

- 1 (a) Diberi $f(x) = \frac{1}{2x+7}$, cari nilai bagi x dengan keadaan $f(x)$ tidak tertakrif.

[1 markah]

Given $f(x) = \frac{1}{2x+7}$, find the value of x such that $f(x)$ is undefined.

[1 mark]

tidak tertakrif.

apb.k

$$2x+7=0$$

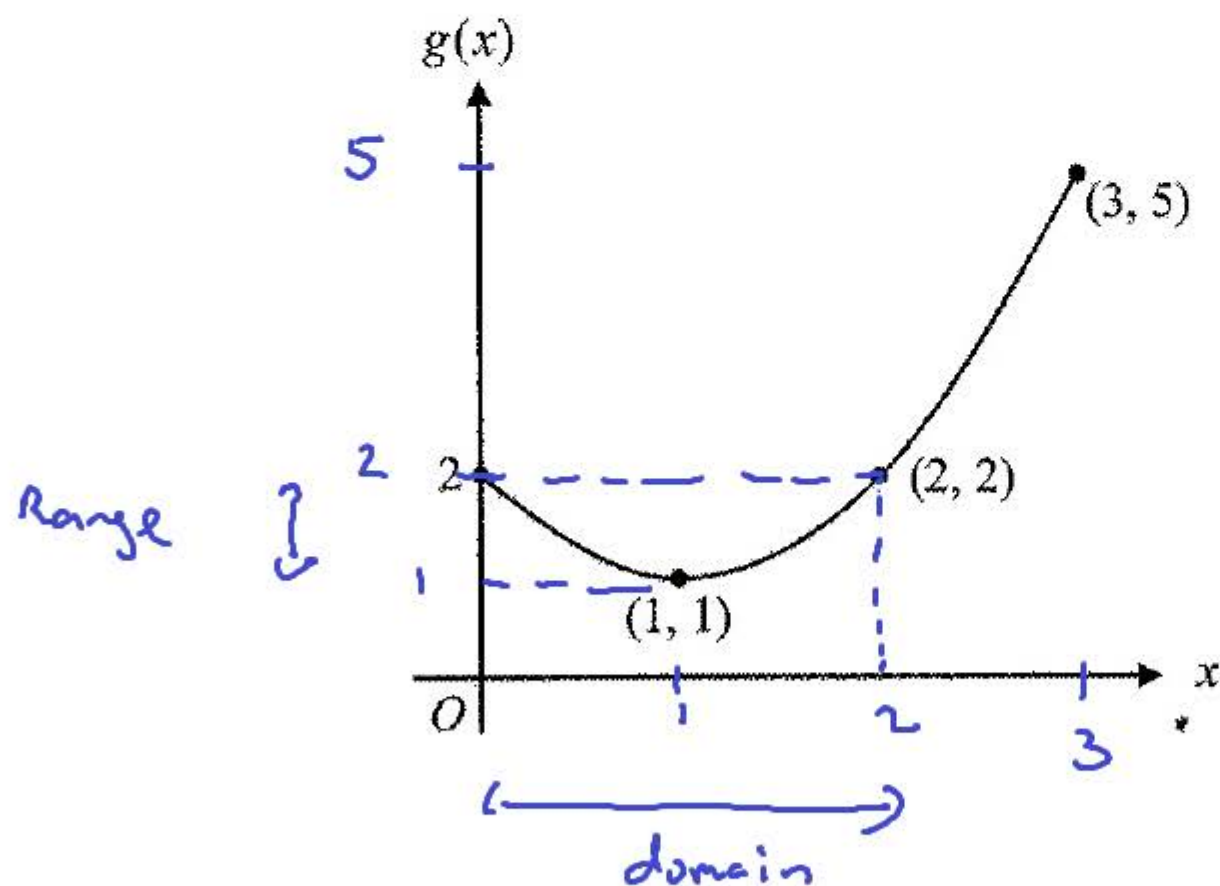
$$x = -7/2$$

$$2x = -7$$

$$x = -3.5$$

- (b) Rajah 1 menunjukkan graf bagi fungsi $g(x)$ untuk domain $0 \leq x \leq 3$.

Diagram 1 shows the graph of the function $g(x)$ for domain $0 \leq x \leq 3$.



Nyatakan

State

- (i) imej bagi 3,
the image of 3,
(ii) julat bagi $x \leq 2$.
the range for $x \leq 2$.

(i) 5

(ii) $1 \leq g(x) \leq 2$

[2 markah]

[2 marks]

- 2 (a) Diberi bahawa $a = 5^x$ dan $b = 5^y$, ungkapkan 5^{x+2y} dalam sebutan a dan b .

[2 markah]

Given that $a = 5^x$ and $b = 5^y$, express 5^{x+2y} in terms of a and b .

[2 marks]

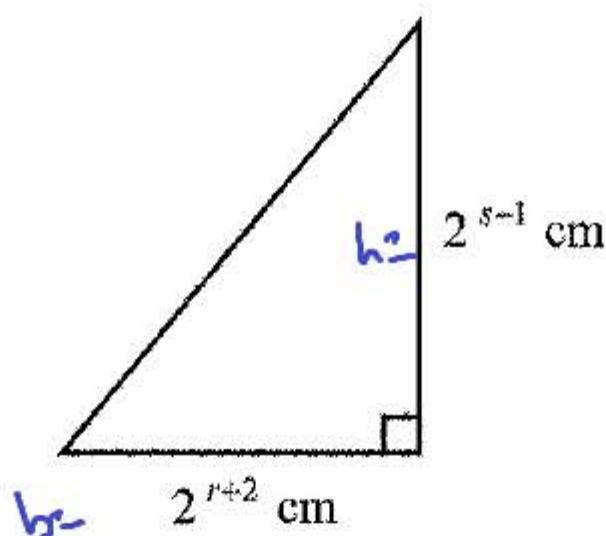
$$\begin{aligned} 5^{x+2y} &= 5^x \cdot 5^{2y} \\ &= \boxed{5^x} \cdot (\boxed{5^y})^2 \\ &= \boxed{a} \boxed{b^2} \end{aligned}$$

$$a^m \cdot a^n = a^{m+n}$$

$$5^x \cdot 5^{2y} = 5^{x+2y}$$

- (b) Rajah 2 menunjukkan sebuah segi tiga.

Diagram 2 shows a triangle.



$$A = 2^{2r+4}$$

$$A_{\Delta} = \frac{1}{2} \times b \times h$$

$$2^{2r+4} = \frac{1}{2} (2^{r+2}) \cdot (2^{s-1})$$

$$2^{2r+4} \cdot 2^1 = 2^{r+2+s-1}$$

$$2^{2r+4+1} = 2^{r+s+1}$$

$$2r+5 = r+s+1$$

$$2r-r = s+1-5$$

$$r = s-4$$

Diberi bahawa luas bagi segi tiga itu ialah 2^{2r+4} cm^2 , ungkapkan r dalam sebutan s .

[3 markah]

Given that the area of the triangle is 2^{2r+4} cm^2 , express r in terms of s .

[3 marks]

$$2^{2r+4} = \boxed{\frac{1}{2}} (2^{r+2}) \cdot (2^{s-1})$$

$$= \boxed{2^{-1}} + r+2 + s-1$$

$$= 2^{r+s}$$

$$\boxed{\frac{1}{2} = 2^{-1}}$$

$$2r+4 = r+s$$

$$2r-r = s-4$$

$$r = s-4$$

3 (a) Diberi $\log_b bc^5 = -9$, cari nilai $\log_b c$.

[2 markah]

T4
B4

Given $\log_b bc^5 = -9$, find the value of $\log_b c$.

[2 marks]

$$\log_b b + 5 \log_b c = -9$$

$$\begin{aligned} \lg a + \lg b &= \lg ab \\ \lg a^c &= c \lg a \end{aligned}$$

$$5 \log_b c = -9 - 1$$

$$= -10$$

$$\log_b c = \frac{-10}{5}$$

$$\log_b c = -2$$

- (b) Terdapat satu kajian tentang sisa perkumuhan suatu organisma di dalam sebuah piring petri. Apabila n bilangan organisma diletakkan di dalam piring petri selama seminit, luas kawasan yang belum dicemari oleh sisa perkumuhan ialah $30(0.9)^n \text{ cm}^2$.

There is a study about the excretory waste of an organism in a petri dish. When n number of organism is placed in the petri dish for a minute, the remaining area that has not been contaminated by the excretory waste is $30(0.9)^n \text{ cm}^2$.

- (i) Nyatakan luas, dalam cm^2 , piring petri tersebut.

State the area, in cm^2 , of the petri dish.

$$\begin{aligned} 30(0.9)^0 &= 30(1) \\ &= 30 \text{ cm}^2 \end{aligned}$$

- (ii) Cari bilangan minimum organisma yang perlu dimasukkan supaya kawasan yang belum dicemari selama seminit adalah kurang daripada 1 cm^2 .

Find the minimum number of organism need to be placed so that the remaining area that has not been contaminated in a minute is less than 1 cm^2 .

[3 markah]

[3 marks]

$$30(0.9)^n < 1$$

$$0.9^n < \frac{1}{30}$$

$$n (\ln 0.9) < \ln\left(\frac{1}{30}\right)$$

$$n > \frac{\ln\left(\frac{1}{30}\right)}{\ln 0.9}$$

$$n > \frac{\ln\left(\frac{1}{30}\right)}{\ln(0.9)} = 32.28151799$$

$$\therefore \text{min } n = 33$$

$\times / ?$ -ve
change direction

- 4 (a) Diberi $y = 4(x-5)^3$ dan $\frac{dy}{dx} = h(x)$, cari nilai bagi $\int_0^4 h(x) dx$. [3 markah]

TS
B3

Given $y = 4(x-5)^3$ and $\frac{dy}{dx} = h(x)$, find the value of $\int_0^4 h(x) dx$. [3 marks]

$$\int \frac{dy}{dx} = h(x) dx$$

$$\int h(x) dx = y + c$$

$$\int_0^4 h(x) dx = [4(x-5)^3]_0^4$$

$$= 4(4-5)^3 - 4(0-5)^3$$

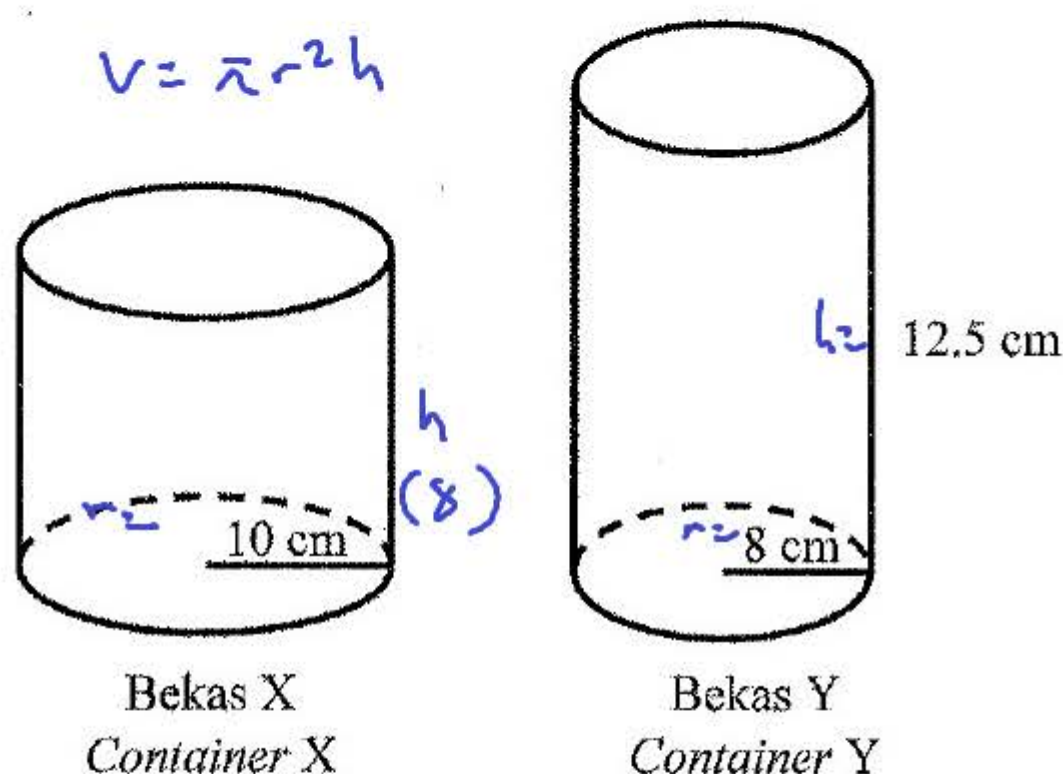
$$= 4(-1) - 4(-125)$$

$$= 496$$

- (b) Rajah 3 menunjukkan dua bekas silinder yang diletakkan di atas satu permukaan yang rata.

TS
B2

Diagram 3 shows two cylindrical containers placed on a flat surface.



$$\pi (10)^2 (h) = \pi (8)^2 (12.5)$$

$$h = \frac{8^2 \times 12.5}{10^2}$$

$$\frac{dV}{dt} = 4\pi \text{ cm}^3/\text{s}$$

$$V_2 = \pi (8)^2 (h)$$

$$= 64\pi h$$

$$\frac{dV}{dh} = 64\pi$$

$$\frac{dh}{dV} = \frac{1}{\frac{dV}{dh}} = \frac{1}{64\pi}$$

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

$$= \frac{1}{64\pi} \cdot 4\pi$$

$$= \frac{1}{16} \text{ cm/s}$$

Diberi bahawa bekas-bekas tersebut mempunyai isi padu yang sama dan air dituang ke dalam bekas-bekas itu dengan kadar malar $4\pi \text{ cm}^3 \text{ s}^{-1}$.

Cari masa, dalam saat, apabila paras air dalam bekas Y melebihi tinggi bekas X.

[3 markah]

It is given that the containers have the same volume and water is poured into the containers at a constant rate of $4\pi \text{ cm}^3 \text{ s}^{-1}$.

Find the time, in seconds, for the water level in container Y exceeds the height of container X.

[3 marks]

$$\frac{8 \times 16}{\frac{1}{16}} = 8 \times 16$$

$$= 128 \text{ s}$$

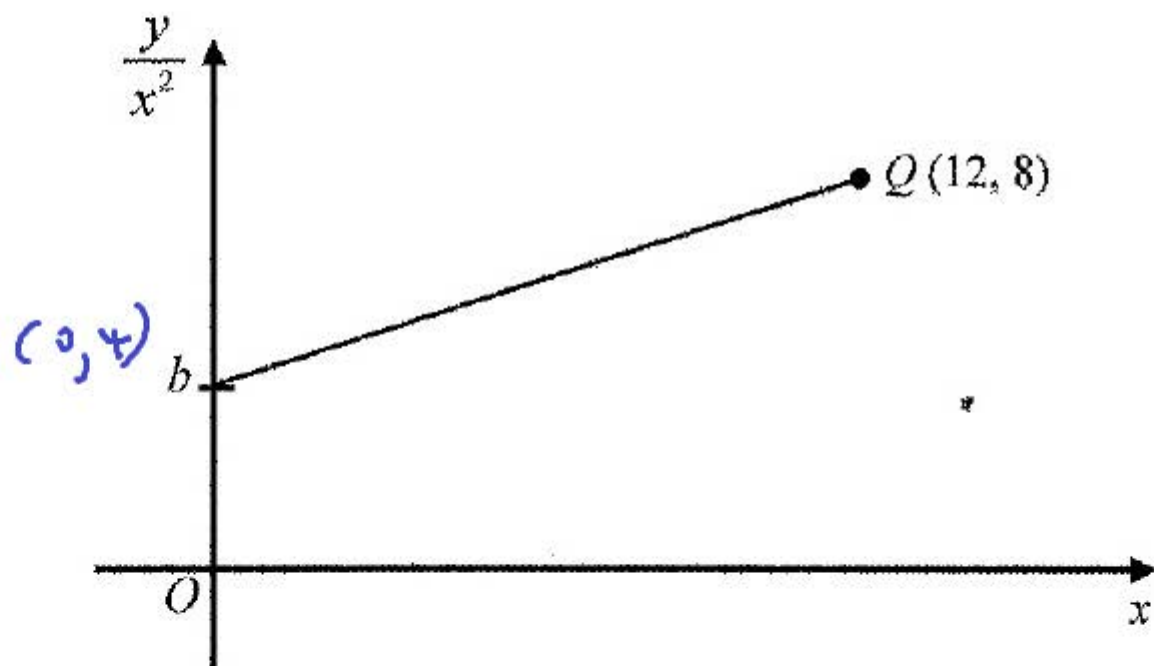
5 Pemboleh ubah x dan y dihubungkan oleh persamaan $y = ax^3 + 4x^2$.

74 Rajah 4 menunjukkan graf garis lurus $\frac{y}{x^2}$ melawan x .

36

The variables x and y are related by the equation $y = ax^3 + 4x^2$.

Diagram 4 shows a straight line graph $\frac{y}{x^2}$ against x .



Rajah 4
Diagram 4

Cari nilai a dan nilai b .

Find the value of a and of b .

$$y = ax^3 + 4x^2$$

$$\left[\frac{y}{x^2} \right] = a \left[x \right] + 4$$

$$Y = mX + c$$

$$y_1 = b = 4$$

$$a = \frac{8-4}{12-0}$$

$$a = \frac{4}{12}$$

$$a = \frac{1}{3}$$

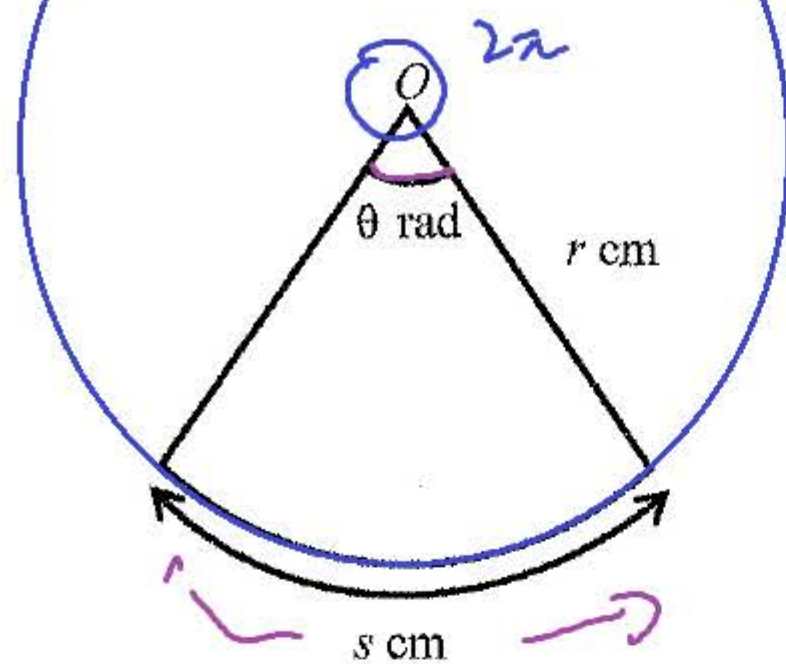
[4 markah]

[4 marks]

6

(a) Rajah 5 menunjukkan sebuah sektor dengan pusat O .

Diagram 5 shows a sector with centre O .



$$C = 2\pi r$$

$$\frac{\theta}{2\pi} = \frac{s}{C}$$

$$s = \frac{\theta}{2\pi} \times C$$

$$= \frac{\theta}{2\pi} \times 2\pi r$$

$$s = r\theta$$

$$\frac{s}{\theta} = \frac{r}{1}$$

$$s = r\theta$$

Buktikan $s = r\theta$. [2 markah]

Prove $s = r\theta$. [2 marks]

$$\frac{s}{\theta} = \frac{2\pi r}{2\pi}$$

$$s = r\theta$$

1

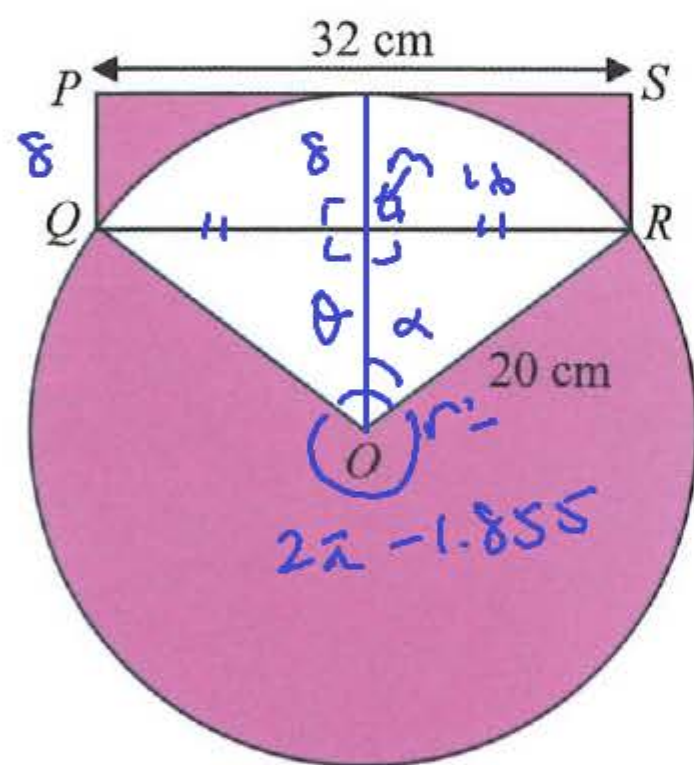
1

(b) Rajah 6 menunjukkan sebuah bulatan berpusat O dan segi empat tepat $PQRS$.

PS ialah tangen kepada bulatan tersebut.

Diagram 6 shows a circle with centre O and a rectangle $PQRS$.

PS is a tangent to the circle.



$$\sin \alpha = \frac{16}{20}$$

$$\alpha = \sin^{-1}\left(\frac{16}{20}\right)$$

$$\theta = 2\alpha = 2\sin^{-1}\left(\frac{16}{20}\right)$$

$$\theta = 2\sin^{-1}\left(\frac{16}{20}\right) \times \frac{3.142}{180}$$

$$A_{OQR} = \frac{1}{2}(20)^2(2\pi - 1.855)$$

$$= 885.8$$

$$0.5 \times 20^2 \times (2 \times 3.142 - 1.855)$$

$$A_{PQRS} = 32(8)$$

$$= 256$$

$$32 \times 8$$

$$OM = \sqrt{20^2 - 16^2} = 12$$

$$PQ = 20 - 12 = 8$$

Hitung luas, dalam cm^2 , bagi kawasan berwarna.

[5 markah]

Calculate the area, in cm^2 , of the coloured region.

[5 marks]

[Guna / Use $\pi = 3.142$]

$$A_{\text{segment}} = \frac{1}{2}(20)^2(1.855) - \frac{1}{2}(20)^2 \sin 106.26^\circ$$

$$= 0.5 \times 20^2 \times (1.855) - 0.5 \times 20^2 \times \sin(106.26^\circ)$$

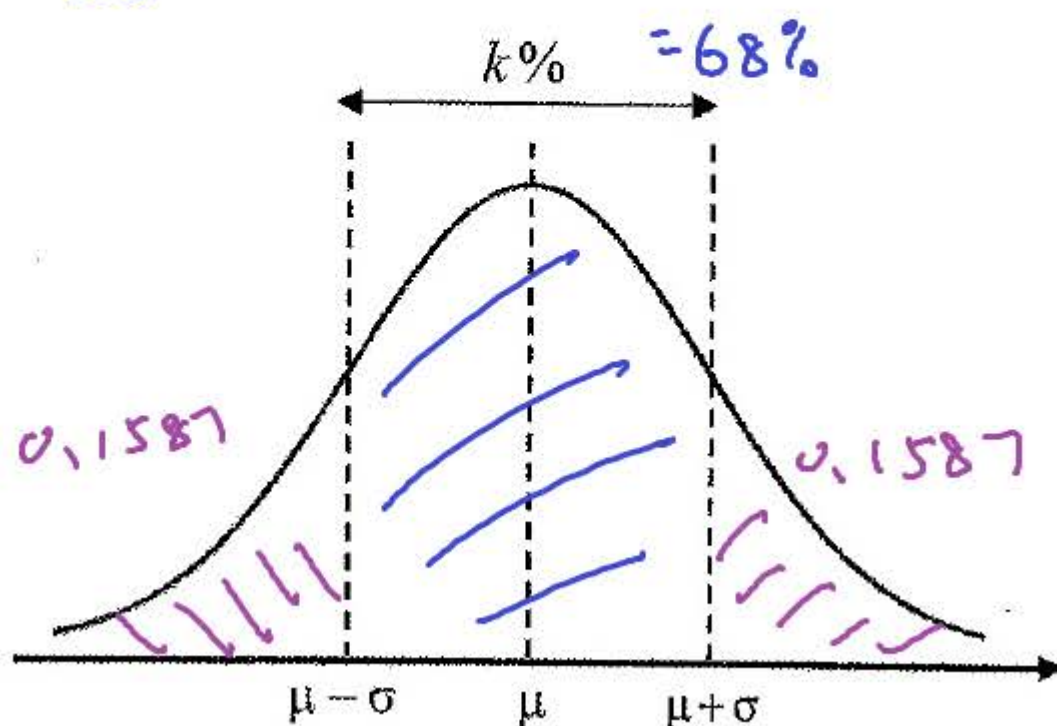
$$= 179$$

$$A_c = 885.8 + 256 - 179$$

$$= 962.8 \text{ cm}^2$$

$$885.8 + 256 - 179$$

- 7 (a) Rajah 7 menunjukkan peratusan taburan data dalam lingkungan sisihan piawai, σ .
Diagram 7 shows the percentage of data distribution within standard deviation, σ .



$$P(Z > 1) =$$

0.1587
0.1587

$$k\% = 1 - 2(0.1587)$$

$$= 1 - 2 \times 0.1587$$

$$= 68.26\%$$

Nyatakan nilai k .
State the value of k .

[1 markah]

[1 mark]

- (b) Lakarkan graf taburan normal piawai yang mewakili $P(-0.2 < z < 0.2)$.

Seterusnya, cari kebarangkalian tersebut.

[3 markah]

Sketch the standard normal distribution graph representing $P(-0.2 < z < 0.2)$.

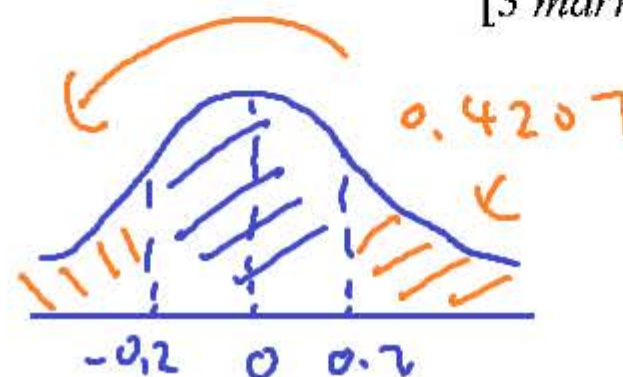
Hence, find the probability.

[3 marks]

$$P(-0.2 < z < 0.2) = 1 - 2(0.4207)$$

$$= 1 - 2 \times 0.4207$$

$$= 0.1586$$

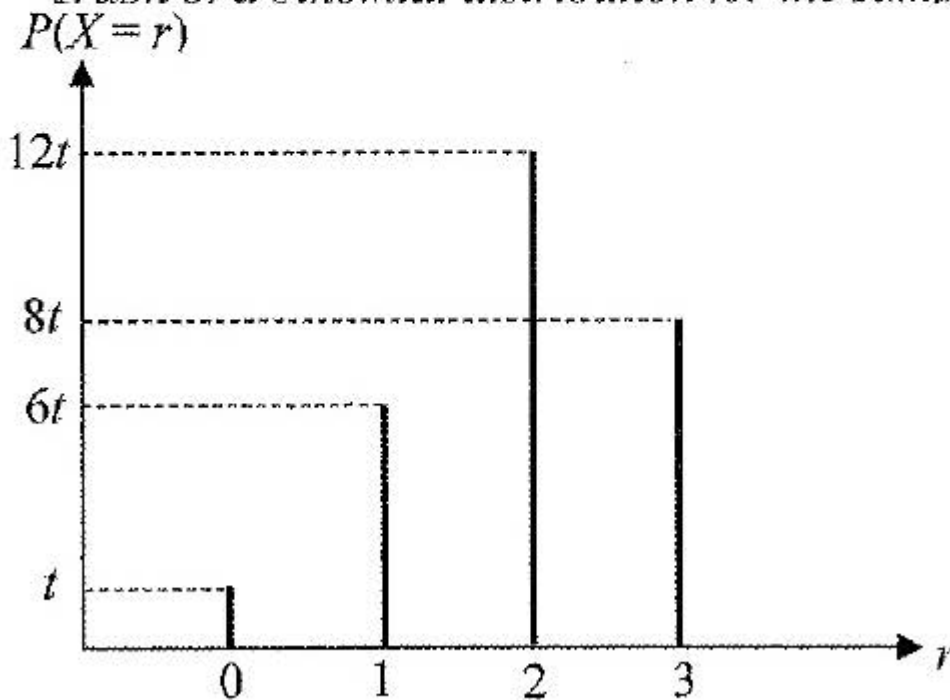


z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											TOLAK								
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641	4	8	12	16	20	24	28	32	36
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247	4	8	12	16	20	24	28	32	36
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.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

75
BS

- 8 Satu tinjauan tentang pengambilan vaksin influenza dalam kalangan kanak-kanak telah dijalankan di sebuah bandar. Didapati kebarangkalian kanak-kanak mengambil vaksin influenza ialah p . Rajah 8 menunjukkan graf taburan binomial bagi sampel data 3 orang kanak-kanak yang telah dipilih secara rawak.

A survey of influenza vaccination among children was conducted in a town. It is found that the probability of children who took the influenza vaccine is p . Diagram 8 shows a graph of a binomial distribution for the sample of 3 children chosen at random.



$$X \sim B(3, p)$$

$$P(X=3) = 8t$$

$${}^3C_3 p^3 (1-p)^0 = 8\left(\frac{1}{27}\right)$$

$$p^3 = \frac{8}{27}$$

$$p = \sqrt[3]{\frac{8}{27}} = \frac{2}{3}$$

$$P(X=0) = t$$

$${}^3C_0 p^0 (1-p)^3 = \frac{1}{27}$$

$$1-p = \sqrt[3]{\frac{1}{27}}$$

$$1-p = \frac{1}{3}$$

$$p = 1 - \frac{1}{3}$$

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

- (a) Cari nilai t .

[2 markah]

Find the value of t .

[2 marks]

- (b) Jika terdapat 630 orang kanak-kanak dalam bandar itu, cari sisihan piawai bilangan kanak-kanak yang telah mengambil vaksin influenza tersebut.

[3 markah]

If there are 630 children in the town, find the standard deviation of the number of children who took the influenza vaccine.

[3 marks]

$$a) \quad 12t + 8t + 6t + t = 1$$

$$27t = 1$$

$$t = \frac{1}{27}$$

$$b) \quad n = 630, \quad p = \frac{2}{3}, \quad q = \frac{1}{3}$$

$$\begin{aligned} \sigma &= \sqrt{npq} \\ &= \sqrt{630 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)} \\ &= \sqrt{140} \\ &= 11.83 \end{aligned}$$

$$\sqrt{140} = 2\sqrt{35}$$

$$\sqrt{140} = 11.83215957$$

9 Satu kumpulan mentor yang terdiri daripada 7 orang pelajar akan dibentuk.

A group of mentors consists of 7 students is to be formed.

10P 8L

$$\begin{array}{r} 10C5 \times 8C2 \\ \hline 7056 \end{array}$$

75

34

(a) Jika terdapat 10 orang pelajar perempuan dan 8 orang pelajar lelaki, kira bilangan cara kumpulan itu boleh dibentuk dengan keadaan bilangan pelajar lelaki adalah genap. [3 markah]

L: 2, 4, 6
P: 5, 3, 1

If there are 10 female students and 8 male students, calculate the number of ways the group can be formed such that the number of male student is even. [3 marks]

$$\begin{array}{r} 10C3 \times 8C4 \\ \hline 8400 \end{array}$$

$$\begin{array}{r} 10C1 \times 8C6 \\ \hline 280 \end{array}$$

(b) Satu kumpulan mentor yang terbentuk terdiri daripada 4 orang pelajar lelaki dan 3 orang pelajar perempuan akan disusun secara sebaris untuk satu sesi fotografi.

A group of mentors that was formed consisting of 4 male students and 3 female students are to be arranged in a row for a photography session.

(i)

7!

(i) Cari bilangan cara berbeza pelajar-pelajar itu dapat disusun secara rawak tanpa sebarang syarat.

Find the number of different ways the students can be arranged randomly without any restriction.

$$\begin{array}{r} 7! \\ \hline 5040 \end{array}$$

(ii) Ketua mentor akan dipilih daripada pelajar lelaki dan penolong ketua mentor akan dipilih daripada pelajar perempuan.

Jika ketua mentor ialah Ryan dan penolong ketua mentor ialah Maria, cari bilangan cara berbeza untuk menyusun kesemua pelajar mengikut jantina, dengan keadaan kedudukan antara Ryan dan Maria dipisahkan oleh sekurang-kurangnya 4 orang pelajar lain.

The head mentor will be chosen from male students and the assistant of the head mentor will be chosen from female students.

If the head mentor is Ryan and the assistant of the head mentor is Maria, find the number of different ways all the students can be arranged according to their gender such that the position between Ryan and Maria is separated by at least 4 other students.

[4 markah]

[4 marks]

$$\begin{array}{c} 4L \quad 3P \quad R, M \\ \begin{array}{c} \xrightarrow{L} \\ R \quad 3P_3 \quad 2P_2 \quad M \\ \hline \end{array} \\ \begin{array}{c} 3P_3 \quad 2P_2 \\ R \quad \quad \quad M \\ \hline \end{array} \\ \begin{array}{c} 3P_3 \quad 2P_2 \quad M \\ R \quad \quad \quad \\ \hline \end{array} \end{array}$$

$$\begin{array}{c} M \quad 2P_2 \quad 3P_3 \quad R \\ \hline 3P_3 \times 2P_2 \times 2 = 24 \\ \begin{array}{c} M \quad 2P_2 \quad 3P_3 \quad R \\ \hline 3P_3 \times 2P_2 \times 2 = 24 \\ \begin{array}{c} M \quad 2P_2 \quad 3P_3 \quad R \\ \hline 3P_3 \times 2P_2 \times 2 = 24 \end{array} \end{array} \end{array}$$

$$3(24) = 72$$

4

9(b)(ii)	${}^1P_1 \times {}^3P_3 \times 1 \times {}^2P_2$	1
	${}^1P_1 \times {}^3P_3 \times 1 \times {}^2P_2 \times 2 \times 3$	1
	72	1

10 Permaidani berbentuk segi empat tepat dengan lebar $(6 - \sqrt{2})$ m mempunyai keluasan $(114 - 36\sqrt{2}) \text{ m}^2$.

T4
B4

Ungkapkan panjang, dalam m, permaidani tersebut dalam bentuk $a + b\sqrt{2}$, dengan keadaan a dan b ialah pemalar.

Seterusnya, nyatakan nisbah panjang kepada lebar permaidani tersebut.

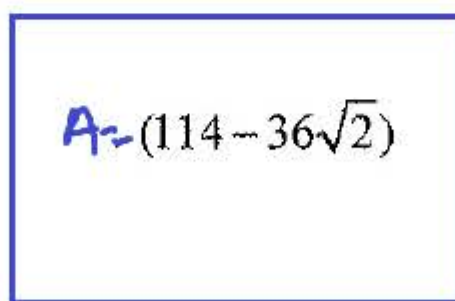
[5 markah]

A rectangular carpet with a width of $(6 - \sqrt{2})$ m has an area of $(114 - 36\sqrt{2}) \text{ m}^2$.

Express the length, in m, of the carpet in the form of $a + b\sqrt{2}$, such that a and b are constants.

Hence, state the ratio of length to width of the carpet.

[5 marks]



$$w = (6 - \sqrt{2}) \text{ m}$$

$$l \cdot w = A$$

$$l = \frac{A}{w}$$

$$l = \frac{(114 - 36\sqrt{2})(6 + \sqrt{2})}{(6 - \sqrt{2})(6 + \sqrt{2})}$$

$\frac{114 - 36\sqrt{2}}{6 - \sqrt{2}}$
13.75735931

$$= \frac{684 + 114\sqrt{2} - 216\sqrt{2} - 72}{36 - 2}$$

$$= \frac{612 - 102\sqrt{2}}{34}$$

$$= 18 - 3\sqrt{2}$$

$$= 3(6 - \sqrt{2})$$

$$l : w = 3(6 - \sqrt{2}) : (6 - \sqrt{2})$$

$$= 3 : 1$$

11 Menyenaikan semua sebutan bagi jujukan adalah **tidak** diterima.

*Listing out all terms of the sequence is **not** accepted.*

T4
B5
A9.

(a) Diberi bahawa sebutan pertama dan beza sepunya bagi suatu janjang aritmetik masing-masing ialah 5 dan -3 .

It is given that the first term and the common difference of an arithmetic progression are 5 and -3 respectively.

(i) Ungkapkan T_n dalam sebutan n .

Express T_n in terms of n .

(ii) Seterusnya, cari dua sebutan yang berturutan dengan keadaan hasil tambah kedua-dua sebutan tersebut ialah -23 .

Hence, find two consecutive terms such that the sum of both terms is -23 .

A.P. $a=5, d=-3$

[4 markah]

[4 marks]

$$\begin{aligned} a) \quad T_n &= a + (n-1)d \\ &= 5 + (n-1)(-3) \\ &= 5 - 3n + 3 \\ &= 8 - 3n \end{aligned}$$

b) let 1st term = x then 2nd term is $x-3$

$$x + (x-3) = -23$$

$$2x = -20$$

$$x = -10$$

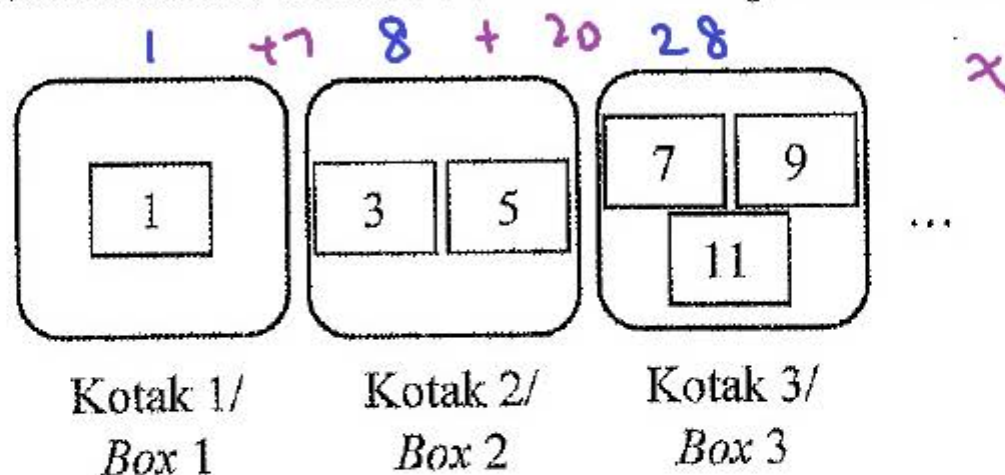
$$\therefore -10, -13 \quad \text{TL}$$

$$-10 + (-13) = -23$$

- (b) Rajah 9 menunjukkan kad-kad berlabel dengan nombor ganjil disusun secara berturutan.

T4
BS
A.D.

Diagram 9 shows cards labelled with odd number arranged consecutively.



Rajah 9
Diagram 9

- (i) Tentukan jumlah bilangan kad dalam 20 kotak yang pertama.
Determine the total number of cards in the first 20 boxes.
- (ii) Seterusnya, cari hasil tambah bagi semua nombor pada kad-kad tersebut.
Hence, find the sum of all numbers on the cards.

[5 markah]

[5 marks]

$$1, 2, 3, \dots, 20$$

$$a=1, d=1, S_n = \frac{n}{2} (2a + (n-1)d) = \frac{n}{2} (a + l)$$

$$S_{20} = \frac{20}{2} (1 + 20) \\ = 210$$

$$(\therefore) 1, 3, 5, 7, 9, \dots \quad T_{210}$$

$$a=1, d=2, S_{210} = \frac{210}{2} [2(1) + (210-1)(2)] \\ = 44100$$

12 Diberi $P(a, b)$ dan $Q(-b, a)$ dengan keadaan a dan b ialah pemalar.

Titik P berada dalam sukuan pertama pada satah Cartes dengan O sebagai asalan.

Given $P(a, b)$ and $Q(-b, a)$ such that a and b are constants. Point P is in the first quadrant of the Cartesian plane with O as the origin.

(a) Nyatakan julat nilai k jika vektor unit dalam arah $\overrightarrow{OP}$ ialah $k\mathbf{i} + m\mathbf{j}$, $k \neq 0$.

[1 markah]

State the range of values of k if the unit vector in the direction of $\overrightarrow{OP}$ is

$k\mathbf{i} + m\mathbf{j}$, $k \neq 0$.

[1 mark]

(b) Jika vektor unit dalam arah $3\overrightarrow{OP}$ ialah $\frac{5}{2}(a\mathbf{i} + b\mathbf{j})$, cari $|2\overrightarrow{OQ}|$. [3 markah]

If the unit vector in the direction of $3\overrightarrow{OP}$ is $\frac{5}{2}(a\mathbf{i} + b\mathbf{j})$, find $|2\overrightarrow{OQ}|$.

[3 marks]

$P(a, b)$ dan $Q(-b, a)$

$$\overrightarrow{OP} = \begin{pmatrix} a \\ b \end{pmatrix}$$

$$|\overrightarrow{OP}| = \sqrt{a^2 + b^2}$$

$$= \frac{1}{\sqrt{a^2 + b^2}}$$

unit vector in the direction of $\overrightarrow{OP}$

$$\frac{1}{\sqrt{a^2 + b^2}} (a\mathbf{i} + b\mathbf{j})$$

$$3\overrightarrow{OP} = \begin{pmatrix} 3a \\ 3b \end{pmatrix}$$

$$|3\overrightarrow{OP}| = \sqrt{(3a)^2 + (3b)^2}$$

$$= \sqrt{9a^2 + 9b^2}$$

$$= \sqrt{9(a^2 + b^2)}$$

$$= 3\sqrt{a^2 + b^2}$$

unit vector in the direction of $3\overrightarrow{OP}$

$$= \frac{1}{3\sqrt{a^2 + b^2}} (3a\mathbf{i} + 3b\mathbf{j})$$

$$= \frac{1}{\sqrt{a^2 + b^2}} (a\mathbf{i} + b\mathbf{j})$$

$$= \frac{5}{2}(a\mathbf{i} + b\mathbf{j})$$

$$\frac{1}{\sqrt{a^2 + b^2}} \Rightarrow \frac{5}{2}$$

$\Rightarrow$

$$\sqrt{a^2 + b^2} = \frac{2}{5}$$

$$|2\overrightarrow{OQ}| = 2|\overrightarrow{OQ}|$$

$$= 2\sqrt{(-b)^2 + a^2}$$

$$= 2\sqrt{a^2 + b^2}$$

$$= 2\left(\frac{2}{5}\right)$$

$$= \frac{4}{5}$$

$Q(-b, a)$

$$\overrightarrow{OQ} = \begin{pmatrix} -b \\ a \end{pmatrix}$$

$$(a) \quad 0 < k \leq 1$$

$$\overrightarrow{OP} = 1\mathbf{i} + 0\mathbf{j}$$

$$\overrightarrow{OP} = \cancel{1}\mathbf{i} + 1\mathbf{j}$$

$$\overrightarrow{OP} = \frac{3}{5}\mathbf{i} + \frac{4}{5}\mathbf{j}$$

1st

$k > 0$

$$2\pi = 360^\circ$$

- 13 (a) Lakarkan sudut $-\frac{7}{3}\pi$ rad pada Rajah 10. Seterusnya, nyatakan sukuan bagi sudut tersebut. [2 markah]

15
136

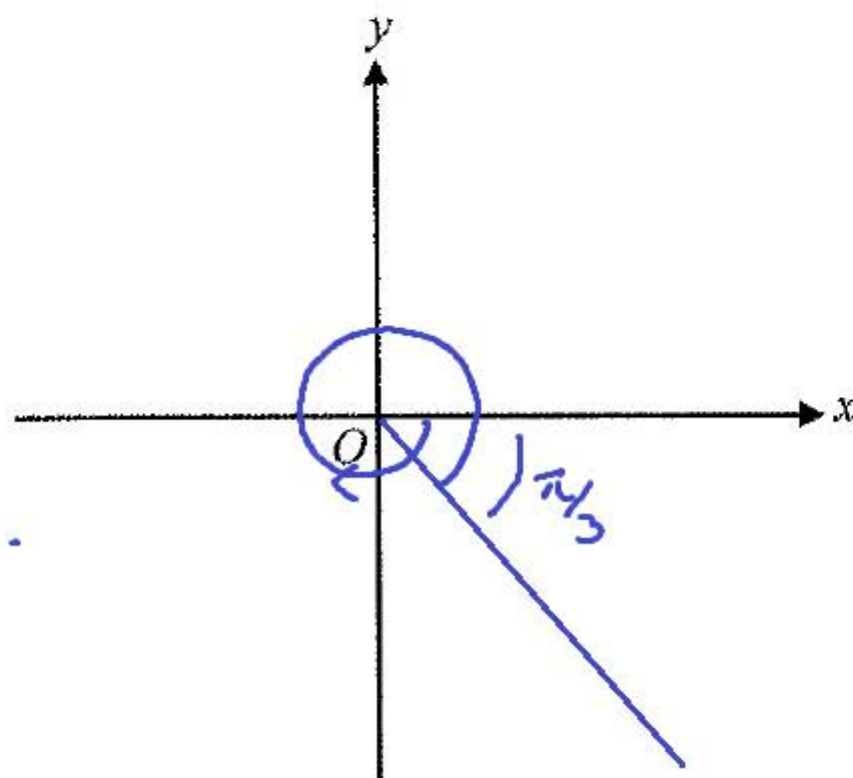
Sketch the angle $-\frac{7}{3}\pi$ rad on Diagram 10. Hence, state the quadrant for the angle.

[2 marks]

Jawapan / Answer:

$$2\pi + \frac{\pi}{3} = \frac{7\pi}{3}$$

Sukuan ke IV.
empat.



Rajah 10
Diagram 10

- (b) Selesaikan persamaan trigonometri $4 \cot x - 1 = 0$ untuk $0^\circ \leq x \leq 360^\circ$.

[2 markah]

$$\cot x = \frac{1}{\tan x}$$

Solve the trigonometric equation $4 \cot x - 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

[2 marks]

$$\frac{4}{\tan x} = 1$$

$$4 = \tan x$$

$$\text{basic } x = \tan^{-1}(4) = 75.96^\circ$$

$$\frac{S}{T} \frac{C}{L} \quad 180^\circ + 0^\circ$$

$\tan^{-1}(4)$ 75.96375653

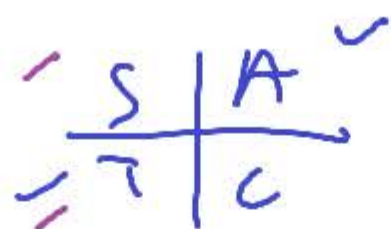
$$x = 75.96^\circ, 180^\circ + 75.96^\circ = 75.96^\circ, 255.96^\circ$$

- (c) Diberi bahawa $\tan A = \sqrt{p}$ dan $\cos B = -\frac{3}{5}$, dengan keadaan A dan B berada pada sukuan yang sama. *skema -3*
- TS
BB
- It is given that $\tan A = \sqrt{p}$ and $\cos B = -\frac{3}{5}$, such that A and B are on the same quadrant.

Cari

Find

- (i) $\sec A$,
 $\sec A$,
 (ii) $\tan(A - B)$.

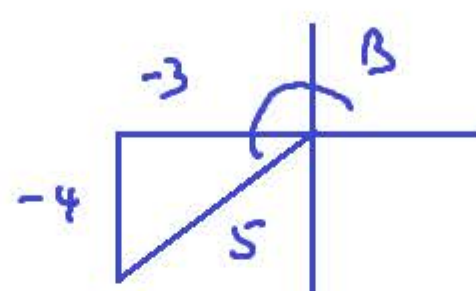
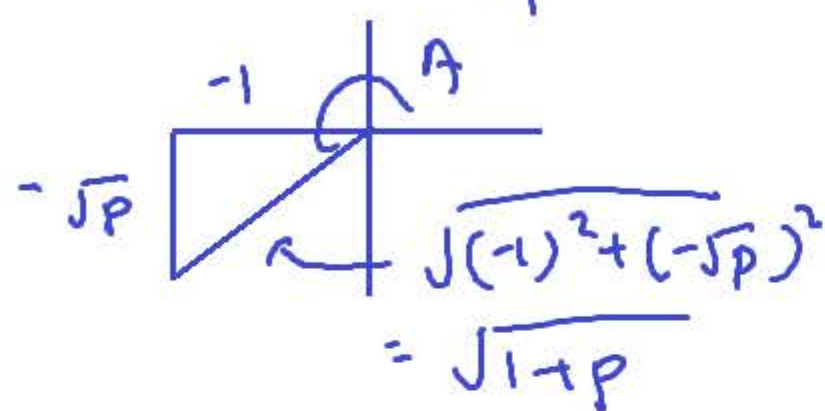


[4 markah]

[4 marks]

$$\tan A = \frac{\sqrt{p}}{1}$$

$$\cos B = -\frac{3}{5}$$



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

$$\sin A = \frac{-\sqrt{p}}{\sqrt{1+p}} \quad \cos A = \frac{-1}{\sqrt{1+p}}$$

$$\sin B = -\frac{4}{5} \quad \tan B = \frac{-4}{-3} = \frac{4}{3}$$

$$(i) \sec A = \frac{1}{\cos A} = \frac{1}{\frac{-1}{\sqrt{1+p}}} = -\sqrt{1+p}$$

$$(ii) \tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$= \frac{(\sqrt{p} - \frac{4}{3})}{(1 + (\sqrt{p})(\frac{4}{3}))} \times 3$$

$$= \frac{(3\sqrt{p} - 4)(3 - 4\sqrt{p})}{(3 + 4\sqrt{p})(3 - 4\sqrt{p})}$$

$$= \frac{9\sqrt{p} - 12p - 12 + 16\sqrt{p}}{9 - 16p}$$

$$9 - 16p$$

$$= \frac{25\sqrt{p} - 12p - 12}{9 - 16p}$$

$$\frac{3\sqrt{p} - 4}{3 + 4\sqrt{p}}$$

- 14 (a) Diberi bahawa garis lurus $y = 1 - m(x+1)$ ialah tangen kepada lengkung $y = x^2$.
Cari nilai m . [3 markah]

It is given that the straight line $y = 1 - m(x+1)$ is tangent to the curve $y = x^2$.
Find the value of m . [3 marks]

Sub (2) into (1)

$$x^2 = 1 - m(x+1)$$

$$x^2 + m(x+1) - 1 = 0$$

$$x^2 + mx + m - 1$$

$$a = 1, b = m, c = m - 1$$

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

$$m^2 - 4(1)(m-1) = 0$$

$$m^2 - 4m + 4 = 0$$

$$(m - 2)^2 = 0$$

$$m = 2$$

- 74
32
- (b) Ketinggian dron A dan B, dalam m, dari tanah masing-masing diwakili oleh fungsi $h(t) = 4t - \frac{1}{2}t^2$ dan $g(t) = -5(t-2)^2 + 22$, dengan keadaan t ialah masa dalam minit selepas dron diterbangkan ke udara.

The height of drone A and B, in m, from the ground are represented by the function $h(t) = 4t - \frac{1}{2}t^2$ and $g(t) = -5(t-2)^2 + 22$ respectively, such that t is time in minutes after the drones are flown into the air.

- (i) Dengan menggunakan kaedah penyempurnaan kuasa dua, cari beza ketinggian antara dron A dan B sekiranya kedua-dua dron tersebut masing-masing berada pada ketinggian maksimum. [3 markah]

By using completing the square method, find the difference in height between drone A and B if both drones are at their own respective maximum height. [3 marks]

- (ii) Cari julat masa, dalam minit, jika ketinggian dron B ialah sekurang-kurangnya 17 m dari tanah dengan menggunakan kaedah garis nombor. [2 markah]

Find the range of time, in minutes, if the height of the drone B is at least 17 m from the ground by using the number line method. [2 marks]

$$h(t) = 4t - \frac{1}{2}t^2$$

$$h(t) = \left(\frac{-\frac{1}{2}t^2 + 4t}{-\frac{1}{2}} \right)$$

$$= -\frac{1}{2}(t^2 - 8t)$$

$$= -\frac{1}{2}\left(t^2 - 8t + \left(\frac{-8}{2}\right)^2 - \left(\frac{-8}{2}\right)^2\right)$$

$$= -\frac{1}{2}\left[(t-4)^2 - 16\right]$$

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

$$a = -\frac{1}{2} \quad \text{axis of sym} \quad t-4=0$$

$$t=4$$

$$\text{D.f.f } h = 22 - 8$$

$$= 14 \text{ m}$$

$$g(t) = -5(t-2)^2 + 22$$

$$g(t) \geq 17$$

$$-5(t-2)^2 + 22 \geq 17$$

$$5(t-2)^2 - 5 \leq 0$$

$$(t^2 - 4t + 4) - 1 \leq 0$$

$$t^2 - 4t + 3 \leq 0$$

$$(t-1)(t-3) \leq 0$$

$$a = -5$$

$$g(t) = -5(t-2)^2 + 22$$

$$\text{axis of sym: } t-2=0$$

$$t=2$$

$$\text{max value} = 22$$

$$(2, 22)$$

$$\text{max value} = 8$$

$$(4, 8)$$

$$g(t) > 17$$

$$\text{let } t-1 \geq 0 \quad t-3 \geq 0$$

$$t \geq 1$$

$$t \geq 3$$

$$\begin{array}{c} - \quad + \quad + \\ \bullet \quad \bullet \end{array}$$

$$\begin{array}{c} + \quad 1 \quad (-) \quad 3 \quad + \end{array}$$

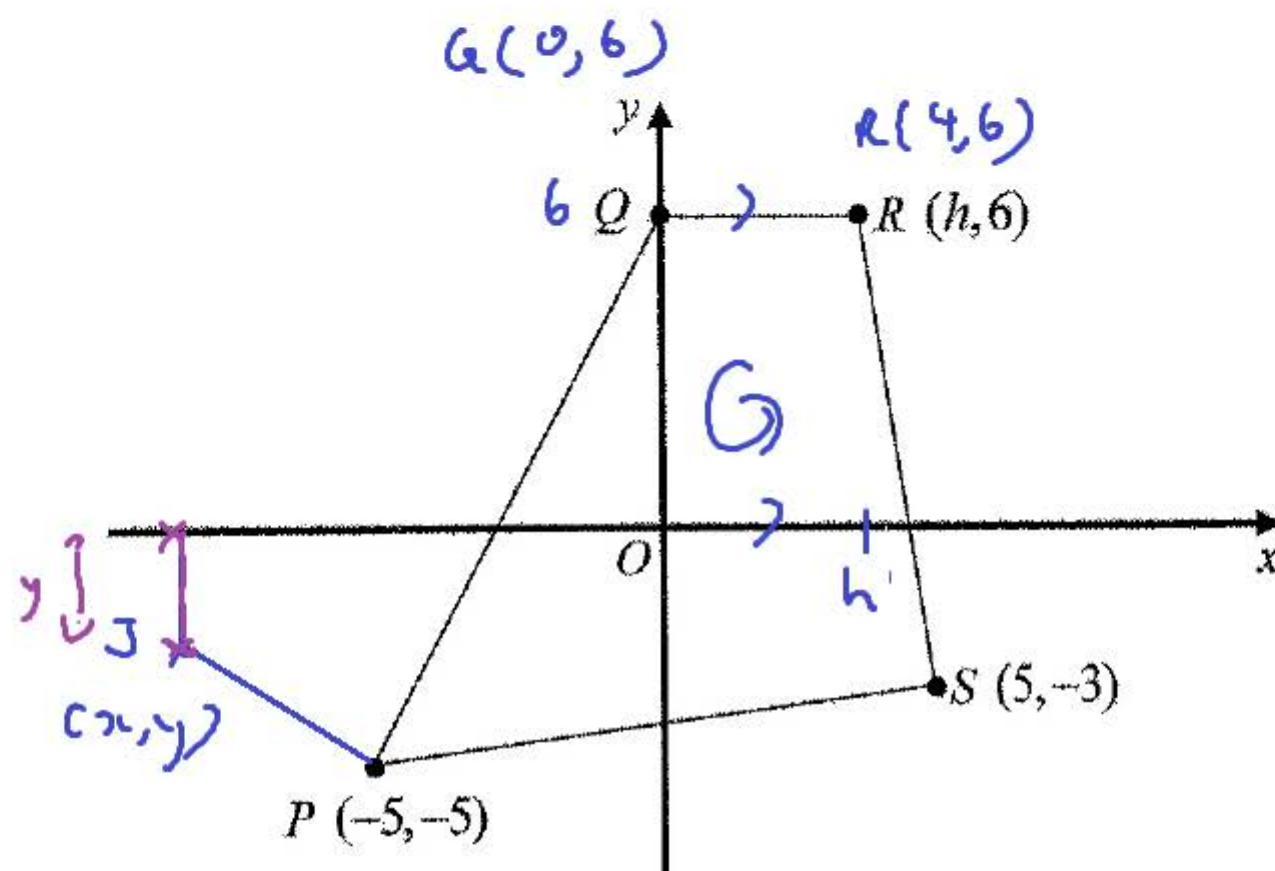
$$\therefore 1 \leq t \leq 3$$

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

Solution by scale drawing is not accepted.

Rajah 11 menunjukkan sisi empat $PQRS$ dengan keadaan O ialah asalan. Garis QR adalah selari dengan paksi- x .

Diagram 11 shows quadrilateral $PQRS$ such that O is the origin. Line QR is parallel to the x -axis.



Diberi bahawa luas sisi empat $PQRS$ ialah 68 unit^2 .

It is given that the area of quadrilateral $PQRS$ is 68 unit^2 .

(a) Cari nilai h . [4 markah]

Find the value of h . [4 marks]

(b) Titik J bergerak dengan keadaan jaraknya dari titik P adalah sentiasa 2 kali jaraknya dari paksi- x .

Cari persamaan lokus bagi J . Seterusnya, tentukan sama ada lokus ini melalui titik $(-5, 5)$ atau tidak. [4 markah]

The point J moves such that its distance from point P is always 2 times its distance from the x -axis.

Find the equation of the locus of J . Hence, determine whether the locus passes through point $(-5, 5)$ or not. [4 marks]

$$A = 68$$

$$68 \times 2 = 136$$

$$\frac{1}{2} \begin{vmatrix} 0 & -5 & 5 & h & 0 \\ 6 & -5 & -3 & 6 & 6 \end{vmatrix} = 68$$

$$\left| (0(-5) + (-5)(-3) + 5(6) + h(6)) - (6(-5) + (-5)(5) + (-3)(h) + 6(0)) \right| = 136$$

$$| 0 + 15 + 30 + 6h + 30 + 25 + 3h - 0 | = 136$$

$$| 9h + 100 | = 136$$

$$9h + 100 = \pm 136$$

$$9h + 100 = 136$$

$$9h = 36$$

$$h = 4$$

$$9h + 100 = -136$$

$$9h = -236$$

$$h = -\frac{236}{9}$$

(rejected, $h > 0$)

$$(b) \text{ let } J(x, y), P(-5, -5), JP = 2y$$

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

$$x^2 + 10x + 25 + y^2 + 10y + 25 = 4y^2$$

$$x^2 - 3y^2 + 10x + 10y + 50 = 0$$

$$(-5, 5), \quad x = -5, \quad y = 5$$

$$\text{LHS } (-5)^2 - 3(5)^2 + 10(-5) + 10(5) + 50$$

$$= 25 - 75 - 50 + 50 + 50$$

$$= 0 = \text{RHS}$$

$$\therefore \text{Locus } J \text{ melalui } (-5, 5)$$