Jawab **semua** *soalan.*

1. The first three terms of a geometric progression are $m + 20,\ m - 4,\ m - 20$. Calculate the value of m and the common ratio, r.
Tiga sebutan pertama suatu janjang geometri ialah $m + 20,\ m - 4,\ m - 20$. *Hitung nilai* m *dan nisbah sepunya,* r. [3 marks/*markah*]

Answer / *Jawapan* :

~~$m-4 = m-20 \div m-20 = m+4$~~

-24

$\frac{m-4}{m+20} = \frac{m-20}{m-4}$

$(m-4)(m-4) = (m+20)(m-20)$

$m^2 - 8m + 16 = m^2 - 400$

$-8m = -416$

$m = 52$

$r = \frac{52-4}{52+20}$

$= \frac{48}{72}$

$= \frac{2}{3}$

3

2. Diagram 2 shows the graph of a straight line $\log_3 y$ against x.
Rajah 2 menunjukkan graf garis lurus $\log_3 y$ *melawan* x.

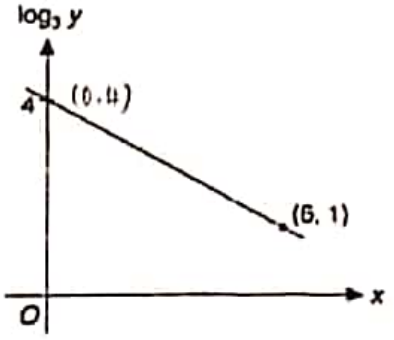


Diagram 2 / *Rajah 2*

Based on Diagram 2, express y in terms of x.
Berdasarkan Rajah 2, ungkapkan y *dalam sebutan* x. [3 marks/*markah*]

Answer / *Jawapan* :

$m = \frac{4-1}{0-6}$

$= -\frac{3}{6}$

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

$\log_3 y = -\frac{1}{2}x + 4$

$y = 3^{-\frac{1}{2}x+4}$

3

3

3. Diagram 3 shows a straight line passing through R (6, 0) and S (0, -4).
Rajah 3 menunjukkan garis lurus yang melalui R (6, 0) dan S (0, -4).

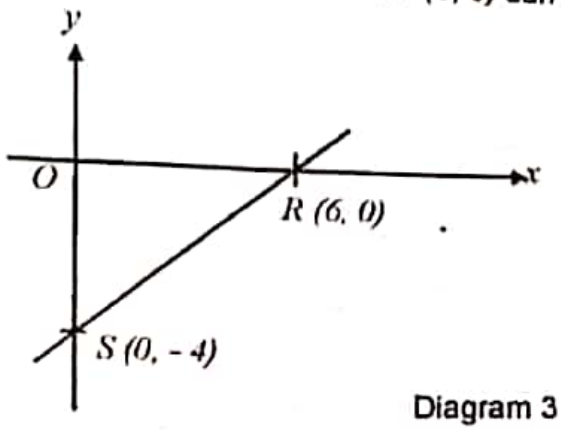


Diagram 3 / *Rajah 3*

A point P moves such that PR is twice PS. Find the equation of the locus of P.
Suatu titik P bergerak dengan keadaan PR adalah dua kali PS. Cari persamaan lokus bagi P.
[3 marks/*markah*]

Answer / *Jawapan*

$\sqrt{(x-6)^2+(y-0)^2} = 2\sqrt{(x-0)^2+(y+4)^2}$

$x^2-12x+36+y^2 = 4(x^2+y^2+8y+16)$

$x^2-12x+36+y^2 = 4x^2+4y^2+32y+64$

$3x^2+3y^2+12x+32y+28=0$ 3

3

4. a and b are non-zero and non-parallel vectors. Given $(m-5)\boldsymbol{a} = (3n+4)\boldsymbol{b}$, where m and n are constants. Find the values of m and n.
a dan b ialah vector bukan sifar dan tidak selari. Diberi $(m-5)\boldsymbol{a} = (3n+4)\boldsymbol{b}$, dengan keadaan m dan n ialah pemalar. Cari nilai m dan nilai n. [2 marks/*markah*]

Answer / *Jawapan* :

$m = 5$ 1

$3n+4=0$

$n = -\frac{4}{3}$ 1

5. Diagram 5 shows the function f which maps x onto y.
Rajah 5 menunjukkan fungsi f yang memetakan x kepada y.

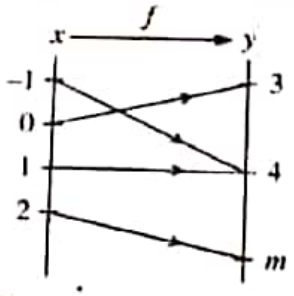


Diagram 5 / *Rajah 5*

State / *Nyatakan*

(a) the type of the relation, / *jenis hubungan,*

(b) the value of m, if $f: x \to x^2 + 3$. / *nilai m, jika $f: x \to x^2 + 3$.* [2 marks/*markah*]

Answer / *Jawapan* :

a) Many to one relation ✓1

b) $f(x) = x^2 + 3$

$f(2) = m$

$2^2 + 3 = m$

$m = 7$ ✓1

3

6. Solve the equation $2\cos^2 x + \sin x = 1$ for $0° \le \theta \le 360°$.
Selesaikan persamaan $2\cos^2 x + \sin x = 1$ untuk $0° \le \theta \le 360°$. [4 marks/*markah*]

Answer / *Jawapan* :

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

$2(1 - \sin^2 x) + \sin x = 1$

$2 - 2\sin^2 x + \sin x - 1 = 0$

$-2\sin^2 x + \sin x + 1 = 0$

$2\sin^2 x - \sin x - 1 = 0$

$(\sin x - 1)(2\sin x + 1) = 0$

$2\sin x \quad \sin x$

$\sin x \quad -1 \quad 2\sin x$

$\sin x - 1 = 0$, $2\sin x + 1 = 0$

$\sin x = 1$ $\sin x = -\frac{1}{2}$

$x = 90°$ $x = 210°, 330°$

$\therefore x = 90°, 210°, 330°$ ✓

7. Diagram 7 shows a sector of OPQ with centre O.
Rajah 7 menunjukkan sector OPQ berpusat O.

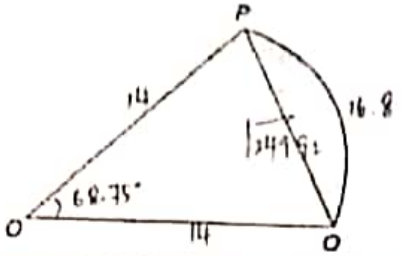


Diagram 7 / *Rajah 7*

The length of the arc PQ is 16.8 cm and the perimeter of sector OPQ is 44.8 cm.
Panjang lengkok PQ ialah 16.8 cm dan perimeter sektor OPQ ialah 44.8 cm.
Find / *Cari*

(a) ∠POQ in radians, / *∠POQ dalam radian,*

(b) the area, in cm^2, of the shaded segment, correct to four significant figures.
luas, dalam cm^2, tembereng berlorek, betul kepada empat angka bererti

[4 marks/*markah*]

Answer / *Jawapan* :

a) $S = r\theta$

$16.8 = r\theta$

$16.8 = 14\theta$

$\theta = 1.2 rad$ //

2

b) Area OPQ $= \frac{1}{2}(14^2)(1.2)$

$= 117.6 cm^2$

Area POQ $= \frac{1}{2}(14)(14)\sin 68.75°$

$= 91.34 cm^2$

Area shaded segment $= 117.6 cm^2 - 91.34 cm^2$

$= 26.26 cm^2$ //

2

4

8. Solve the equation : / *Selesaikan persamaan :*

$3^{x+2} = 72 + 3^x$

[3 marks/*markah*]

Answer / *Jawapan* :

$3^{x+2} = 72 + 3^x$

$3^{x+2} - 3^x = 72$

~~3^{x+2}~~

~~$3^x = 72$~~

$3^x(3^2 - 1) = 72$

$3^x(8) = 72$

$3^x = 9$

$3^x = 3^2$

$x = 2$ //

2

2

9. Given that the gradient function of a curve is $4x - 7$. Find,
Diberi bahawa fungsi kecerunan bagi satu lengkung ialah $4x - 7$. *Cari,*
(a) y in term of x / y *dalam sebutan* x
(b) the equation of the curve that passes through (2, -3).
persamaan lengkung yang melalui (2, –3) [3 marks/*markah*]

Answer / *Jawapan* :

a) $\frac{dy}{dx} = 4x - 7$

$y = \int 4x - 7\, dx = \frac{4x^2}{2} - 7x + c$

$= \frac{4x^2}{2} - 7x + c = 2x^2 - 7x + c$

$= 2x^2 - 7x + c$

b) $y = 2x^2 - 7x + c$

$-3 = 2(2)^2 - 7(2) + c$

$c = 3$

$y = 2x^2 - 7x + 3$

1 2 2

4 3 3

10. Given the quadratic function $g(x) = x^2 - 2px - 3p + 18$, where p is a constant, is always positive when $q < p < r$. Find the value of q and of r.
Diberi fungsi kuadratik $g(x) = x^2 - 2px - 3p + 18$, *dengan keadaan* p *ialah pemalar, adalah sentiasa positif apabila* $q < p < r$. *Cari nilai* q *dan nilaif* r. [3 marks/*markah*]

Answer / *Jawapan* :

$g(x) = x^2 - 2px - 3p + 18$

$a = 1 \quad b = -2p \quad c = 18 - 3p$

$b^2 - 4ac > 0$

$(-2p)^2 - 4(1)(18 - 3p) > 0$

$4p^2 - 72 + 12p > 0$

$4p^2 + 12p - 72 > 0 \quad \div 4$

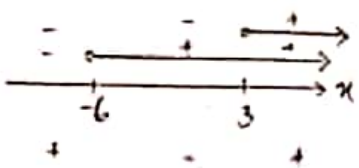
$p^2 + 3p - 18 > 0$

$(p - 3)(p + 6) > 0$ (+)

$(p - 3)(p + 6) = 0$

$p - 3 = 0 \quad p + 6 = 0$

$p = 3 \quad p = -6$ ~~(ignore)~~



$\therefore -6 < p < 3$

$q = -6$

$r = 3$

(3)

11. Given the equation of the perpendicular bisector of the line segment that connects the points E(4, h) and F(2,k) is $4y = x + 9$, find the value of $h + k$.
Diberi persamaan pembahagi dua sama serenjang bagi tembereng garis yang menghubungkan titik E(4, h) dan F(2,k) ialah $4y = x + 9$, cari nilai $h + k$. [3 marks/*markah*]

Answer / *Jawapan* :

$4y = x + 9$

$y = \frac{x}{4} + \frac{9}{4}$

$y = \frac{3}{4} + \frac{9}{4}$

$y = 3$

$\frac{h+k}{2} = 3$

$h + k = 6$

3

3

12. Points A, B and C are collinear. It is given that $\overrightarrow{AB} = 4\boldsymbol{a} + (1 + r)\boldsymbol{b}$ and $\overrightarrow{BC} = 2\boldsymbol{a} - \boldsymbol{b}$, where r is a constant. Find
Titik A, B dan C adalah segaris. Diberi bahawa $\overrightarrow{AB} = 4\boldsymbol{a} + (1 + r)\boldsymbol{b}$ *dan* $\overrightarrow{BC} = 2\boldsymbol{a} - \boldsymbol{b}$, *dengan keadaan* r *ialah pemalar. Cari*
(a) the value of r, / *nilai* r,
(b) the ratio of $AB : BC$. / *nisbah* $AB : BC$. [4 marks/*markah*]

Answer / *Jawapan* :

a) $4\underset{\sim}{a} + (1+r)\underset{\sim}{b} = 2\underset{\sim}{a} - \underset{\sim}{b}$

k

13. If α and β are the roots of the equation $2x^2 + 4x - 3 = 0$, form a quadratic equation with the roots $2\alpha + 1$ and $2\beta + 1$.
Jika α dan β adalah punca-punca bagi persamaan $2x^2 + 4x - 3 = 0$, bentuk satu persamaan kuadratik dengan punca-punca $2\alpha + 1$ dan $2\beta + 1$. [4 marks/*markah*]

Answer / *Jawapan* :

$x^2 - (\alpha+\beta)x + \alpha\beta = 0 \quad \times 2$

$2x^2 - 2(\alpha+\beta)x + 2\alpha\beta = 0$

$2x^2 + 4x - 3 = 0$

$-2(\alpha+\beta) = 4 \qquad 2\alpha\beta = -3$

$\alpha+\beta = -2 \qquad \alpha\beta = -\frac{3}{2}$

$x^2 - (2\alpha+1+2\beta+1)x + (2\alpha+1)(2\beta+1) = 0$

$x^2 - [2(\alpha+\beta)+2]x + (4\alpha\beta + 2\alpha + 2\beta + 1) = 0$

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

$4\alpha\beta + 2(\alpha+\beta) + 1 = 4(-\frac{3}{2}) + 2(-2) = -9$

$\therefore x^2 + 2x - 9 = 0$

4

(4)

14. Diagram 14 shows a row of squares for a game.
Rajah 14 menunjukkan sebaris petak segi empat sama untuk satu permainan.

	A			C	B		D

Diagram 14 / *Rajah 14*

A coin is placed on one of the squares and a fair dice is thrown. If 1 or 2 is obtained, the coin is moved one square to the left. If 3, 4, 5, or 6 is obtained, the coin is moved one square to

14. Diagram 14 shows a row of squares for a game.
Rajah 14 menunjukkan sebaris petak segi empat sama untuk satu permainan.

	A			C	B		D

Diagram 14 / *Rajah 14*

A coin is placed on one of the squares and a fair dice is thrown. If 1 or 2 is obtained, the coin is moved one square to the left. If 3, 4, 5, or 6 is obtained, the coin is moved one square to the right.
Sekeping duit syiling diletakkan di atas satu daripada petak itu dan sebiji dadu dilambungkan. Jika 1 atau 2 diperoleh, duit syiling itu akan digerakkan satu petak ke kiri. Jika 3, 4, 5 atau 6 diperoleh, duit syiling itu akan digerakkan satu petak ke kanan.

(a) The coin is placed on square labelled A and the dice is thrown once. What is the probability that the coin is moved one square to the right?
Duit syiling diletakkan di atas petak berlabel A dan dadu dilambungkan sekali. Apakah kebarangkalian bahawa duit syiling itu digerakkan ke kanan?

(b) The coin is placed on square labelled B. The dice is thrown once and the coin is moved. The dice is thrown for the second time and the coin is moved again. Find the probability that the coin is placed on either square B or C or D.
Duit syiling diletakkan di atas petak berlabel B. Dadu dilambung sekali dan duit syiling digerakkan. Dadu dilambung untuk kali kedua dan duit syiling digerakkan sekali lagi. Cari kebarangkalian bahawa duit syiling itu terletak sama ada di petak berlabel B atau C atau D.

[4 marks/*markah*]

← 1, 2 ($\frac{1}{3}$)
3, 4, 5, 6 → ($\frac{2}{3}$)

Answer / *Jawapan* :

a) $P(R) = \frac{2}{3}$ /1

b) $P(B) = (\frac{1}{3} \times \frac{2}{3}) = \frac{2}{9}$

$P(D) = (\frac{2}{3} \times \frac{2}{3}) = \frac{4}{9}$ /1

$P(B \text{ or } C \text{ or } D)$
$= P(B) + P(C) + P(D)$
$= (\frac{1}{3} \times \frac{2}{3} + \frac{2}{3} \times \frac{1}{3}) + 0 + (\frac{2}{3} \times \frac{2}{3})$
$= \frac{8}{9}$

15. A set of data consists of eight positive numbers. It is given that $\sum(x-\bar{x})^2 = 96$ and $\sum x^2 = 168$. Find
Satu set data mengandungi lapan nombor positif. Diberi bahawa $\sum(x-\bar{x})^2 = 96$ *dan* $\sum x^2 = 168$. *Cari*

(a) the variance / *varians* (b) the mean / *min* [3 marks/*markah*]

Answer / *Jawapan* :

a) $6^2 = \frac{96}{8}$

$= 12$ ✓

1

b) $12 = \frac{168}{8} - \bar{x}^2$

$\bar{x}^2 = \frac{168}{8} - 12$

$\bar{x}^2 = 9$

$\bar{x} = \pm 3$

$\bar{x} = 3, -3$ (ignore)

$\therefore \bar{x} = 3$ ✓

2

3

16. Given $\int_2^4 f(x)\,dx = 5$, find / *Diberi* $\int_2^4 f(x)\,dx = 5$, *cari*

(a) $\int_4^2 3f(x)\,dx$ (b) $\int_2^4 [3 + f(x)]\,dx$ [3 marks/*markah*]

Answer / *Jawapan* .

a) $\int_4^2 f(x)\,dx = -5$

$\int_4^2 3f(x)\,dx = \int_4^2 3(-5)\,dx$

$= \int_4^2 (-15)\,dx$

$= \left[-\frac{15x}{1}\right]_4^2$

$= [-15(2) + 15(4)]$

$= 30$ ✓

b) $\int_2^4 [3 + f(x)]\,dx$

$= \int_2^4 [3 + 5]\,dx$

$= \int_2^4 8\,dx$

$= [8x]_2^4$

$= [8(4) - 8(2)]$

16

$\int_2^4 3\,dx + \int_2^4 f(x)\,dx$

$= [3x]_2^4 + 5$

$= [3(4) - 3(2)] + 5$

$= 11$ ✓

2

2

17. Diagram 17 shows part of the graph of the function $f: x \to |-4x|$.
Rajah 17 menunjukkan sebahagian daripada fungsi $f: x \to |-4x|$.

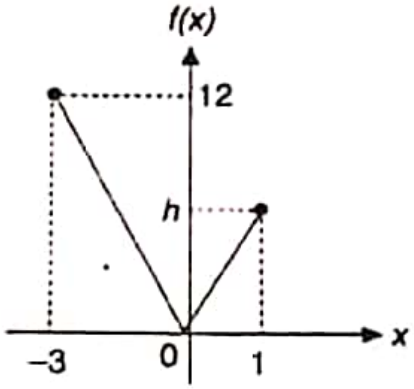


Diagram 17 / *Rajah 17*

State / *Nyatakan*

(a) the value oh h / *nilai bagi* h

(b) the range of the values of $f(x)$ corresponding to the given domain
julat nilai bagi $f(x)$ *yang sepadan dengan domain yang diberi.* [2 marks/*markah*]

Answer / *Jawapan* :

a) $f(x) = |-4x|$
$= |-4(1)|$
$= |-4|$
$= 4$
$h = 4$ ✓

b) $0 \leq f(x) \leq 12$ ✓

(2)

18. Given $log_2 3 = m$ and $log_2 5 = n$, express $log_4 75$ in terms of m and n.
Diberi $log_2 3 = m$ *dan* $log_2 5 = n$, *ungkapkan* $log_4 75$ *dalam sebutan* m *dan* n.
[3 marks/*mark*]

Answer / *Jawapan* :

$\log_4 75 = \frac{\log_2 75}{\log_2 4}$ ✓

$= \frac{\log_2 5 \times \log_2 5 \times \log_2 3}{\log_2 2^2}$ $\quad \frac{\log_2 5 + \log_2 5 + \log_2 3}{\log_2 2^2}$

$= \frac{n \times n \times m}{2}$ $\quad = \frac{n+n+m}{2}$

$\log_4 75 = \frac{n^2 m}{2}$ ✓ $\quad \log_4 75 = \frac{2n+m}{2}$ ✗

(1)

19. The first three terms of an arithmetic progression are –20, –16 and –12. If the sum of the first n terms is positive, find the least value of n.
Tiga sebutan pertama suatu janjang aritmetik ialah –20, –16 dan –12. Jika hasil tambah n sebutan pertama adalah positif, cari nilai terkecil bagi n. [3 marks/markah]

Answer / *Jawapan* :

$a = -20 \quad d = 4$

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

$\frac{n}{2}[2(-20) + (n-1)4] \geq 0$

$n(-40 + 4n - 4) \geq 0$

$-40n + 4n^2 - 4n \geq 0$

$4n^2 - 44n \geq 0 \quad \div 4$

$n^2 - 11n \geq 0$

$n(n-11) \geq 0$

$n \geq 0 \qquad n - 11 \geq 0$

$n \geq 11$

$\therefore n = 11$ //

20. Diagram 20 shows the graph of quadratic function $g(x) = a(x-1)^2 + k$, where a and k are constants.
Rajah 20 menunjukkan graf fungsi kuadratik $g(x) = a(x-1)^2 + k$, dengan keadaan a dan k adalah pemalar.

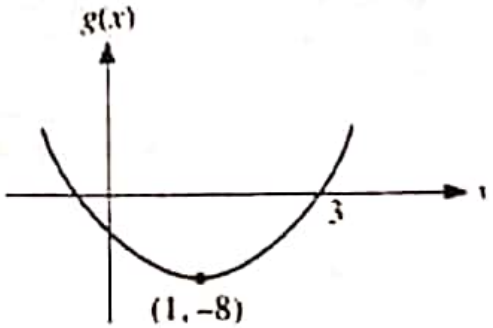


Diagram 20 / *Rajah 20*

State / *Nyatakan*
(a) the value of k / *nilai k*
(b) the value of a / *nilai a*
(c) the equation of axis of symmetry / *persamaan paksi simetri* [3 marks/markah]

Answer / *Jawapan* :

a) $k = -8$ 1

b) $g(x) = a(x-1)^2 + k, (3, 0)$

$0 = a(3-1)^2 - 8$

$0 = 4a - 8$

$4a = 8$

$a = 2$ // 1

c) $x = 1$ 1

3

21. Given that $f: x \to \frac{2h}{x-4k}, x \neq 4k$, where h and k are constants and $f^{-1}: x \to \frac{4-3x}{x}, x \neq 0$, find the value of h and of k.

Diberi bahawa $f: x \to \frac{2h}{x-4k}, x \neq 4k$, *dengan keadaan h dan k adalah pemalar dan* $f^{-1}: x \to \frac{4-3x}{x}, x \neq 0$, *cari nilai h dan nilai k* [3 marks/*markah*]

Answer / *Jawapan* :

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

$4-3y = xy$

$xy+3y = 4$

$y(x+3) = 4$

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

$f(x) = \frac{4}{x+3}$ -①

$f(x) = \frac{2h}{x-4k}$ -②

By comparing ① and ②

$2h = 4$ $\quad -4k = 3$

$h = 2$ $\quad k = -\frac{3}{4}$

3

3

22. In a geometric progression the sum of the first and third terms is 50 while the sum of the second and fourth terms is 150. Find

hasil tambah sebutan pertama dan sebutan ketiga ialah 50

22. In a geometric progression the sum of the first and third terms is 50 while the sum of the second and fourth terms is 150. Find
Dalam suatu janjang geometri , hasil tambah sebutan pertama dan sebutan ketiga ialah 50 manakala hasil tambah sebutan kedua dan sebutan keempat ialah 150. Cari

(a) the first term of the progression / *sebutan pertama janjang itu*

(b) the sum of the first three terms after the second term
hasil tambah tiga sebutan yang pertama selepas sebutan kedua [4 marks/*markah*]

Answer / *Jawapan* :

a) $S_1 + S_3 = 50$

$a + ar^2 = 50$

$a(1+r^2) = 50$

$a = \frac{50}{1+r^2}$

$S_2 + S_4 = 150$

$ar + ar^3 = 150$

$a(r+r^3) = 150$

$a = \frac{150}{r+r^3}$

$\frac{50}{1+r^2} = \frac{150}{r+r^3}$

$\frac{50}{150} = \frac{(1+r)(1-r)}{r(1+r^2)}$

$\frac{50}{150} = \frac{(1+r)(1-r)}{r(1+r^2)(1-r)}$

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

$r = 3$

$a = \frac{50}{1+3^2}$

$a = 5$ ✓ 2

b) $S_5 - S_3 = \frac{5(3^5-1)}{3-1} - \frac{5(3^3-1)}{3-1}$

$= 605 - 40$

$= 565$ ✓ 2

(2)

23 Diagram 23 shows the movement of a ball that was thrown by Adira.
Rajah 23 menunjukkan gerakan sebiji bola selepas dilontar oleh Adira.

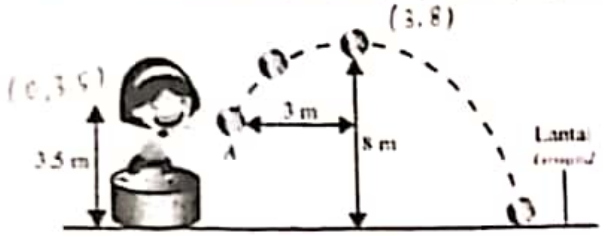


Diagram 23 / *Rajah 23*

The ball is thrown at the height of 3.5 m from the ground. The ball achieved its maximum height of 8 m at a horizontal distance of 3 m from point A. Write a quadratic function which represents the movement of the ball.
Bola tersebut dilontar pada ketinggian 3.5 m dari lantai. Bola tersebut mencapai tinggi maksimum 8 m apabila berada pada jarak mengufuk 3 m dari titik A. Tulis satu fungsi kuadratik yang mewakili gerakan tersebut. **[4 marks/markah]**

Answer / *Jawapan* :

maximum point = (3, 8)

$y = -a(x-3)^2 + 8$, (0, 3.5)

$3.5 = -a(0-3)^2 + 8$

$3.5 = -9a + 8$

$9a = 4.5$

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

$\therefore y = -\frac{1}{2}(x-3)^2 + 8$ // 4

4

4

24. A badminton team consisting of 3 boys and 3 girls is chosen from 4 boys and 5 girls. Find the number of ways

Satu pasukan badminton yang terdiri daripada 3 orang lelaki dan 3 orang perempuan dipilih daripada 4 orang lelaki dan 5 orang perempuan. Cari bilangan cara

(a) the team can be formed, / *pasukan tersebut dapat dibentuk,*

(b) the team is arranged in a row with the two ends of the row must be boys.
pasukan itu disusun dalam satu baris dengan kedua-dua hujung barisan itu terdiri daripada lelaki.

[4 marks/*markah*]

Answer / *Jawapan* :

a) ${}^{9}C_{6} = 84$ ✗ ${}^{4}C_{3} \times {}^{5}C_{3} = 40$

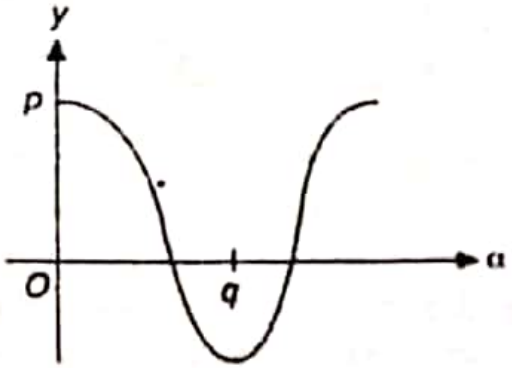
b) ~~${}^{7}C_{4} \times {}^{4}C_{2} = 210$~~

${}^{7}P_{4} \times {}^{4}P_{2} = 10080$ ✗ $3 \times 4 \times 3 \times 2 \times 1 \times 2 = 144$ ✗

0

25. (a) Given $\cos\theta = h$, state $\tan(180^o - \theta)$ in terms of h.
Diberi $\cos\theta = h$, nyatakan $\tan(180^o - \theta)$ dalam sebutan h.

(b) Diagram 25 shows part of the graph $y = \frac{3}{2}\cos 6\theta$
Rajah 25 menunjukkan sebahagian graf $y = \frac{3}{2}\cos 6\theta$



State the value of p and of q. / *Nyatakan nilai p dan nilai q.*

Answer / *Jawapan* :

a) $\tan(180° - \theta) = -h$ 1

b) $y = \frac{3}{2}\cos 6\theta$, $y = 0$

$\frac{3}{2}\cos 6\theta = 0$

$\cos 6\theta = 0$

$6\theta = 90°, 270°$

$\theta = 15°, 45°$

$q = \frac{15° + 45°}{2}$

$q = 30°$ 1 $p = \frac{3}{2}$ 1

END OF QUESTION PAPER

Jawab **semua** *soalan.*

1. The first three terms of a geometric progression are $m + 20,\ m - 4,\ m - 20$. Calculate the value of m and the common ratio, r.
Tiga sebutan pertama suatu janjang geometri ialah $m + 20,\ m - 4,\ m - 20$. *Hitung nilai* m *dan nisbah sepunya,* r. [3 marks/*markah*]

Answer / *Jawapan* :

~~$m-4 = m-20 \div m-20 = m+4$~~

-24

$\frac{m-4}{m+20} = \frac{m-20}{m-4}$

$(m-4)(m-4) = (m+20)(m-20)$

$m^2 - 8m + 16 = m^2 - 400$

$-8m = -416$

$m = 52$

$r = \frac{52-4}{52+20}$

$= \frac{48}{72}$

$= \frac{2}{3}$

3

2. Diagram 2 shows the graph of a straight line $\log_3 y$ against x.
Rajah 2 menunjukkan graf garis lurus $\log_3 y$ *melawan* x.

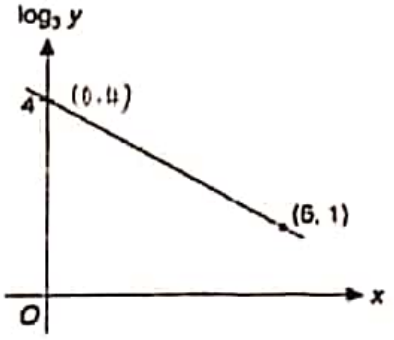


Diagram 2 / *Rajah 2*

Based on Diagram 2, express y in terms of x.
Berdasarkan Rajah 2, ungkapkan y *dalam sebutan* x. [3 marks/*markah*]

Answer / *Jawapan* :

$m = \frac{4-1}{0-6}$

$= -\frac{3}{6}$

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

$\log_3 y = -\frac{1}{2}x + 4$

$y = 3^{-\frac{1}{2}x+4}$

3

3

3. Diagram 3 shows a straight line passing through R (6, 0) and S (0, -4).
Rajah 3 menunjukkan garis lurus yang melalui R (6, 0) dan S (0, -4).

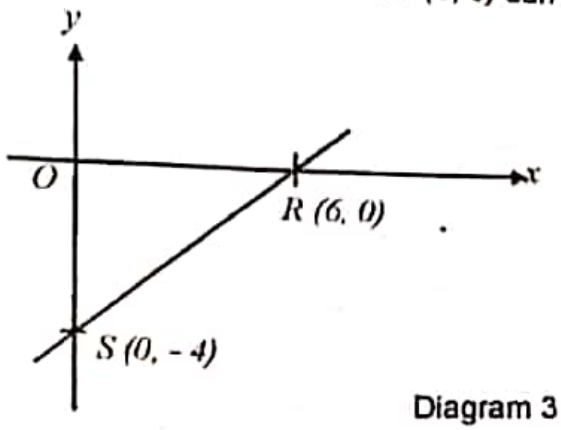


Diagram 3 / *Rajah 3*

A point P moves such that PR is twice PS. Find the equation of the locus of P.
Suatu titik P bergerak dengan keadaan PR adalah dua kali PS. Cari persamaan lokus bagi P.
[3 marks/*markah*]

Answer / *Jawapan*

$\sqrt{(x-6)^2+(y-0)^2} = 2\sqrt{(x-0)^2+(y+4)^2}$

$x^2-12x+36+y^2 = 4(x^2+y^2+8y+16)$

$x^2-12x+36+y^2 = 4x^2+4y^2+32y+64$

$3x^2+3y^2+12x+32y+28=0$ 3

3

4. a and b are non-zero and non-parallel vectors. Given $(m-5)\boldsymbol{a} = (3n+4)\boldsymbol{b}$, where m and n are constants. Find the values of m and n.
a dan b ialah vector bukan sifar dan tidak selari. Diberi $(m-5)\boldsymbol{a} = (3n+4)\boldsymbol{b}$, dengan keadaan m dan n ialah pemalar. Cari nilai m dan nilai n. [2 marks/*markah*]

Answer / *Jawapan* :

$m = 5$ 1

$3n+4=0$

$n = -\frac{4}{3}$ 1

5. Diagram 5 shows the function f which maps x onto y.
Rajah 5 menunjukkan fungsi f yang memetakan x kepada y.

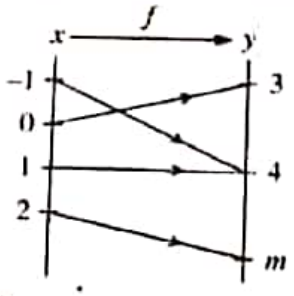


Diagram 5 / *Rajah 5*

State / *Nyatakan*

(a) the type of the relation, / *jenis hubungan,*

(b) the value of m, if $f: x \to x^2 + 3$. / *nilai m, jika $f: x \to x^2 + 3$.* [2 marks/*markah*]

Answer / *Jawapan* :

a) Many to one relation ✓1

b) $f(x) = x^2 + 3$

$f(2) = m$

$2^2 + 3 = m$

$m = 7$ ✓1

3

6. Solve the equation $2\cos^2 x + \sin x = 1$ for $0° \le \theta \le 360°$.
Selesaikan persamaan $2\cos^2 x + \sin x = 1$ untuk $0° \le \theta \le 360°$. [4 marks/*markah*]

Answer / *Jawapan* :

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

$2(1 - \sin^2 x) + \sin x = 1$

$2 - 2\sin^2 x + \sin x - 1 = 0$

$-2\sin^2 x + \sin x + 1 = 0$

$2\sin^2 x - \sin x - 1 = 0$

$(\sin x - 1)(2\sin x + 1) = 0$

$2\sin x \quad \sin x$

$\sin x \quad -1 \quad 2\sin x$

$\sin x - 1 = 0$, $2\sin x + 1 = 0$

$\sin x = 1$ $\sin x = -\frac{1}{2}$

$x = 90°$ $x = 210°, 330°$

$\therefore x = 90°, 210°, 330°$ ✓

7. Diagram 7 shows a sector of OPQ with centre O.
Rajah 7 menunjukkan sector OPQ berpusat O.

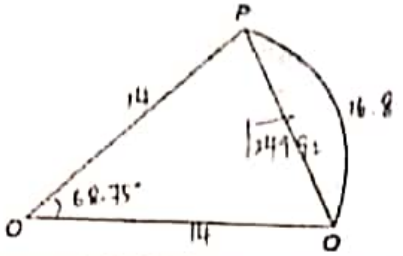


Diagram 7 / *Rajah 7*

The length of the arc PQ is 16.8 cm and the perimeter of sector OPQ is 44.8 cm.
Panjang lengkok PQ ialah 16.8 cm dan perimeter sektor OPQ ialah 44.8 cm.
Find / *Cari*

(a) ∠POQ in radians, / *∠POQ dalam radian,*

(b) the area, in cm^2, of the shaded segment, correct to four significant figures.
luas, dalam cm^2, tembereng berlorek, betul kepada empat angka bererti

[4 marks/*markah*]

Answer / *Jawapan* :

a) $S = r\theta$

$16.8 = r\theta$

$16.8 = 14\theta$

$\theta = 1.2 rad$ //

2

b) Area OPQ $= \frac{1}{2}(14^2)(1.2)$

$= 117.6 cm^2$

Area POQ $= \frac{1}{2}(14)(14)\sin 68.75°$

$= 91.34 cm^2$

Area shaded segment $= 117.6 cm^2 - 91.34 cm^2$

$= 26.26 cm^2$ //

2

4

8. Solve the equation : / *Selesaikan persamaan :*

$3^{x+2} = 72 + 3^x$

[3 marks/*markah*]

Answer / *Jawapan* :

$3^{x+2} = 72 + 3^x$

$3^{x+2} - 3^x = 72$

~~3^{x+2}~~

~~$3^x = 72$~~

$3^x(3^2 - 1) = 72$

$3^x(8) = 72$

$3^x = 9$

$3^x = 3^2$

$x = 2$ //

2

2

9. Given that the gradient function of a curve is $4x - 7$. Find,
Diberi bahawa fungsi kecerunan bagi satu lengkung ialah $4x - 7$. *Cari,*
(a) y in term of x / y *dalam sebutan* x
(b) the equation of the curve that passes through (2, -3).
persamaan lengkung yang melalui (2, –3) [3 marks/*markah*]

Answer / *Jawapan* :

a) $\frac{dy}{dx} = 4x - 7$

$y = \int 4x - 7\, dx = \frac{4x^2}{2} - 7x + c$

$= \frac{4x^2}{2} - 7x + c = 2x^2 - 7x + c$

$= 2x^2 - 7x + c$

b) $y = 2x^2 - 7x + c$

$-3 = 2(2)^2 - 7(2) + c$

$c = 3$

$y = 2x^2 - 7x + 3$

1 2 2

4 3 3

10. Given the quadratic function $g(x) = x^2 - 2px - 3p + 18$, where p is a constant, is always positive when $q < p < r$. Find the value of q and of r.
Diberi fungsi kuadratik $g(x) = x^2 - 2px - 3p + 18$, *dengan keadaan* p *ialah pemalar, adalah sentiasa positif apabila* $q < p < r$. *Cari nilai* q *dan nilaif* r. [3 marks/*markah*]

Answer / *Jawapan* :

$g(x) = x^2 - 2px - 3p + 18$

$a = 1 \quad b = -2p \quad c = 18 - 3p$

$b^2 - 4ac > 0$

$(-2p)^2 - 4(1)(18 - 3p) > 0$

$4p^2 - 72 + 12p > 0$

$4p^2 + 12p - 72 > 0 \quad \div 4$

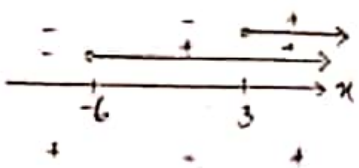
$p^2 + 3p - 18 > 0$

$(p - 3)(p + 6) > 0$ (+)

$(p - 3)(p + 6) = 0$

$p - 3 = 0 \quad p + 6 = 0$

$p = 3 \quad p = -6$ ~~(ignore)~~



$\therefore -6 < p < 3$

$q = -6$

$r = 3$

(3)

11. Given the equation of the perpendicular bisector of the line segment that connects the points E(4, h) and F(2,k) is $4y = x + 9$, find the value of $h + k$.
Diberi persamaan pembahagi dua sama serenjang bagi tembereng garis yang menghubungkan titik E(4, h) dan F(2,k) ialah $4y = x + 9$, cari nilai $h + k$. [3 marks/*markah*]

Answer / *Jawapan* :

$4y = x + 9$

$y = \frac{x}{4} + \frac{9}{4}$

$y = \frac{3}{4} + \frac{9}{4}$

$y = 3$

$\frac{h+k}{2} = 3$

$h + k = 6$

3

3

12. Points A, B and C are collinear. It is given that $\overrightarrow{AB} = 4\boldsymbol{a} + (1 + r)\boldsymbol{b}$ and $\overrightarrow{BC} = 2\boldsymbol{a} - \boldsymbol{b}$, where r is a constant. Find
Titik A, B dan C adalah segaris. Diberi bahawa $\overrightarrow{AB} = 4\boldsymbol{a} + (1 + r)\boldsymbol{b}$ *dan* $\overrightarrow{BC} = 2\boldsymbol{a} - \boldsymbol{b}$, *dengan keadaan* r *ialah pemalar. Cari*
(a) the value of r, / *nilai* r,
(b) the ratio of $AB : BC$. / *nisbah* $AB : BC$. [4 marks/*markah*]

Answer / *Jawapan* :

a) $4\underset{\sim}{a} + (1+r)\underset{\sim}{b} = 2\underset{\sim}{a} - \underset{\sim}{b}$

k

13. If α and β are the roots of the equation $2x^2 + 4x - 3 = 0$, form a quadratic equation with the roots $2\alpha + 1$ and $2\beta + 1$.
Jika α dan β adalah punca-punca bagi persamaan $2x^2 + 4x - 3 = 0$, bentuk satu persamaan kuadratik dengan punca-punca $2\alpha + 1$ dan $2\beta + 1$. [4 marks/*markah*]

Answer / *Jawapan* :

$x^2 - (\alpha+\beta)x + \alpha\beta = 0 \quad \times 2$

$2x^2 - 2(\alpha+\beta)x + 2\alpha\beta = 0$

$2x^2 + 4x - 3 = 0$

$-2(\alpha+\beta) = 4 \qquad 2\alpha\beta = -3$

$\alpha+\beta = -2 \qquad \alpha\beta = -\frac{3}{2}$

$x^2 - (2\alpha+1+2\beta+1)x + (2\alpha+1)(2\beta+1) = 0$

$x^2 - [2(\alpha+\beta)+2]x + (4\alpha\beta + 2\alpha + 2\beta + 1) = 0$

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

$4\alpha\beta + 2(\alpha+\beta) + 1 = 4(-\frac{3}{2}) + 2(-2) = -9$

$\therefore x^2 + 2x - 9 = 0$

4

(4)

14. Diagram 14 shows a row of squares for a game.
Rajah 14 menunjukkan sebaris petak segi empat sama untuk satu permainan.

	A			C	B		D

Diagram 14 / *Rajah 14*

A coin is placed on one of the squares and a fair dice is thrown. If 1 or 2 is obtained, the coin is moved one square to the left. If 3, 4, 5, or 6 is obtained, the coin is moved one square to

14. Diagram 14 shows a row of squares for a game.
Rajah 14 menunjukkan sebaris petak segi empat sama untuk satu permainan.

	A			C	B		D

Diagram 14 / *Rajah 14*

A coin is placed on one of the squares and a fair dice is thrown. If 1 or 2 is obtained, the coin is moved one square to the left. If 3, 4, 5, or 6 is obtained, the coin is moved one square to the right.
Sekeping duit syiling diletakkan di atas satu daripada petak itu dan sebiji dadu dilambungkan. Jika 1 atau 2 diperoleh, duit syiling itu akan digerakkan satu petak ke kiri. Jika 3, 4, 5 atau 6 diperoleh, duit syiling itu akan digerakkan satu petak ke kanan.

(a) The coin is placed on square labelled A and the dice is thrown once. What is the probability that the coin is moved one square to the right?
Duit syiling diletakkan di atas petak berlabel A dan dadu dilambungkan sekali. Apakah kebarangkalian bahawa duit syiling itu digerakkan ke kanan?

(b) The coin is placed on square labelled B. The dice is thrown once and the coin is moved. The dice is thrown for the second time and the coin is moved again. Find the probability that the coin is placed on either square B or C or D.
Duit syiling diletakkan di atas petak berlabel B. Dadu dilambung sekali dan duit syiling digerakkan. Dadu dilambung untuk kali kedua dan duit syiling digerakkan sekali lagi. Cari kebarangkalian bahawa duit syiling itu terletak sama ada di petak berlabel B atau C atau D.

[4 marks/*markah*]

← 1, 2 ($\frac{1}{3}$)
3, 4, 5, 6 → ($\frac{2}{3}$)

Answer / *Jawapan* :

a) $P(R) = \frac{2}{3}$ /1

b) $P(B) = (\frac{1}{3} \times \frac{2}{3}) = \frac{2}{9}$

$P(D) = (\frac{2}{3} \times \frac{2}{3}) = \frac{4}{9}$ /1

$P(B \text{ or } C \text{ or } D)$
$= P(B) + P(C) + P(D)$
$= (\frac{1}{3} \times \frac{2}{3} + \frac{2}{3} \times \frac{1}{3}) + 0 + (\frac{2}{3} \times \frac{2}{3})$
$= \frac{8}{9}$

15. A set of data consists of eight positive numbers. It is given that $\sum(x-\bar{x})^2 = 96$ and $\sum x^2 = 168$. Find
Satu set data mengandungi lapan nombor positif. Diberi bahawa $\sum(x-\bar{x})^2 = 96$ *dan* $\sum x^2 = 168$. *Cari*

(a) the variance / *varians* (b) the mean / *min* [3 marks/*markah*]

Answer / *Jawapan* :

a) $6^2 = \frac{96}{8}$

$= 12$ ✓

1

b) $12 = \frac{168}{8} - \bar{x}^2$

$\bar{x}^2 = \frac{168}{8} - 12$

$\bar{x}^2 = 9$

$\bar{x} = \pm 3$

$\bar{x} = 3, -3$ (ignore)

$\therefore \bar{x} = 3$ ✓

2

3

16. Given $\int_2^4 f(x)\,dx = 5$, find / *Diberi* $\int_2^4 f(x)\,dx = 5$, *cari*

(a) $\int_4^2 3f(x)\,dx$ (b) $\int_2^4 [3 + f(x)]\,dx$ [3 marks/*markah*]

Answer / *Jawapan* .

a) $\int_4^2 f(x)\,dx = -5$

$\int_4^2 3f(x)\,dx = \int_4^2 3(-5)\,dx$

$= \int_4^2 (-15)\,dx$

$= \left[-\frac{15x}{1}\right]_4^2$

$= [-15(2) + 15(4)]$

$= 30$ ✓

b) $\int_2^4 [3 + f(x)]\,dx$

$= \int_2^4 [3 + 5]\,dx$

$= \int_2^4 8\,dx$

$= [8x]_2^4$

$= [8(4) - 8(2)]$

16

$\int_2^4 3\,dx + \int_2^4 f(x)\,dx$

$= [3x]_2^4 + 5$

$= [3(4) - 3(2)] + 5$

$= 11$ ✓

2

2

17. Diagram 17 shows part of the graph of the function $f: x \to |-4x|$.
Rajah 17 menunjukkan sebahagian daripada fungsi $f: x \to |-4x|$.

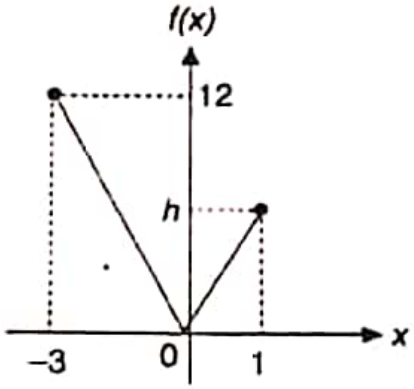


Diagram 17 / *Rajah 17*

State / *Nyatakan*

(a) the value oh h / *nilai bagi* h

(b) the range of the values of $f(x)$ corresponding to the given domain
julat nilai bagi $f(x)$ *yang sepadan dengan domain yang diberi.* [2 marks/*markah*]

Answer / *Jawapan* :

a) $f(x) = |-4x|$
$= |-4(1)|$
$= |-4|$
$= 4$
$h = 4$ ✓

b) $0 \leq f(x) \leq 12$ ✓

(2)

18. Given $log_2 3 = m$ and $log_2 5 = n$, express $log_4 75$ in terms of m and n.
Diberi $log_2 3 = m$ *dan* $log_2 5 = n$, *ungkapkan* $log_4 75$ *dalam sebutan* m *dan* n.
[3 marks/*mark*]

Answer / *Jawapan* :

$\log_4 75 = \frac{\log_2 75}{\log_2 4}$ ✓

$= \frac{\log_2 5 \times \log_2 5 \times \log_2 3}{\log_2 2^2}$ $\quad \frac{\log_2 5 + \log_2 5 + \log_2 3}{\log_2 2^2}$

$= \frac{n \times n \times m}{2}$ $\quad = \frac{n+n+m}{2}$

$\log_4 75 = \frac{n^2 m}{2}$ ✓ $\quad \log_4 75 = \frac{2n+m}{2}$ ✗

(1)

19. The first three terms of an arithmetic progression are –20, –16 and –12. If the sum of the first n terms is positive, find the least value of n.
Tiga sebutan pertama suatu janjang aritmetik ialah –20, –16 dan –12. Jika hasil tambah n sebutan pertama adalah positif, cari nilai terkecil bagi n. [3 marks/markah]

Answer / *Jawapan* :

$a = -20 \quad d = 4$

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

$\frac{n}{2}[2(-20) + (n-1)4] \geq 0$

$n(-40 + 4n - 4) \geq 0$

$-40n + 4n^2 - 4n \geq 0$

$4n^2 - 44n \geq 0 \quad \div 4$

$n^2 - 11n \geq 0$

$n(n-11) \geq 0$

$n \geq 0 \qquad n - 11 \geq 0$

$n \geq 11$

$\therefore n = 11$ //

20. Diagram 20 shows the graph of quadratic function $g(x) = a(x-1)^2 + k$, where a and k are constants.
Rajah 20 menunjukkan graf fungsi kuadratik $g(x) = a(x-1)^2 + k$, dengan keadaan a dan k adalah pemalar.

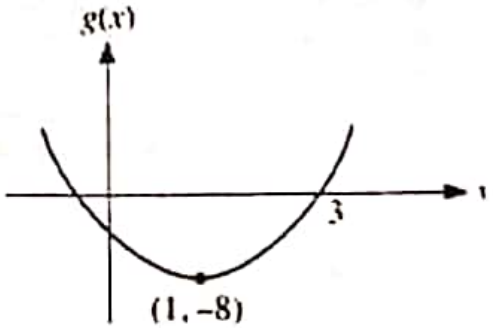


Diagram 20 / *Rajah 20*

State / *Nyatakan*
(a) the value of k / *nilai k*
(b) the value of a / *nilai a*
(c) the equation of axis of symmetry / *persamaan paksi simetri* [3 marks/markah]

Answer / *Jawapan* :

a) $k = -8$ 1

b) $g(x) = a(x-1)^2 + k, (3, 0)$

$0 = a(3-1)^2 - 8$

$0 = 4a - 8$

$4a = 8$

$a = 2$ // 1

c) $x = 1$ 1

3

21. Given that $f: x \to \frac{2h}{x-4k}, x \neq 4k$, where h and k are constants and $f^{-1}: x \to \frac{4-3x}{x}, x \neq 0$, find the value of h and of k.

Diberi bahawa $f: x \to \frac{2h}{x-4k}, x \neq 4k$, *dengan keadaan h dan k adalah pemalar dan* $f^{-1}: x \to \frac{4-3x}{x}, x \neq 0$, *cari nilai h dan nilai k* [3 marks/*markah*]

Answer / *Jawapan* :

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

$4-3y = xy$

$xy+3y = 4$

$y(x+3) = 4$

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

$f(x) = \frac{4}{x+3}$ -①

$f(x) = \frac{2h}{x-4k}$ -②

By comparing ① and ②

$2h = 4$ $\quad -4k = 3$

$h = 2$ $\quad k = -\frac{3}{4}$

3

3

22. In a geometric progression the sum of the first and third terms is 50 while the sum of the second and fourth terms is 150. Find

hasil tambah sebutan pertama dan sebutan ketiga ialah 50

22. In a geometric progression the sum of the first and third terms is 50 while the sum of the second and fourth terms is 150. Find
Dalam suatu janjang geometri , hasil tambah sebutan pertama dan sebutan ketiga ialah 50 manakala hasil tambah sebutan kedua dan sebutan keempat ialah 150. Cari

(a) the first term of the progression / *sebutan pertama janjang itu*

(b) the sum of the first three terms after the second term
hasil tambah tiga sebutan yang pertama selepas sebutan kedua [4 marks/*markah*]

Answer / *Jawapan* :

a) $S_1 + S_3 = 50$

$a + ar^2 = 50$

$a(1+r^2) = 50$

$a = \frac{50}{1+r^2}$

$S_2 + S_4 = 150$

$ar + ar^3 = 150$

$a(r+r^3) = 150$

$a = \frac{150}{r+r^3}$

$\frac{50}{1+r^2} = \frac{150}{r+r^3}$

$\frac{50}{150} = \frac{(1+r)(1-r)}{r(1+r^2)}$

$\frac{50}{150} = \frac{(1+r)(1-r)}{r(1+r^2)(1-r)}$

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

$r = 3$

$a = \frac{50}{1+3^2}$

$a = 5$ ✓ 2

b) $S_5 - S_3 = \frac{5(3^5-1)}{3-1} - \frac{5(3^3-1)}{3-1}$

$= 605 - 40$

$= 565$ ✓ 2

(2)

23 Diagram 23 shows the movement of a ball that was thrown by Adira.
Rajah 23 menunjukkan gerakan sebiji bola selepas dilontar oleh Adira.

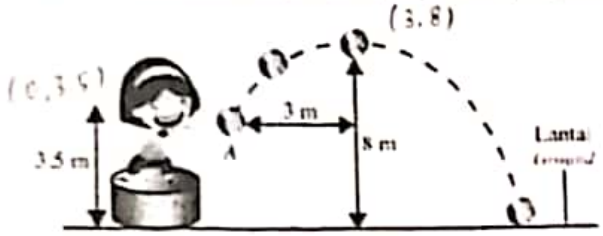


Diagram 23 / *Rajah 23*

The ball is thrown at the height of 3.5 m from the ground. The ball achieved its maximum height of 8 m at a horizontal distance of 3 m from point A. Write a quadratic function which represents the movement of the ball.
Bola tersebut dilontar pada ketinggian 3.5 m dari lantai. Bola tersebut mencapai tinggi maksimum 8 m apabila berada pada jarak mengufuk 3 m dari titik A. Tulis satu fungsi kuadratik yang mewakili gerakan tersebut. **[4 marks/markah]**

Answer / *Jawapan* :

maximum point = (3, 8)

$y = -a(x-3)^2 + 8$, (0, 3.5)

$3.5 = -a(0-3)^2 + 8$

$3.5 = -9a + 8$

$9a = 4.5$

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

$\therefore y = -\frac{1}{2}(x-3)^2 + 8$ // 4

4

4

24. A badminton team consisting of 3 boys and 3 girls is chosen from 4 boys and 5 girls. Find the number of ways

Satu pasukan badminton yang terdiri daripada 3 orang lelaki dan 3 orang perempuan dipilih daripada 4 orang lelaki dan 5 orang perempuan. Cari bilangan cara

(a) the team can be formed, / *pasukan tersebut dapat dibentuk,*

(b) the team is arranged in a row with the two ends of the row must be boys.
pasukan itu disusun dalam satu baris dengan kedua-dua hujung barisan itu terdiri daripada lelaki.

[4 marks/*markah*]

Answer / *Jawapan* :

a) ${}^{9}C_{6} = 84$ ✗ ${}^{4}C_{3} \times {}^{5}C_{3} = 40$

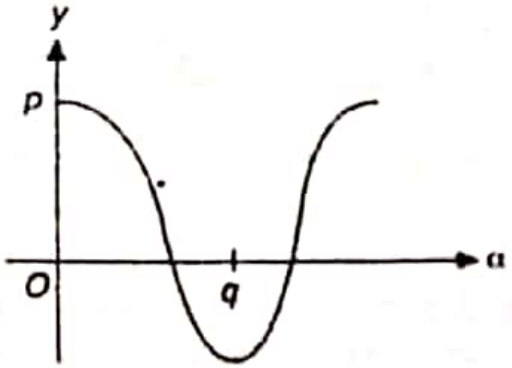
b) ~~${}^{7}C_{4} \times {}^{4}C_{2} = 210$~~

${}^{7}P_{4} \times {}^{4}P_{2} = 10080$ ✗ $3 \times 4 \times 3 \times 2 \times 1 \times 2 = 144$ ✗

0

25. (a) Given $\cos\theta = h$, state $\tan(180^o - \theta)$ in terms of h.
Diberi $\cos\theta = h$, nyatakan $\tan(180^o - \theta)$ dalam sebutan h.

(b) Diagram 25 shows part of the graph $y = \frac{3}{2}\cos 6\theta$
Rajah 25 menunjukkan sebahagian graf $y = \frac{3}{2}\cos 6\theta$



State the value of p and of q. / *Nyatakan nilai p dan nilai q.*

Answer / *Jawapan* :

a) $\tan(180° - \theta) = -h$ 1

b) $y = \frac{3}{2}\cos 6\theta$, $y = 0$

$\frac{3}{2}\cos 6\theta = 0$

$\cos 6\theta = 0$

$6\theta = 90°, 270°$

$\theta = 15°, 45°$

$q = \frac{15° + 45°}{2}$

$q = 30°$ 1 $p = \frac{3}{2}$ 1

END OF QUESTION PAPER