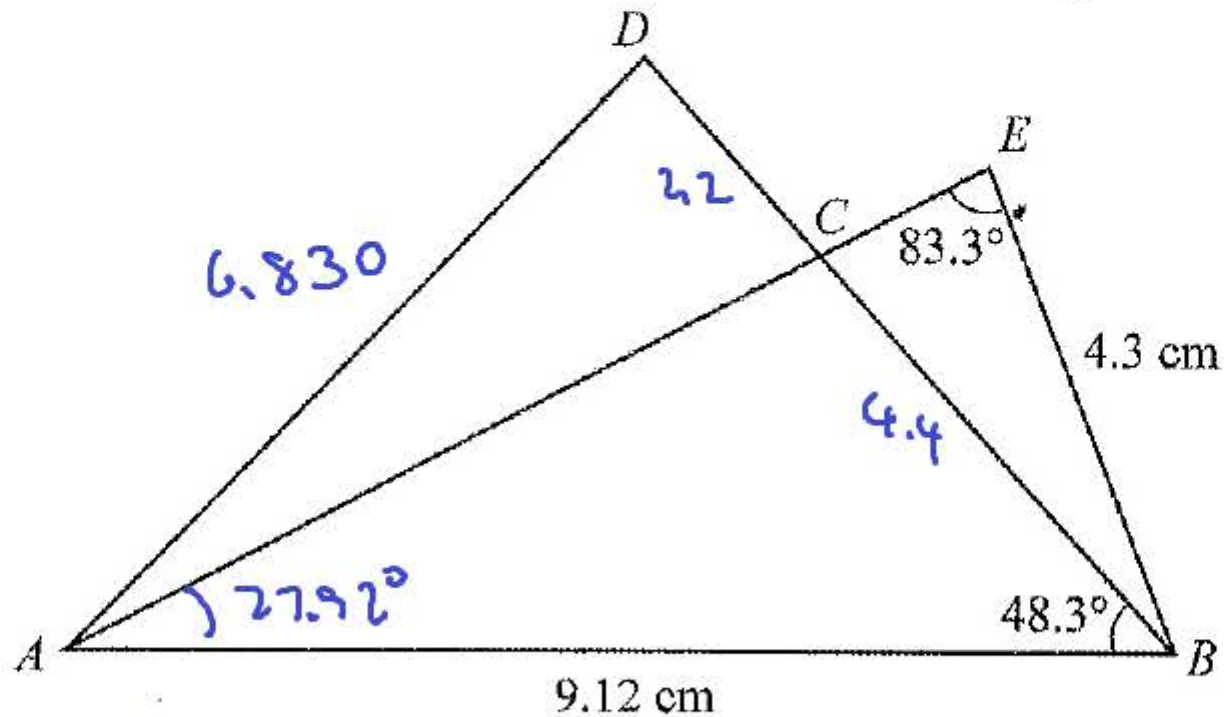


12 Penyelesaian secara lukisan berskala **tidak** diterima.

*Solutions by scale drawing are **not** accepted.*

Rajah 8 menunjukkan dua buah segi tiga, ABD dan ABE . BCD dan ACE ialah garis lurus.

Diagram 8 shows two triangles, ABD and ABE . BCD and ACE are straight lines.



Diberi bahawa $BC = 4.4$ cm dan $BC = \frac{2}{3}BD$.

It is given that $BC = 4.4$ cm and $BC = \frac{2}{3}BD$.

(a) Hitung panjang, dalam cm, bagi AD .

[3 markah]

Calculate the length, in cm, of AD .

[3 marks]

(b) (i) Cari $\angle BAE$, dalam darjah.

Find $\angle BAE$, in degrees.

(ii) Jika titik B' berada pada garis lurus AB dengan keadaan $B'C = BC$, lakarkan segi tiga $AB'C$. Seterusnya, cari $\angle ACB'$ dalam darjah.

If point B' lies on the straight line AB such that $B'C = BC$, sketch the triangle $AB'C$. Hence, find $\angle ACB'$ in degrees.

[4 markah]

[4 marks]

(c) Hitung luas, dalam cm^2 , segi tiga ABD dengan menggunakan rumus Heron.

[3 markah]

Calculate the area, in cm^2 , triangle ABD by using Heron's formula.

[3 marks]

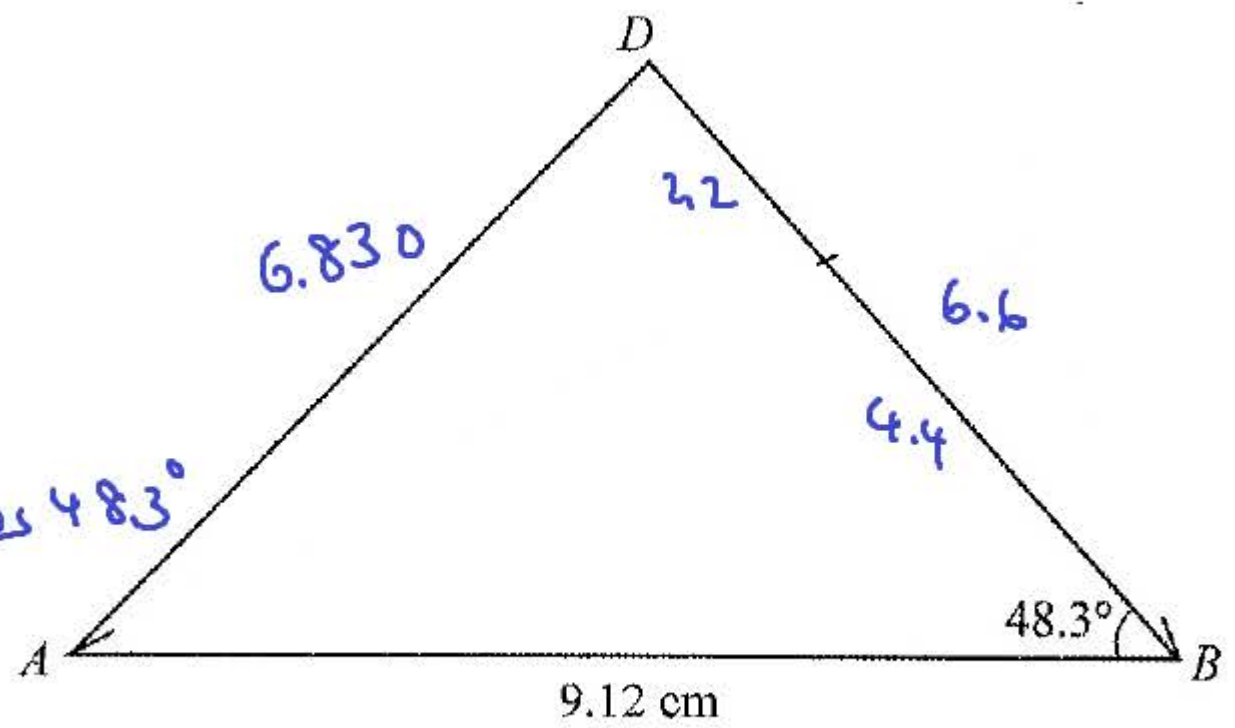
$$BD = \frac{3}{2} BC$$

$$= \frac{3}{2} (4.4)$$

$$= 6.6$$

$$CD = 6.6 - 4.4$$

$$= 2.2$$



(a) $AD^2 = 9.12^2 + 6.6^2 - 2(9.12)(6.6)\cos 48.3^\circ$

$$= \sqrt{9.12^2 + 6.6^2 - 2 \times 9.12 \times 6.6 \times \cos 48.3^\circ}$$

$$= 46.65130899$$

$$AD = \sqrt{46.65}$$

$$= 6.83$$

$$\sqrt{\text{Ans}}$$

$$6.830176351$$

b) $\frac{\sin \theta}{4.3} = \frac{\sin 83.3^\circ}{9.12}$

$$\sin \theta = \frac{4.3 \sin(83.3)}{9.12}$$

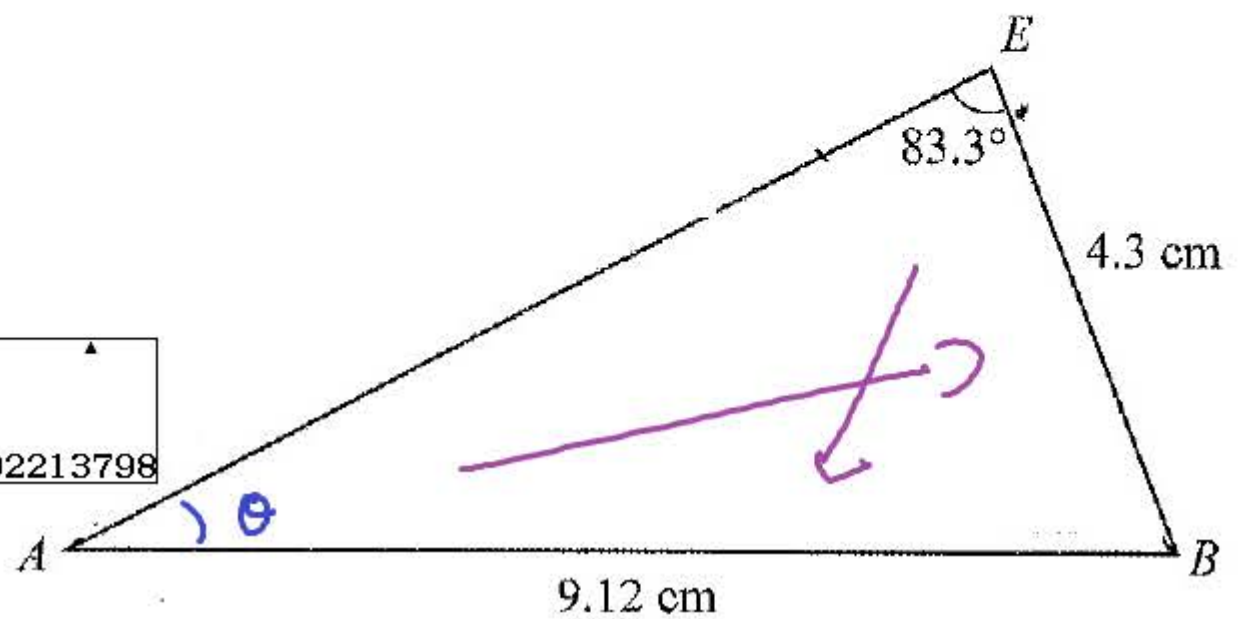
$$0.4682712492$$

$$\sin^{-1}(\text{Ans})$$

$$27.92213798$$

$$\theta = \sin^{-1} 0.4683$$

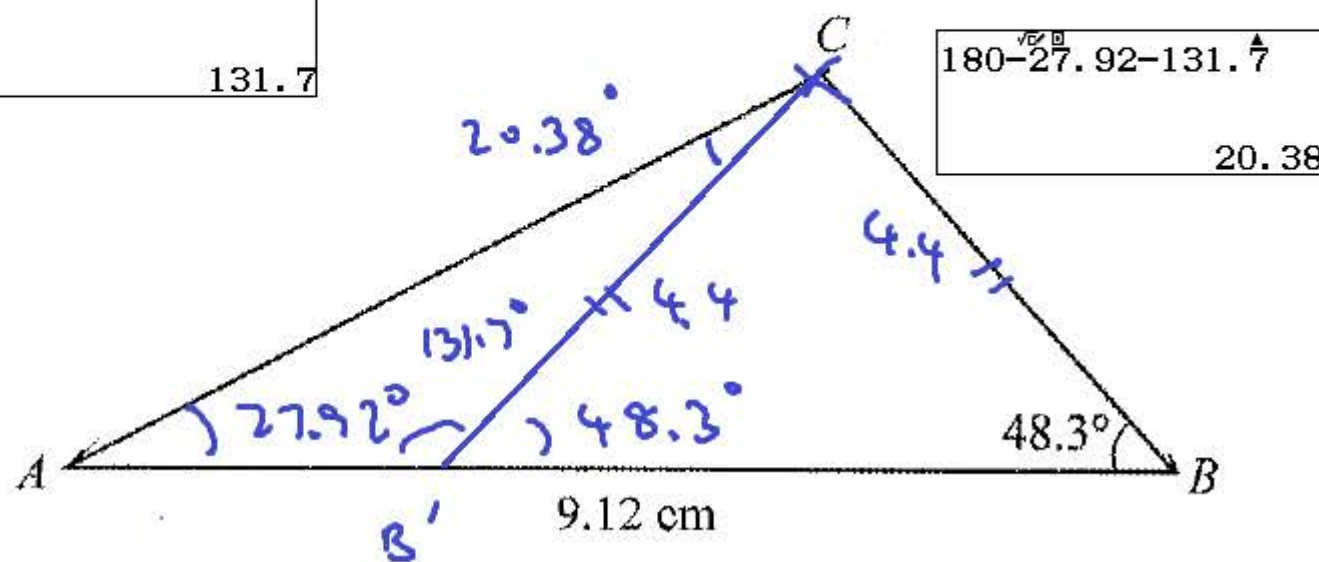
$$\angle BAE = 27.92^\circ$$



(ii) $B'C = BC$,

$$180 - 48.3$$

$$131.7$$



$$180 - 27.92 - 131.7$$

$$20.38$$

$$\angle ACB' = 20.38^\circ$$

$$S = \frac{6.83 + 6.6 + 9.12}{2}$$

$$11.275$$

$$A = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{11.275(11.275 - 6.83)(11.275 - 6.6)(11.275 - 9.12)}$$

$$= 22.47 \text{ cm}^2$$

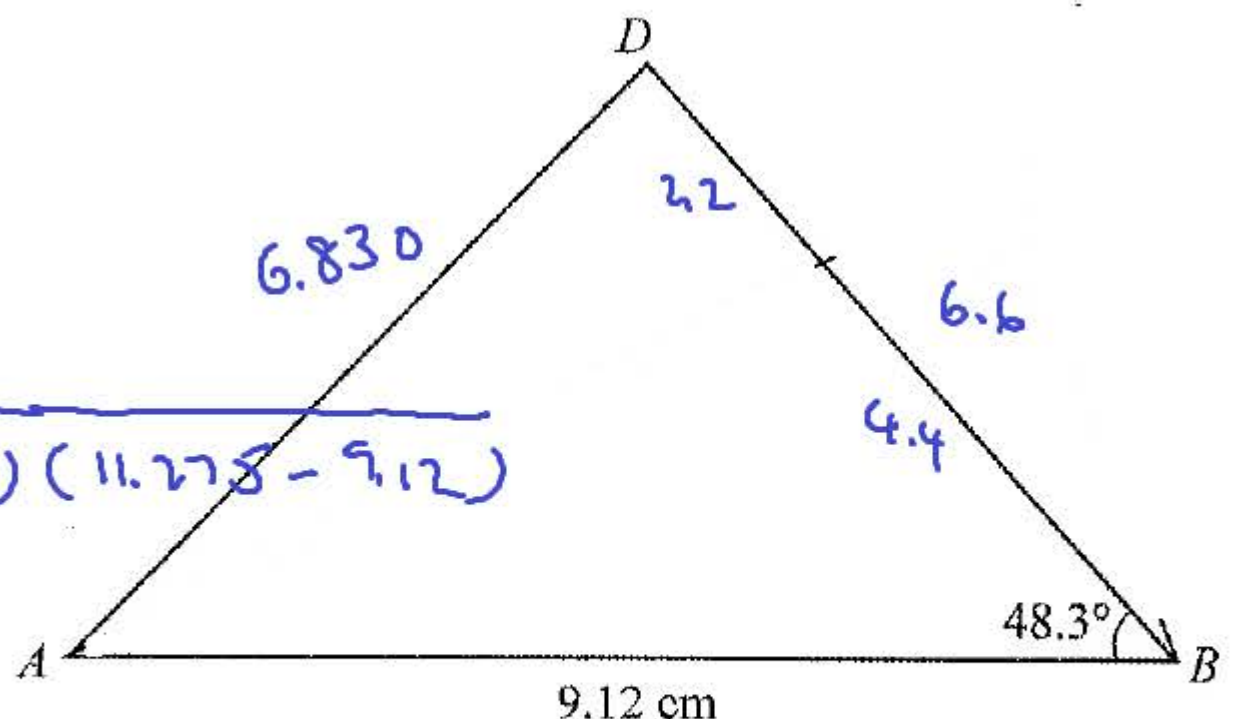
$$\sqrt{\text{Ans}(\text{Ans} - 6.83)(\text{Ans} - 6.6)(\text{Ans} - 9.12)}$$

$$22.47028614$$

$$A = \frac{1}{2}ab \sin C$$

$$\frac{1}{2} \times 6.6 \times 9.12 \sin(48.3^\circ)$$

$$22.47082273$$



- 13 75 67 Sebuah kelab rekreasi menawarkan kelas tarian dan kelas renang. Bayaran kelas tarian dan kelas renang masing-masing ialah RM10 dan RM15 sejam. Kelas-kelas tersebut adalah tertakluk kepada kekangan berikut.

A recreation club offers dance class and swimming class. The payment for dance class and swimming class are RM10 and RM15 per hour respectively. The classes are subjected to the following constraints.

- I Jumlah masa maksimum untuk kedua-dua kelas ialah 20 jam seminggu.
The maximum total time for both classes is 20 hours per week.
- II Jumlah bayaran untuk kedua-dua kelas dalam seminggu tidak melebihi RM250.
The total payment for both classes in a week does not exceed RM250.
- III Perkaitan tempoh masa untuk kelas tarian dan kelas renang untuk setiap ahli dalam seminggu ditunjukkan dalam halaman 36.
The relation of time duration for dance class and swimming class for each member in a week is shown in page 36.

- (a) Dalam seminggu, kelab telah memperuntukkan x jam untuk kelas tarian dan y jam untuk kelas renang. Tulis ketaksamaan I dan II. [2 markah]

In a week, the club has allocated x hours for dance class and y hours for swimming class. Write inequalities I and II. [2 marks]

- (b) Tulis kekangan III dalam bentuk ketaksamaan dan huraikan dalam ayat. [2 markah]

Write constraint III in inequality form and describe in sentence. [2 marks]

- (c) Pada halaman 36, bina dan label rantau R yang memenuhi semua kekangan itu. [3 markah]

On page 36, construct and label the region R which satisfies all the constraints. [3 marks]

- (d) Gunakan graf yang dibina di 13 (c) untuk menjawab soalan berikut.
Use the graph constructed in 13 (c) to answer the following question.

Diberi bahawa purata kalori yang dibakar semasa menari dan berenang masing-masing ialah 350 kalori dan 450 kalori sejam.

Dengan melukis fungsi objektif, cari jumlah kalori maksimum yang dibakar dalam seminggu. [3 markah]

It is given that the average calories burned while dancing and swimming are 350 calories and 450 calories per hour respectively.

By drawing the objective function, find the maximum total of calories burned in a week. [3 marks]

$$K = 350x + 450y$$

$$\begin{array}{r} 50 \overline{) 350 \quad 450} \\ \underline{7 \quad 9} \\ 7 \times 9 \times 50 \\ = 3150 \end{array}$$

$$3150 = 350x + 450y$$

$$x=0, \quad y=7 \quad (0, 7)$$

$$y=0, \quad x=9 \quad (9, 0)$$

max when $(10, 10)$

$$\begin{aligned} \text{max Calories} &= 350(10) + 450(10) \\ &= 8000 \end{aligned}$$

$$a) \quad x + y \leq 20$$

$$10x + 15y \leq 250$$

$$y = \frac{50 - 2x}{3}$$

$$\frac{50 - 2 \times 16}{3}$$

$$x=0, y=20$$

$$2x + 3y \leq 50$$

$$x=1, y=16$$

$$x=18, y=2$$

$$x=16, y=6$$

$$b) \quad (3,0), (8,5)$$

$$m = \frac{5-0}{8-3}$$

$$y - 0 = 1(x - 3)$$

$$= 1$$

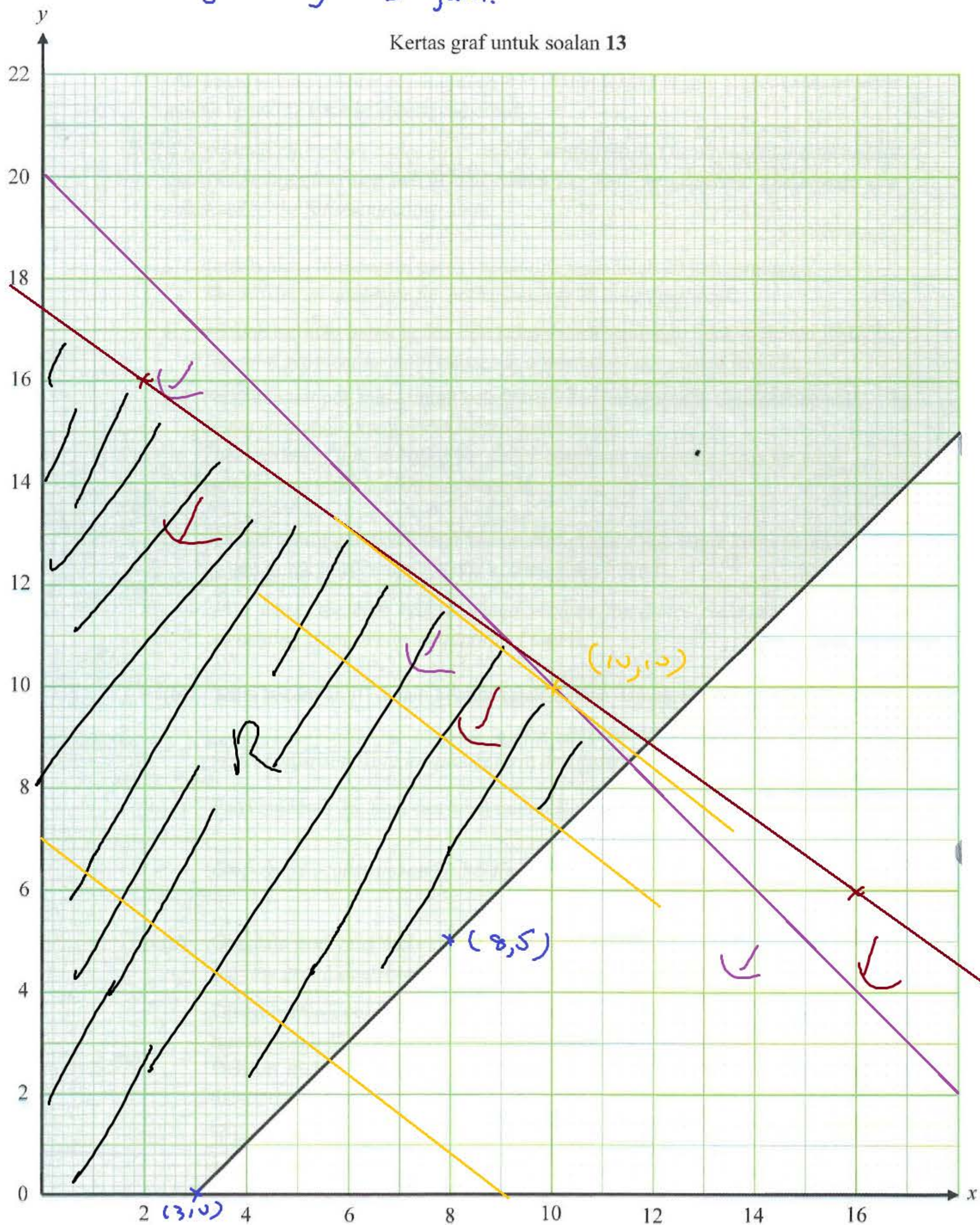
$$y = x - 3$$

$$\therefore y \geq x - 3$$

$$\Rightarrow y - x \geq -3$$

jam untuk kelas renang lebih daripada jam untuk kelas tarian
sekurang-kurangnya 3 jam.

Kertas graf untuk soalan 13



- 14 Jadual 2 menunjukkan maklumat tentang empat bahan yang digunakan untuk menghasilkan sebalang gula-gula.

74
310 Table 2 shows information about four ingredients used to produce a jar of sweets.

Bahan Ingredient	Perubahan indeks harga dari tahun 2020 ke tahun 2022 Change of price index from the year 2020 to the year 2022	Indeks harga pada tahun 2022 berasaskan tahun 2018 Price index in the year 2022 based on the year 2018	Pemberat Weightage
$\frac{100\% - 10\%}{P}$ P	$\frac{100\% - 10\%}{110\%}$ Menokok 10% 10% increase	121	7
$\frac{100\% - 30\%}{Q}$ Q	$\frac{100\% - 30\%}{130\%}$ Menokok 30% 30% increase	$100 + 3m$	7
R	Tidak berubah No change	100	2
$\frac{100\% - 10\%}{S}$ S	$\frac{100\% - 10\%}{90\%}$ Menyusut 10% 10% decrease	81	4

Jadual 2

Table 2

(a) Hitung

Calculate

- (i) harga bahan P pada tahun 2018 jika harganya pada tahun 2022 ialah RM12.10,

the price of ingredient P in the year 2018 if its price in the year 2022 is RM12.10,

- (ii) harga bahan S pada tahun 2022 jika harganya pada tahun 2020 ialah RM15.00.

the price of ingredient S in the year 2022 if its price in the year 2020 is RM15.00.

[3 markah]

[3 marks]

a1) P: $P_{22} = 12.10$ $I_{22/18} = 121$

$$\frac{12.1}{P_{18}} \times 100 = 121$$

$$P_{18} = \frac{12.1 \times 100}{121}$$

$$= \text{RM } 10.00$$

ii) S : $P_{22} = ?$ $P_{20} = 15$ $I_{22/20} = 90$

$$\frac{P_{22}}{15} \times 100 = 90$$

$$P_{22} = \frac{90 \times 15}{100}$$

$$= \text{RM } 13.50$$

- (b) Diberi bahawa peratus kenaikan harga bahan Q dari tahun 2020 ke tahun 2022 adalah sama dengan peratus kenaikan harganya dari tahun 2018 ke tahun 2020. Cari nilai m . [2 markah]

It is given that the percentage increase of price of ingredient Q from the year 2020 to the year 2022 is equal to the percentage increase of its price from the year 2018 to the year 2020.

Find the value of m .

[2 marks]

- (c) (i) Hitung indeks gubahan bagi kos untuk menghasilkan satu balang gula-gula itu pada tahun 2022 berasaskan tahun 2020.

Calculate the composite index for the cost to produce a jar of sweets in the year 2022 based on the year 2020.

- (ii) Kos pembuatan satu balang gula-gula pada tahun 2020 ialah RM30. Diberi bahawa jumlah kos pembuatan pada tahun 2022 ialah RM263 222.40 dan harga jualan satu balang gula-gula pada tahun tersebut ialah RM40.

Tentukan sama ada keuntungan sebanyak RM40 000 dapat dicapai pada tahun 2022. Berikan justifikasi anda.

The cost to produce a jar of sweets in the year 2020 is RM30. It is given that the total production cost in the year 2022 is RM263 222.40 and the selling price of a jar of sweets in that year is RM40.

Determine whether a profit of RM40 000 is achievable in the year 2022.

Give your justification.

[5 markah]

[5 marks]

$$(b) \text{ c. } I_{22/20} = 130 = I_{20/18}, \quad I_{22/18} = 100 + 3m$$

$$100 + 3m = \frac{130 \times 130}{100}$$

$$3m = 169 - 100$$

$$3m = 69$$

$$m = 23$$

$$\begin{array}{c|cc} & 20 & 22 \\ \hline 18 & 130 & 100 + 3m \\ 20 & 100 & 130 \end{array}$$

$I_{22/20}$	w
110	7
130	7
100	2
90	4

$$\bar{I} = \frac{\sum Iw}{\sum w}$$

$$= \frac{110(7) + 130(7) + 100(2) + 90(4)}{7 + 7 + 2 + 4}$$

$$= \frac{2240}{20} = 112$$

$$\begin{array}{l} 7834 \times 6.4 \\ \hline 50137.6 \end{array}$$

$$ii) P_{20} = 30$$

$$\frac{P_{22}}{30} \times 100 = 112$$

$$P_{22} = \frac{112 \times 30}{100} = \text{RM } 33.60$$

$$K = \text{RM } 263\,222.40 \div 3360$$

$$= \frac{263222.4}{33.6} = 7834$$

$$\text{untung} = 40 - 33.60 = \text{RM } 6.40$$

Jumlah untung

$$= 7834 \times 6.40 = \text{RM } 50\,137.60 > \text{RM } 40\,000$$

dapat dicapai

- 15 Halaju $v \text{ ms}^{-1}$, suatu zarah yang bergerak di sepanjang suatu garis lurus ialah $v = 3t^2 - 14t + 8$, dengan keadaan t ialah masa dalam saat selepas melalui titik tetap O . $t=0, s=0$
- TS
68 The velocity $v \text{ ms}^{-1}$, of a particle that moves along a straight line is $v = 3t^2 - 14t + 8$, such that t is the time in seconds after passing through fixed point O .

(a) Cari masa, dalam saat, apabila zarah itu berhenti seketika. [2 markah]

Find the time, in seconds, when the particle stops momentarily. [2 marks]

(b) Hitung

Calculate

(i) pecutan awal, dalam ms^{-2} , zarah tersebut,

initial acceleration, in ms^{-2} , of the particle,

(ii) halaju minimum, dalam ms^{-1} , zarah tersebut.

minimum velocity, in ms^{-1} , of the particle.

[4 markah]

[4 marks]

(c) Hitung jumlah jarak, dalam m, yang dilalui zarah tersebut sehingga ia berhenti buat kali yang kedua. [4 markah]

Calculate the total distance, in m, travelled by the particle until it stops for the second time. [4 marks]

a) $v = 3t^2 - 14t + 8, v = 0$

$$3t^2 - 14t + 8 = 0$$

$$(t - 4)(3t - 2) = 0$$

$$t - 4 = 0 \quad 3t - 2 = 0$$

$$t = 4 \quad t = \frac{2}{3}$$

c) $t = 0, v = 8, a = 3$ ✓

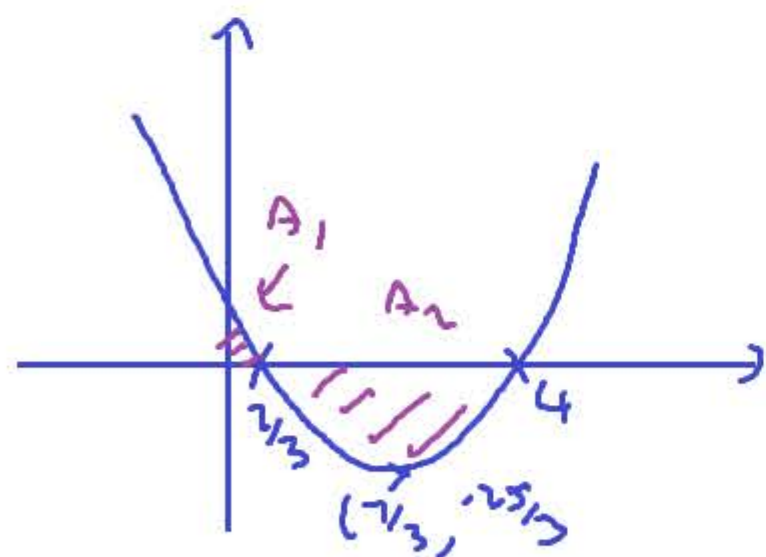
b.) $a = \frac{dv}{dt}$

$$= 6t - 14$$

∴ $a = 0, 6t - 14 = 0$
 $t = \frac{14}{6} = \frac{7}{3}$

$$v = 3\left(\frac{7}{3}\right)^2 - 14\left(\frac{7}{3}\right) + 8$$

$$= -\frac{25}{3} \text{ m/s}$$



$$A_1 = \int_0^{2/3} (3t^2 - 14t + 8) dt$$

$$= \left[t^3 - 7t^2 + 8t \right]_0^{2/3}$$

$$= \left[\left(\frac{2}{3}\right)^3 - 7\left(\frac{2}{3}\right)^2 + 8\left(\frac{2}{3}\right) - (0 - 0 + 0) \right]$$

$$A_2 = \left| \int_{2/3}^4 (3t^2 - 14t + 8) dt \right|$$

$$= \left| \left[t^3 - 7t^2 + 8t \right]_{2/3}^4 \right|$$

$$= \left| 4^3 - 7(4)^2 + 8(4) - \frac{68}{27} \right|$$

$$= \left| -16 - \frac{68}{27} \right| = \left| -\frac{500}{27} \right|$$

$$= \frac{500}{27}$$

$$= \frac{68}{27} - 0 = \frac{68}{27}$$

Jumlah jarak

$$= \frac{68}{27} + \frac{500}{27}$$

$$= \frac{568}{27}$$

$$= 21.04$$

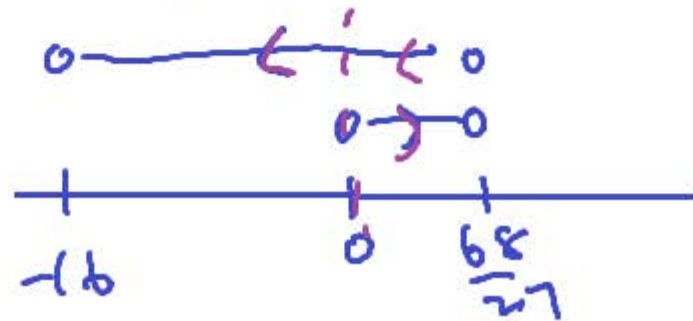
$$(c) \int_0^{\frac{2}{3}} (-3t^2 - 14t + 8) dt$$

$$= t^3 - 7t^2 + 8t + C, \quad t=0, \quad s=0 \Rightarrow C=0$$

$$s = t^3 - 7t^2 + 8t$$

$$t = \frac{2}{3}, \quad s = \left(\frac{2}{3}\right)^3 - 7\left(\frac{2}{3}\right)^2 + 8\left(\frac{2}{3}\right) = \frac{68}{27}$$

$$t = 4, \quad s = 4^3 - 7(4)^2 + 8(4) = -16$$



$$\text{total } d = \frac{68}{27} + \frac{68}{27} + 16$$

$$= 16 + \frac{68+68}{27} = \frac{568}{27}$$