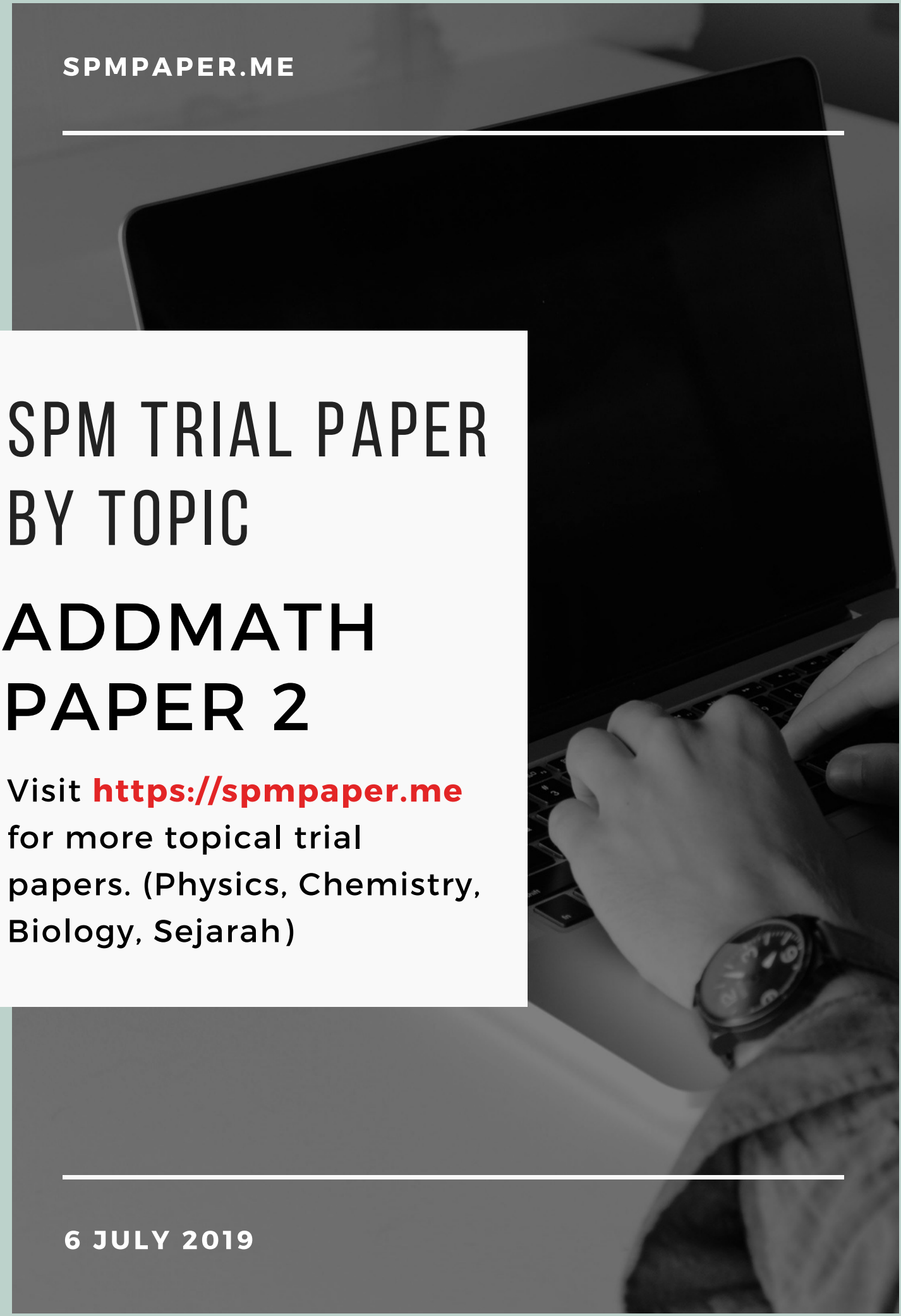


SPMPAPER.ME

SPM TRIAL PAPER BY TOPIC

ADDMATH PAPER 2

Visit **https://spmpaper.me** for more topical trial papers. (Physics, Chemistry, Biology, Sejarah)

6 JULY 2019

Table of Contents

Form 4 AddMath

Chapter 1: Functions

Chapter 2: Quadratic Equation

Kedah 2018 P2(A) Q1

1

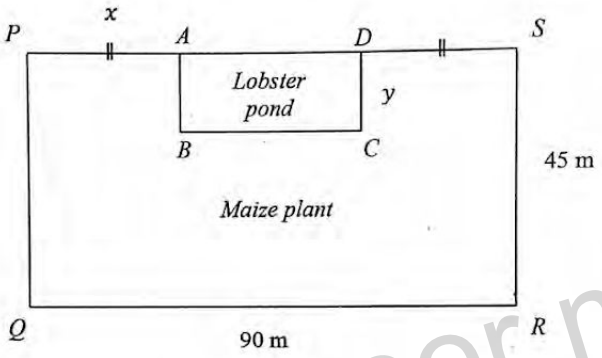


Diagram 1/ *Rajah* 1

Diagram 1 shows a piece of rectangular land *PQRS*. En Musa rears lobster in a rectangular pond *ABCD*. Perimeter of the pond is 130 m. The remain land with area of 3300 m^2 is used to plant maize. Find, in meter, the length of each side of the pond.

[7 *marks*]

Rajah 1 *menunjukkan sebidang tanah berbentuk segiempat tepat PQRS. En Musa menternak udang galah di dalam kolam segiempat tepat ABCD. Perimeter tanah kolam tersebut ialah* 130 m. *Tanah yang selebihnya digunakan untuk menanam jagung dengan keluasan* 3300 m^2. *Cari panjang, dalam meter, bagi setiap sisi kolam udang itu.*

[7 *markah*]

Kedah 2018 P2(A) Q1 Answer

N0.	SOLUTION	MARKS
1	$(90-2x+y)2=130$	P1
	$90-2x+y=65$	
	$y=2x-25$	P1
	$(90\times45)-(90-2x)(y)=3300$	P1
	$750=90y-2xy$	
	$750=90(2x-25)-2x(2x-25)$	K1 Eliminate x or y
	$750=180x-2250-4x^2+50x$	
	$4x^2-230x+3000=0$	
	$x=\frac{-(-230)\pm\sqrt{(-230)^2-4(4)(3000)}}{2(4)}$	K1 Solve quadratic equation
	$x=37.5$, $x=20$	N1
	When $x=20$, $y=2(15)-25$	
	$=15$	
	$x=37.5$, $y=2(37.5)-25$ (abaikan)	
	$=50$	
	$AD=50$	N1 Both sides of the pond correct
	$AB=15$	
		7

Chapter 3: Quadratic Function

Chapter 4: Simultaneous Equation

MRSM 2018 P2(A) Q1

1 Solve the following simultaneous equations:
Selesaikan persamaan serentak berikut:

$$\sqrt{x} = 1 - y$$
$$2x + 5y = 17$$

[5 *marks*]
[5 *markah*]

MRSM 2018 P2(A) Q1 Answer

No	Solution	Scheme	Sub marks	Marks
1	$x = \frac{17-5y}{2}$ or $x = (1-y)^2$ or $y = \frac{17-2x}{5}$ or $y = 1-\sqrt{x}$	P1 seen or implied		
	$2(1-y)^2 + 5y = 17$ or $2x + 5(1-\sqrt{x}) = 17$ or $\sqrt{x} = 1 - \left(\frac{17-2x}{5}\right)$	K Eliminate x or y	5	5
	$2y^2 + y - 15 = 0$ or $4x^2 - 73x + 144 = 0$ or $2x - 5\sqrt{x} - 12 = 0$	K Solve *quadratic equation		
	Factorization $(2y-5)(y+3) = 0$ or $(4x-9)(x-16) = 0$ or $(2\sqrt{x}+3)(\sqrt{x}-4) = 0$	N1 First set of values		
	OR **Formula** $y = \frac{-1 \pm \sqrt{1^2 - 4(2)(-15)}}{2(2)}$ or $x = \frac{-(-73) \pm \sqrt{(-73)^2 - 4(4)(144)}}{2(4)}$ a, b, c must be correct	N Second set of values		
	OR **Completing the square** $\left(y + \frac{1}{4}\right)^2 = \frac{121}{16}$ or $\left(x - \frac{73}{8}\right)^2 = \frac{3025}{4}$			
	$y = \frac{5}{2}$ // 2.5 & $y = -3$ or $x = \frac{9}{4}$ // 2.25 & $x = 16$			
	$x = \frac{9}{4}$ // 2.25 & $x = 16$ or $y = \frac{5}{2}$ // 2.5 & $y = -3$			

Note :
1. OW-1 it steps to solve the quadratic equation is not shown
2. SS-1 improper factorization is shown
i.e: $\left(y - \frac{5}{2}\right)(y+3)$

Chapter 5: Indices and Logarithms

Kedah 2018 P2(A) Q5

5 (a) Given that $2^x = 3^y = 18^q$, express q in terms of x and y.

[3 *marks*]

(b) If $k = 1 + \frac{1}{2}x$ and $x = \log_3 5$, find the value of 9^k.

[3 *marks*]

(a) *Diberi bahawa* $2^x = 3^y = 18^q$, *ungkapkan* q *dalam sebutan* x *dan* y.

[3 *markah*]

(b) *Jika* $k = 1 + \frac{1}{2}x$ *dan* $x = \log_3 5$, *cari nilai* 9^k.

[3 *markah*]

3472/2 *Additional Mathematics Paper 2* [Lihat halaman sebelah SULIT

Kedah 2018 P2(A) Q5 Answer

5		
(a)	$2^x = 3^y = 18^q = k$	
	$2 = k^{\frac{1}{x}}, 3 = k^{\frac{1}{y}}, 18 = k^{\frac{1}{q}}$	K1
	$2 \times 3 \times 3 = 18$	
	$k^{\frac{1}{x}} k^{\frac{1}{y}} k^{\frac{1}{y}} = k^{\frac{1}{q}}$	K1
	$\frac{1}{x} + \frac{2}{y} = \frac{1}{q}$	
	$q = \frac{xy}{2x+y}$	N1
(b)	$x = \log_3 5,\ 3^x = 5$	
	$9^k = 9^{1+\frac{1}{2}x}$	K1
	$= 3^{2(1+\frac{1}{2}x)}$	K1
	$= 3^{2+x}$	
	$= 45$	N1
		6

Chapter 6: Coordinate Geometry

Kedah 2018 P2(B) Q9

9 Solution by scale drawing is **not** accepted.
Penyelesaian secara lukisan berskala ***tidak*** *diterima.*

Diagram 9 shows two triangles PQT and QRS. The equation of the straight line QR is $x - y + 6 = 0$ and $\angle QRS = 90°$.

Rajah 9 menunjukkan dua buah segi tiga PQT dan QRS. Persamaan garis lurus QR ialah $x - y + 6 = 0$ *dan* $\angle QRS = 90°$.

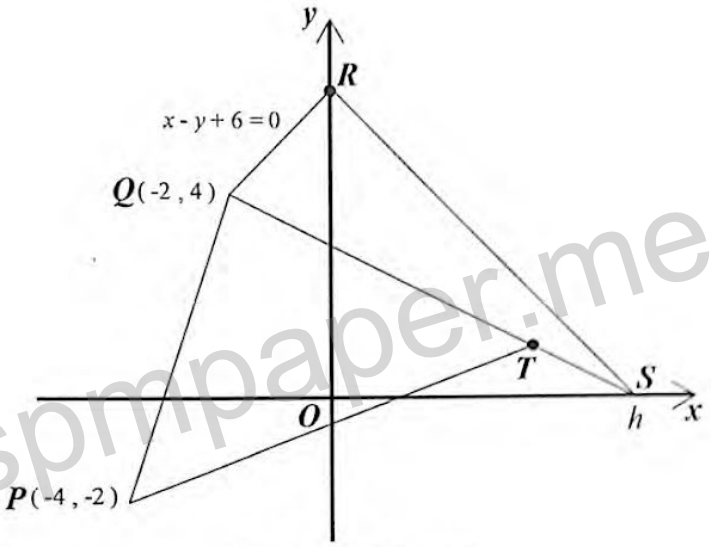


Diagram 9 / *Rajah 9*

(*a*) Find
Cari

(i) the value of h,
nilai h,
[3 *marks*]
[3 *markah*]

(ii) the coordinates of T where $QT : QS = 3 : 4$,
koordinat T *di mana* $QT : QS = 3 : 4$,
[2 *marks*]
[2 *markah*]

(iii) the area, in unit^2, of the shaded region.
luas, dalam unit^2, *rantau berlorek.*
[2 *marks*]
[2 *markah*]

(*b*) In a special condition, R is a moving point where $\angle QRS = 90°$. Find the equation of locus R.
Dalam suatu situasi khas, R *ialah titik bergerak dengan* $\angle QRS = 90°$. *Cari persamaan lokus* R.
[3 *marks*]
[3 *markah*]

Kedah 2018 P2(B) Q9 Answer

N0.	SOLUTION	MARKS
9 (a)	(i)	
	$m_{QR}=1$ $m_{RS}=-1$	K1 for using $m_1m_2=-1$
	$R=(0,6)$ $S=(h,0)$	
	$\frac{6}{-h}=-1$	K1
	$h=6$	N1
	(ii)	
	$(x,y)=\left(\frac{18-2}{4},\frac{4}{4}\right)$ $=(4,1)$	K1 N1
	(iii)	
	$A=\frac{1}{2}\begin{vmatrix}4 & -2 & -4 & 4\\ 1 & 4 & -2 & 1\end{vmatrix}$ $=\frac{1}{2}\lvert(16+4-4)-(-2-16-8)\rvert$ $=\frac{1}{2}\lvert16+26\rvert$ $=21$	K1 use formula of *Area* N1
(b)	$\left(\frac{y-4}{x+2}\right)\left(\frac{y}{x-6}\right)=-1$	K1 for using $m_1m_2=-1$ to form equation
	$y^2-4y=-x^2+4x+12$	K1
	$x^2+y^2-4x-4y-12=0$	N1
		10

MRSM 2018 P2(B) Q8

8 Solutions by scale drawing is not accepted.
Penyelesaian secara lukisan berskala tidak diterima.

Diagram 8 shows the straight line RQ which is perpendicular to the straight line KL at point Q.
Rajah 8 menunjukkan garis lurus RQ yang berserenjang dengan garis lurus KL pada titik Q.

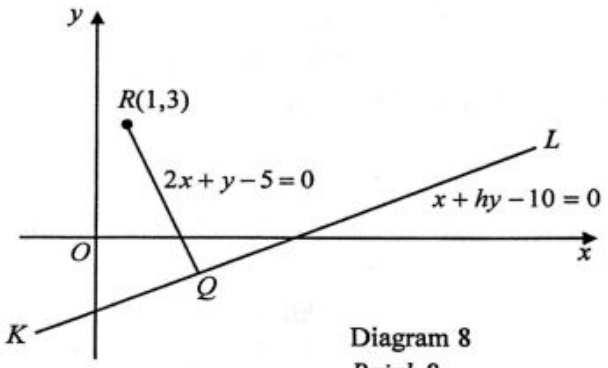


Diagram 8
Rajah 8

(a) Find
Cari
(i) the value of h,
nilai bagi h,
(ii) the coordinates of Q.
koordinat Q.
[4 *marks*]
[4 *markah*]

(b) The straight line RQ is extended to S such that $RQ : RS = 1 : 5$.
Find the area, in unit^2, of triangle ROS.
[4 *marks*]
Garis lurus RQ dipanjangkan ke S dengan keadaan RQ : RS = 1 : 5.
Cari luas, dalam unit^2, segitiga ROS.
[4 *markah*]

(c) A point T moves such that its distance from point R is always 5 units.
Find the equation of the locus of T.
[2 *marks*]
Titik T bergerak dengan keadaan jaraknya dari titik R sentiasa 5 unit.
Cari persamaan lokus T.
[2 *markah*]

MRSM 2018 P2(B) Q8 Answer

No	Solution	Scheme	Sub mark	Marks
8 (a)	(i) $m_1 m_2 = -1$ $\left(-\frac{1}{h}\right)(-2) = -1$	K1 Use $m_1 m_2 = -1$ to find h $\left(-\frac{1}{h}\right)(-2) = -1$	2	
	$h = -2$	N1 $h = -2$		
	(ii) $y = -2x + 5$ .....(i) $2y = x - 10$ .....(ii)	K1 Solve simultaneous equation	2	
	$x = 4$ $y = -3$ $Q(4, -3)$	N1 $Q(4, -3)$		
(b)	$\frac{x(1)+4}{1+4} = *4$ or $\frac{3(4)+y(1)}{1+4} = *-3$	K1 Use ratio theorem	2	10
	$S(16, -27)$	N1 $S(16, -27)$		
	$Area = \frac{1}{2}\begin{vmatrix} 0 & 1 & *16 & 0 \\ 0 & 3 & *-27 & 0 \end{vmatrix}$	K1 Use $\frac{1}{2}\begin{vmatrix} x_1 & x_2 & *x_3 & x_1 \\ y_1 & y_2 & *y_3 & y_1 \end{vmatrix}$	2	
	$= \frac{1}{2}\lvert -27 - 48 \rvert$ $= 37.5$	N1 37.5 or equivalent		
(c)	$\sqrt{[x-1]^2 + [y-3]^2} = 5$	K1 Use $RT = 5$	2	
	$x^2 + y^2 - 2x - 6y - 15 = 0$	N1 $x^2 + y^2 - 2x - 6y - 15 = 0$ or equivalent		

Chapter 7: Statistic

Kedah 2018 P2(A) Q2

2 Table 2 shows the frequency distribution of the marks obtained by N students in a test.
Jadual 2 menunjukkan taburan kekerapan markah yang diperolehi N orang murid dalam suatu ujian.

Marks ***Markah***	**Number of students** ***Bilangan murid***
0 – 9	4
10 – 19	9
20 – 29	5
30 – 39	p
40 – 49	2

Table 2 / *Jadual 2*

(*a*) Given that the median mark is 23·5, find the value of p and of N.
Diberi bahawa median bagi markah ialah 23·5, cari nilai p dan nilai N.

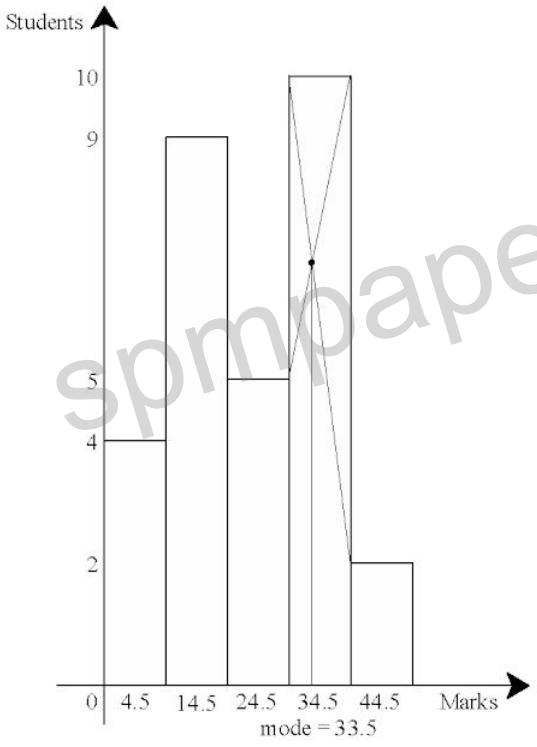
[3 *marks*]
[3 *markah*]

(*b*) Using a scale of 2 cm for 10 marks on the horizontal axis and 2 cm for 1 student on the vertical axis, draw a histogram to represent the frequency distribution. Find the mode of the distribution.

Dengan menggunakan 2 cm *mewakili* 10 *markah pada paksi mengufuk dan* 2 cm *mewakili* 1 *orang murid pada paksi menegak, lukiskan sebuah histogram untuk mewakili taburan kekerapan itu. Cari mod bagi taburan itu.*

[4 *marks*]
[4 *markah*]

Kedah 2018 P2(A) Q2 Answer

N0.	SOLUTION	MARKS
2 (*a*)	$m = 19\cdot5 + \left(\frac{\frac{20+p}{2} - 13}{5}\right)10 = 23\cdot5$ $\frac{20+p}{2} = 15$ $p = 10$ $N = 30$	P1 *Any 3 of these value* 19·5 , 13 , 5 , 10 K1 formula of m N1 both p & N
(*b*)	 Mode = 33·5	K1 Plot / Correct axes & uniform scale K1 Correct histogram (5 bar) K1 Find mode N1
		7

Chapter 8: Circular Measure

Kedah 2018 P2(B) Q8

Diagram 8 shows two sectors. QPV is a sector of a circle with centre P and radius 8cm. SWT is a sector of a circle with centre W and radius 10cm. PQ is parallel to WS. The length of the arc ST is 7cm.

8 Diagram 8 shows two sectors. *QPV* is a sector of a circle with centre *P* and radius 8 cm. *SWT* is a sector of a circle with centre *W* and radius 10 cm. *PQ* is parallel to *WS*. The length of the arc *ST* is 7 cm.

Rajah 8 menunjukkan dua sektor. QPV ialah sektor sebuah bulatan dengan pusat P dan jejari 8 cm. SWT ialah sektor sebuah bulatan dengan pusat W dan jejari 10 cm. PQ adalah selari dengan WS. Panjang lengkok ST ialah 7 cm.

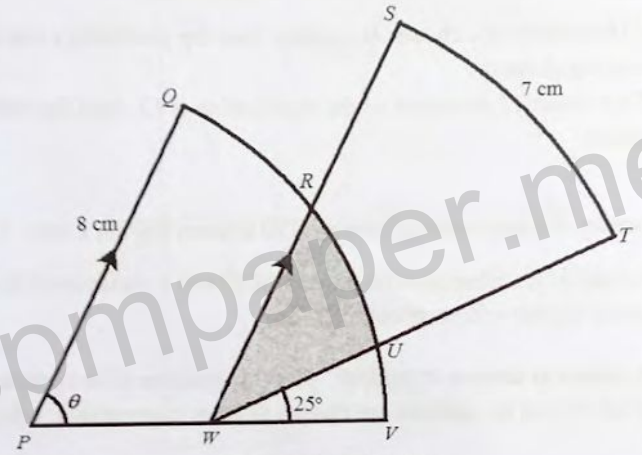


Diagram 8 / *Rajah 8*

[Use / *Guna* $\pi = 3{\cdot}142$]

It is given that the area of the whole diagram *PQRSTUV* is $63{\cdot}88\,\text{cm}^2$.
Diberi bahawa luas keseluruhan rajah PQRSTUV ialah $63{\cdot}88\ \text{cm}^2$.

Calculate
Hitung

(*a*) the value of θ, in radians, correct to three decimal places, [3 *marks*]
nilai θ, *dalam radians, betul kepada tiga tempat perpuluhan,* [3 *markah*]

(*b*) the perimeter, in cm, of sector *QPV*, [3 *marks*]
perimeter, dalam cm, *sektor QPV,* [3 *markah*]

(*c*) the area, in cm^2, of the shaded region. [4 *marks*]
luas, dalam cm^2, *kawasan berlorek.* [4 *markah*]

Kedah 2018 P2(B) Q8 Answer

NO.	SOLUTION	MARKS
8		
(a)	$\angle SWT = \frac{7}{10} / 0\cdot7 / 40\cdot10° / 40\cdot11°$	K1 use $s = r\theta$
	$\frac{25°}{180°} \times \pi = 0\cdot4364rad / 0\cdot4363rad$	
	$\theta = 0\cdot7 + 0\cdot4363 = 1\cdot1363\,rad$ $(65\cdot10°)$	K1
	$\theta = 1\cdot136\,rad\ (3d.p.)$	N1
(b)		
	$ArcQV = 8 \times 1\cdot136 = 9\cdot088$	K1
	$Perimeter = 8 + 8 + 9\cdot088$ $= 25\cdot088$	K1 N1
(c)		
	$A_{QPV} = \frac{1}{2}(8^2)(1\cdot136) = 36\cdot352$	K1
	$A_{SWT} = \frac{1}{2}(10^2)(0\cdot7) = 35$	K1 use formula $A = \frac{1}{2}r^2\theta$ to find A_{QPV} , A_{SWT}
	$Area = 71\cdot352 - 63\cdot88$ $= 7\cdot472$	K1 N1
		10

MRSM 2018 P2(B) Q10

10 Diagram 10 shows a plan of a mini garden, PQR in the form of a sector of a circle centered at P.

Rajah 10 *menunjukkan pelan sebuah taman mini,* PQR *berbentuk sektor sebuah bulatan berpusat di* P.

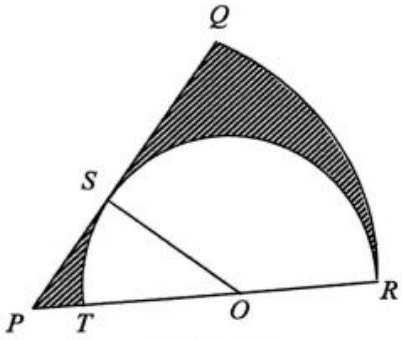


Diagram 10
Rajah 10

$ORST$ is a pond in a shape of a semicircle inscribed in the sector PQR. The shaded region is to be planted with grass. It is given that PQ is the tangent to the semicircle at point S, $\angle SOT = \frac{\pi}{6}$ radian and $OP = 7{\cdot}5$ m.

$ORST$ ialah sebuah kolam berbentuk semi bulatan terterap dalam sektor PQR. Kawasan berlorek akan ditanam dengan rumput. Diberi PQ adalah tangen kepada semi bulatan di titik S, $\angle SOT = \frac{\pi}{6}$ *radian dan* $OP = 7{\cdot}5$ m.

[Use/Guna $\pi = 3{\cdot}142$]

(*a*) Find the radius, in m, of sector PQR. [3 *marks*]
Cari jejari, dalam m, *sektor* PQR. [3 *markah*]

(*b*) Hence, calculate
Seterusnya, hitung

(i) the perimeter, in m, of the region to be planted with grass,
perimeter, dalam m, *kawasan yang akan ditanam dengan rumput,*

(ii) the area, in m^2, of the region to be planted with grass.
luas, dalam m^2, *kawasan yang akan ditanam dengan rumput.*

[7 *marks*]
[7 *markah*]

MRSM 2018 P2(B) Q10 Answer

No	Solution	Scheme	Sub marks	Marks
10				
(a)	$\cos\left(\frac{\pi}{6}\right) = \frac{OS}{7.5}$ or $\sin\left(\frac{\pi}{3}\right) = \frac{OS}{7.5}$ $PR = {}^{\circ}6.495 + 7.5$ $= 13.995$	KI Use trigonometric ratio or equivalent to find OS KI ${}^{\circ}OS + 7.5$ NI 13.995//14	3	
(b)	(i) $\angle SPO = \frac{\pi}{3}$ or 1.047 or 60° $QR = {}^{\circ}13.995\left(\frac{\pi}{3}\right)$ $= 14.66$ $Perimeter = {}^{\circ}13.995 + {}^{\circ}14.66 + {}^{\circ}6.495(\pi) + (7.5 - {}^{\circ}6.495)$ $= 50.06 \leftrightarrow 50.08$	PI Seen or implied KI Find arc QR or arc TSR KI ${}^{\circ}PQ + {}^{\circ}\text{arc}QR + {}^{\circ}\text{arc}TSR + {}^{\circ}PT$ NI $50.06 \leftrightarrow 50.08$	4	10
	Area semicircle $ORST$ $= \frac{1}{2} \times \pi \times {}^{\circ}6.495^2 = 66.26$ Area of sector PQR $= \frac{1}{2} \times {}^{\circ}13.995^2 \times \frac{\pi}{3} = 102.55$ Area shaded region $= {}^{\circ}102.55 - {}^{\circ}66.26$ $= 36.29$	KI Find the area of semicircle $ORST$ or area of sector PQR KI ${}^{\circ}\text{Area } PQR - {}^{\circ}\text{Area } ORST$ NI $36.26 \leftrightarrow 36.37$	3	

Chapter 9: Differentiation

MRSM 2018 P2(B) Q11

11 A manufacturing company produces and sells tables. The cost function is given by $C(x) = 1500 - \frac{x^3}{3} + 65x^2$, where x is the number of table produced. Each table is sold at a price of RM3000.

Sebuah syarikat pembuatan menghasilkan dan menjual meja. Fungsi kos diberi oleh $C(x) = 1500 - \frac{x^3}{3} + 65x^2$, *dengan keadaan x mewakili bilangan meja yang dihasilkan. Setiap meja dijual dengan harga* RM 3000.

Find

Cari

(a) the profit function, [3 *marks*]

fungsi keuntungan, [3 *markah*]

(b) the maximum number of tables to be produced to gain a maximum profit, [5 *marks*]

bilangan meja yang maksimum untuk dihasilkan bagi memperolehi keuntungan maksimum, [5 *markah*]

(c) the maximum profit that can be obtained. [2 *marks*]

keuntungan maksimum yang boleh diperolehi. [2 *markah*]

MRSM 2018 P2(B) Q11 Answer

No	Solution	Scheme	Sub marks	Marks
11				
(a)	$3000x$	P1 seen		
	$P(x) = 3000x - \left(-\frac{x^3}{3} + 65x^2 + 1500\right)$	K1	3	
	$= 3000x + \frac{x^3}{3} - 65x^2 - 1500$	N1		
(b)	$\frac{dP}{dx} = 3000 + x^2 - 130x = 0$	K1 Differentiate * $P(x)$ and equate to 0		
	$x^2 - 130x + 3000 = 0$			
	$(x-100)(x-30) = 0$	K1 Solve quadratic equation		
	$x = 30, x = 100$	N1 30, 100		
	$\frac{d^2P}{dx^2} = 2x - 130$	K1 Find P"(x) and substitute x=100 or x=30 OR substitute x=100 and x=30 into P(x)	5	10
	$2(30) - 130 = -70 < 0$ $2(100) - 130 = 70 > 0$			
	$x = 30$	N1 30		
(c)	$3000(30) + \frac{30^3}{3} - 65(30)^2 - 1500$	K1	2	
	=RM 39000	N1 RM 39000		
		Note: For correct answer only. Award K1N1 if the method of substitution x=30 into P(x) is shown in (b)		

Chapter 10: Solution of Triangle

Kedah 2018 P2(C) Q13

13 Diagram 13 shows two triangles PQR and PST.
Rajah 13 menunjukkan dua buah segi tiga PQR dan PST.

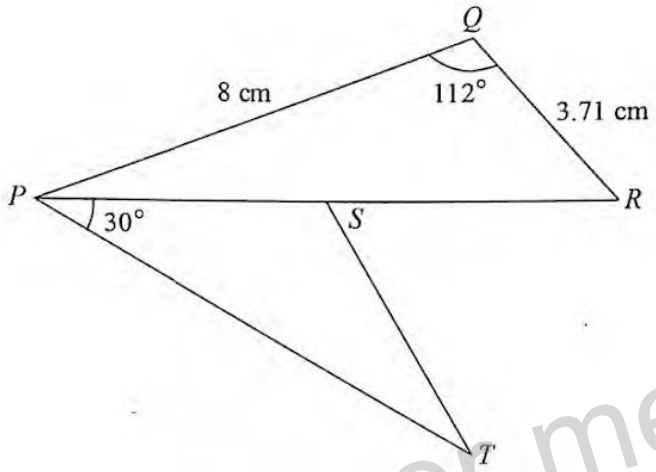


Diagram 13 / *Rajah 13*

It is given that $SP = SR = ST$.
Diberi bahawa $SP = SR = ST$.

(*a*) Calculate
Hitung

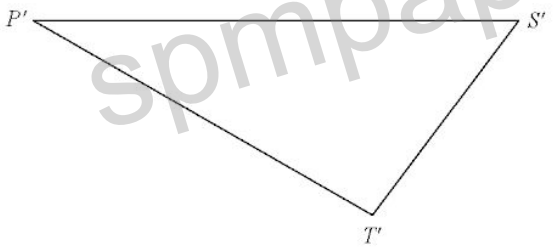
(i) the length, in cm, of SR,
panjang, dalam cm, *bagi* SR, [2 *marks*] [2 *markah*]

(ii) perimeter, in cm, of the diagram $PQRST$.
perimeter, dalam cm, *bagi rajah* $PQRST$. [4 *marks*] [4 *markah*]

(*b*) (i) Sketch a triangle $P'S'T'$ which has a different shape from triangle PST such that $P'T' = PT$, $S'T' = ST$ and $\angle T'P'S' = \angle TPS$.
Lakar sebuah segi tiga $P'S'T'$ *yang mempunyai bentuk berbeza daripada segi tiga* PST *dengan keadaan* $P'T' = PT$, $S'T' = ST$ *dan* $\angle T'P'S' = \angle TPS$. [1 *mark*] [1 *markah*]

(ii) Hence, find the area, in cm^2, of the triangle $P'S'T'$.
Seterusnya, cari luas, dalam cm^2, *bagi segi tiga* $P'S'T'$. [3 *marks*] [3 *markah*]

Kedah 2018 P2(C) Q13 Answer

NO.	SOLUTION	MARKS
13		
(a)	(i)	
	$PR^2 = 8^2 + 3\cdot71^2 - 2(8)(3\cdot71)\cos 112°$	K1 use cosine rule
	$PR = 10$	
	$SR = 5$	N1
	(ii)	
	$\frac{PT}{\sin 120°} = \frac{5}{\sin 30°}$	K1 use sine rule
	$PT = 8\cdot66$	N1
	Perimeter	
	$= 8 + 3\cdot71 + 5 + 5 + 8.66$	K1
	$= 30\cdot37$	N1
(b)	(i)	
		N1
	(ii)	
	$Area = \frac{1}{2}(8\cdot66)(10)\sin 30°$	K1 use $A = \frac{1}{2}ab\sin c$
	$= 21\cdot65$	K1 $P'S' = 10$
	OR	N1
	$Area = \frac{1}{2}(8\cdot66)(5)$	
	$= 21\cdot65$	
		10

MRSM 2018 P2(A) Q5

5 Diagram 5 shows triangle ABC. Point P lies on the straight line BC and point Q lies on the straight line AC.

Rajah 5 menunjukkan segitiga ABC. Titik P terletak pada garis lurus BC dan titik Q terletak pada garis lurus AC.

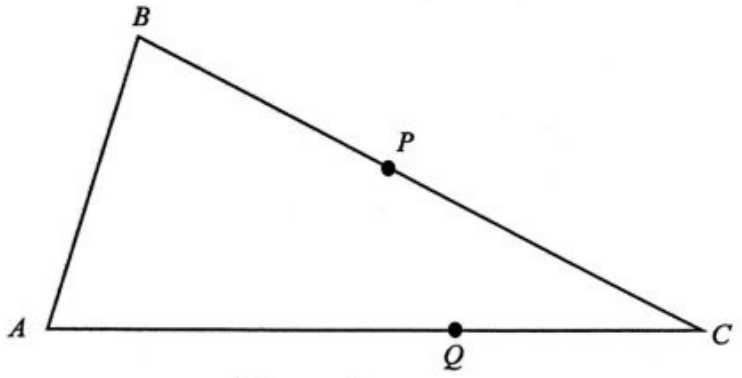


Diagram 5
Rajah 5

It is given that $BP = PC$, $QC = \frac{1}{3}AC$, $\overrightarrow{AB} = 3\underline{u}$ and $\overrightarrow{AC} = 2\underline{v}$.

Diberi bahawa $BP = PC$, $QC = \frac{1}{3}AC$, $\overrightarrow{AB} = 3\underline{u}$ *dan* $\overrightarrow{AC} = 2\underline{v}$.

(a) Express in term of $\underline{u}$ and / or $\underline{v}$:

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

(i) $\overrightarrow{BC}$

(ii) $\overrightarrow{PQ}$

[3 *marks*]
[3 *markah*]

(b) The straight line PQ is extended to the point R such that $\overrightarrow{PR} = -9\underline{u} + k\underline{v}$, where k is a constant.
Find the value of k. [3 *marks*]

Garis lurus PQ dipanjangkan ke titik R dengan keadaan $\overrightarrow{PR} = -9\underline{u} + k\underline{v}$, *dengan keadaan k ialah pemalar.*
Cari nilai k. [3 *markah*]

MRSM 2018 P2(A) Q5 Answer

No	Solution	Marking Scheme	Sub marks	Marks
5 (a)	(i) $\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AC}$ $= -3\underline{u} + 2\underline{v}$	K1 Use triangle law N1 $\overrightarrow{BC} = -3\underline{u} + 2\underline{v}$		
	(ii) $\overrightarrow{PQ} = \overrightarrow{PC} + \frac{1}{3}\overrightarrow{CA}$ $= \frac{1}{2}(-3\underline{u} + 2\underline{v}) + \frac{1}{3}(-2\underline{v})$ $= -\frac{3}{2}\underline{u} + \frac{1}{3}\underline{v}$	N1 $\overrightarrow{PQ} = -\frac{3}{2}\underline{u} + \frac{1}{3}\underline{v}$	3	
(b)	$-9\underline{u} + k\underline{v} = \lambda\left(-\frac{3}{2}\underline{u} + \frac{1}{3}\underline{v}\right)$ $-9\underline{u} + k\underline{v} = -\frac{3\lambda}{2}\underline{u} + \frac{\lambda}{3}\underline{v}$ $\frac{-3\lambda}{2} = -9 \quad k = \frac{\lambda}{3}$ $k = 2$	K1 Use PQ=λPR or PR=λPQ K1 Equate the coefficient $\underline{u}$ *and of* $\underline{v}$ and solve. N1 $k = 2$	3	6

MRSM 2018 P2(C) Q14

14 Solution by scale drawing is not accepted.
Penyelesaian secara lukisan berskala tidak diterima.

Diagram 14 shows a tetrahedron $ABCD$ such that $\angle BAC = 64^\circ$, $\angle ACD = 35^\circ$, $\angle BDC = 104^\circ$, $AB = 8$ cm and $BD = 15$ cm.

Rajah 14 *menunjukkan sebuah tetrahedron ABCD dengan keadaan* $\angle BAC = 64^\circ$, $\angle ACD = 35^\circ$, $\angle BDC = 104^\circ$, $AB = 8$ cm *dan* $BD = 15$ cm.

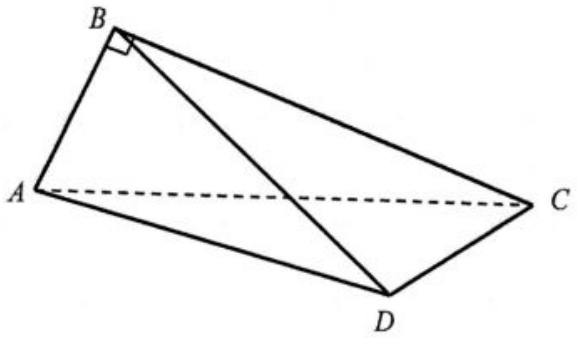


Diagram 14
Rajah 14

It is given that the area of triangle BCD is $29{\cdot}1$ cm^2 and ABC is a right angle triangle.
Diberi bahawa luas segi tiga BCD ialah $29{\cdot}1$ cm^2 *dan ABC adalah segi tiga bersudut tegak.*

(*a*) Calculate
Hitung

(i) the length, in cm, of CD,
Panjang, dalam cm, *bagi CD,*

(ii) the length, in cm, of AD,
panjang, dalam cm, *bagi AD,*

(iii) $\angle CAD$.

[7 *marks*]
[7 *markah*]

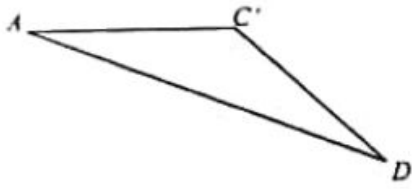
(*b*) Point C' lies on AC such that $DC' = DC$.
Titik C' *terletak pada AC dengan keadaan* $DC' = DC$.

(i) Sketch the triangle $\Delta ADC'$.
Lakar segi tiga $\Delta ADC'$.

(ii) Calculate the length, in cm, of AC'.
Hitung panjang, dalam cm, *bagi* AC'.

[3 *marks*]
[3 *markah*]

MRSM 2018 P2(C) Q14 Answer

No	Solution		marks	
14 (a)	(i) $29.1 = \frac{1}{2} \times 15 \times CD \times \sin 104°$ $CD = 3.999$	K1 Use $\frac{1}{2}ab\sin C = 29.1$ N1 3.999//4	2	
	(ii) $\cos 64° = \frac{8}{AC}$ $AC = 18.249//18.25$	N1 18.249//18.25		
	$AD^2 = \text{•}18.249^2 + \text{•}3.999^2 - 2\text{•}(18.249)\text{•}(3.999)\cos 35°$ $AD = 15.15$	K1 Use cosine rule N1 15.15	3	
	(iii) $\frac{\sin \angle CAD}{\text{•}3.999} = \frac{\sin 35°}{\text{•}15.15}$ $3.999^2 = 18.25^2 + 15.15^2 - 2(18.25)(15.15)\cos \angle CAD$ $\angle CAD = 8.71°$	K1 Use sine rule or cosine rule N1 $8.70° \leftrightarrow 8.74°$ $8°42' \leftrightarrow 8°44'$	2	10
(b)	(i) 	P1 Triangle with $\angle AC'D$ must be obtuse	1	
	(ii) $\frac{AC'}{\sin 26.29°} = \frac{15.15}{\sin 145°}$ $AC'^2 = 3.999^2 + 15.15^2 - 2(3.999)(15.15)\cos 26.29°$ $AC' = 11.70$	K1 Use sine rule or cosine rule or equivalent method N1 11.70	2	

Chapter 11: Index Number

Kedah 2018 P2(C) Q15

15 Table 15 shows the price indices and respective weightages for four different materials, P, Q, R and S, used in the production of a type of cake.

Material *Bahan*	Price index in the year 2016 based on the year 2015 *Indeks harga dalam tahun 2016 berasaskan tahun 2015*	Weightage *Pemberat*
P	120	2
Q	115	3
R	x	1
S	110	y

Table 15 / *Jadual* 15

(*a*) The price of material R is increased by 35% from the year 2015 to the year 2016. Find the value of x.

[1 *mark*]

(*b*) The price of material Q is RM 1·50 in the year 2016. Calculate its price in the year 2015.

[2 *marks*]

(*c*) Given the price index of material P in the year 2017 based on the year 2015 is 140. Calculate its price index in the year 2017 based on the year 2016.

[2 *marks*]

(*d*) The composite index for the production cost of the cake in the year 2016 based on the year 2015 is 116.

(i) Find the value of y.

(ii) The cost of making a cake is RM 20 in the year 2015. Find the maximum number of cakes can be produced using an allocation of RM 500 in the year 2016.

[5 *marks*]

Jadual 15 *menunjukkan indeks harga dan pemberat masing-masing bagi empat bahan* P, Q, R *dan* S *dalam penghasilan suatu jenis kek.*

(a) *Harga bagi bahan* R *bertambah sebanyak* 35% *dari tahun* 2015 *ke tahun* 2016. *Cari nilai* x.

[1 *markah*]

(b) *Harga bagi bahan* Q *pada tahun* 2016 *ialah* RM 1·50. *Hitungkan harganya pada tahun* 2015.

[2 *markah*]

(c) *Diberi indeks harga bagi bahan* P *dalam tahun* 2017 *berasaskan tahun* 2015 *ialah* 140. *Hitungkan indeks harganya dalam tahun* 2017 *berasaskan tahun* 2016.

[2 *markah*]

(d) *Indeks gubahan untuk kos pembuatan kek itu pada tahun* 2016 *berasaskan tahun* 2015 *ialah* 116.

(i) *Cari nilai* y.

(ii) *Kos pembuatan kek ialah* RM 20 *pada tahun* 2015. *Cari bilangan maksimum kek yang dapat dihasilkan dengan mengunakan peruntukan* RM 500 *pada tahun* 2016.

[5 *markah*]

Kedah 2018 P2(C) Q15 Answer

N0.	SOLUTION	MARKS
15		
(*a*)	$x = 135$	N1
(*b*)	$\frac{1 \cdot 50 \times 100}{Q} = 115$	K1
	$= 1 \cdot 30$	N1
(*c*)	$\frac{120 \times I}{100} = 140$	K1
	$I = 116 \cdot 67$	N1
(*d*)		
(i)	$\frac{120 \times 2 + 115 \times 3 + 135 \times 1 + 110 \times y}{2 + 3 + 1 + y} = 116$	K1
	$y = 4$	N1
(ii)	$\frac{p}{20} \times 100 = 116$	K1
	$p = 23 \cdot 2$	
	$\frac{500}{23 \cdot 2} = 21 \cdot 55$	K1
	max = 21	N1
		10

MRSM 2018 P2(C) Q15

15 Table 15 shows the price indices and the weightages of four items *A*, *B*, *C* and *D* used to make a kind of food.

Jadual 15 *menunjukkan indeks harga dan pemberat bagi empat bahan A, B, C dan D yang digunakan untuk membuat sejenis makanan.*

Item ***Bahan***	**Price index in the year 2016 based on the year 2015** ***Indeks harga pada tahun 2016 berasaskan tahun 2015***	**Price index in the year 2017 based on the year 2015** ***Indeks harga pada tahun 2017 berasaskan tahun 2015***	**Weightage** ***Pemberat***
A	110	115	4
B	125	140	*m*
C	130	120	*n*
D	120	132	5

Table 15
Jadual 15

The composite index for the cost of making food for the year 2017 based on the year 2015 is 130 and the total weightage is 20.

Indeks gubahan bagi kos membuat makanan pada tahun 2017 *berasaskan tahun* 2015 *ialah* 130 *dan jumlah pemberat ialah* 20.

(*a*) Calculate
Hitung

(i) the value of *m* and of *n*,
nilai m dan nilai n,

(ii) the price of item *B* in the year 2015 if its price in the year 2016 is RM 21 · 00,
harga bahan B pada tahun 2015 *jika harganya pada tahun* 2016 *ialah* RM 21 · 00,

(iii) the price index of item *D* in the year 2017 based on the year 2016.
indeks harga bagi bahan D pada tahun 2017 *berasaskan tahun* 2016.

[8 *marks*]
[8 *markah*]

(*b*) The cost of all items increases by 25% from the year 2017 to the year 2018.
Find the composite index for the cost of making the food in the year 2018 based on the year 2015. [2 *marks*]

Kos bagi semua bahan itu meningkat sebanyak 25% *dari tahun* 2017 *ke tahun* 2018.
Cari indeks gubahan bagi kos membuat makanan itu pada tahun 2018 *berasaskan tahun* 2015. [2 *markah*]

MRSM 2018 P2(C) Q15 Answer

No.	Solution	Scheme	Sub marks	Marks
15 (a)	$m+n+4+5=20$ $m+n=11$ ---------- (1) $\frac{140(m)+120(n)+115(4)+132(5)}{m+n+4+5}=130$ $m-n=5$ ---------- (2) or $\frac{140m+120n+115(4)+132(5)}{20}=130$ $140+120n=1480$ (1) + (2) $2m=16$ $m=8$ $8+n=11$ $n=3$	K1 Use $m+n+4+5=20$ K1 Use $\frac{\sum fw}{\sum w}=130$ K1 Solve simultaneous equation N1 $m=8$ and $n=3$	4	
(b)	$\frac{21}{P_{15}}\times 100 = 125$ $P_{15} = 16.80$	K1 Use $\frac{P_{16}}{P_{15}}\times 100=125$ N1 16.80	2	10
(c)	$132 \times \frac{100}{120}$ 110	K1 Use $\left[\frac{120}{100}\times\frac{x}{100}\right]\times 100=132$ or equivalent N1 110	2	
(d)	$\frac{125}{100}\times 130$ 162.5	K1 Use $\frac{125}{100}\times 130$ N1 162.5	2	

Form 5 AddMath

Chapter 1: Progression

Kedah 2018 P2(A) Q3

3

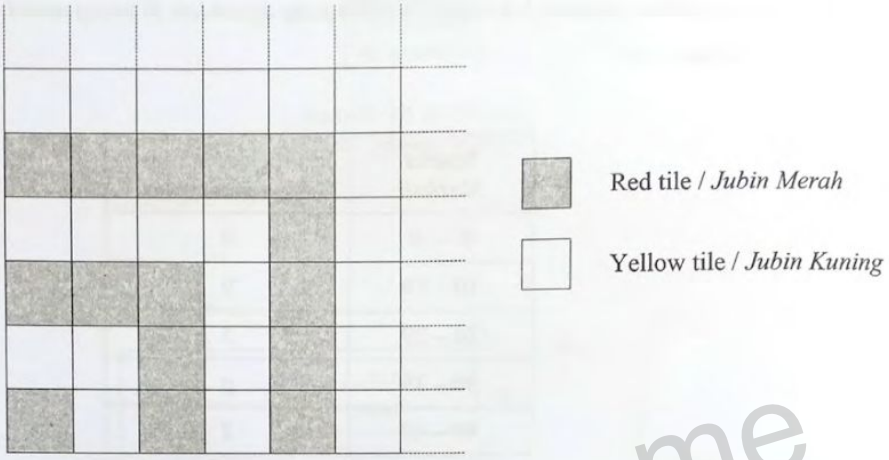


Diagram 3 / *Rajah* 3

Mr Aiman wants to form a pattern on the floor of his son's room as Diagram 3. Given that the size of his son's room is 6 m × 6 m and the size of a piece of tile is 30 cm × 30 cm.

(*a*) How many red tiles are needed?

(*b*) Find the difference between the number of red tiles and yellow tiles.

[5 *marks*]

Encik Aiman ingin membentuk suatu corak pada lantai bilik anaknya seperti Rajah 3. *Diberi bahawa bilik anak Encik Aiman adalah seluas* 6 m × 6 m *dan saiz sekeping jubin ialah* 30 cm × 30 cm.

(*a*) *Berapakah jubin merah yang diperlukan*?

(*b*) *Cari beza antara bilangan jubin merah dan jubin kuning.*

[5 *markah*]

Kedah 2018 P2(A) Q3 Answer

3 (a)	$a=1, \quad d=4, \quad n=10$ $S_{10}=\frac{10}{2}[2(1)+9(4)]$ $=190$	P1 any 2 correct K1 use S_{10} N1
(b)	Yellow tiles = 400 – 190 = 210 OR $S_{10}=\frac{10}{2}[2(3)+9(4)]$ $=210$ Difference = 210 – 190 = 20	N1 N1
		5

MRSM 2018 P2(A) Q4

4 Diagram 4 shows two children playing a swing.

Rajah 4 *menunjukkan dua kanak-kanak bermain buaian.*

Diagram 4
Rajah 4

The swing is released from a position and it swings through a distance of x cm. On each successive swing, the distance is 5% lesser than the previous distance. The process continues until the swing stops. It is given that total distance covered in the first 3 swings is 855·75cm.

Buaian itu dilepaskan dari satu kedudukan dan ia berayun dengan jarak sejauh x cm. *Jarak setiap ayunan yang berikutnya ialah* 5% *kurang daripada jarak sebelumnya. Proses ini berulang sehingga buaian itu berhenti. Diberi bahawa jumlah jarak yang dilalui dalam* 3 *ayunan yang pertama ialah* 855·75cm.

(*a*) Find the value of x. [3 *marks*]
Cari nilai x. [3 *markah*]

(*b*) The n-th swing covers a distance of less than 200 cm for the first time.
Find the value of n. [3 *marks*]
Ayunan ke-n *meliputi jarak kurang dari* 200 cm *buat kali pertama.*
Cari nilai n. [3 *markah*]

(*c*) Find the total distance, in cm, that the swing has swung before it stops. [2 *marks*]
Cari jumlah jarak yang dilalui, dalam cm, *oleh buaian itu sebelum ia berhenti.*
[2 *markah*]

MRSM 2018 P2(A) Q4 Answer

4				
(a)	$r = 0.95$	PI Seen or implied		
	$\frac{x(1-0.95^3)}{1-0.95} = 855.75$	KI Use $S_3 = 855.75$ with $^{\bullet}r = 0.95$	3	
	$x = 300$	NI 300		
(b)	$300(0.95)^{n-1} < 200$	KI Use $^{\bullet}300(0.95)^{n-1} < 200$ Accept = or ≤		
	$(0.95)^{n-1} < \frac{200}{300}$	KI Solve the equation using logarithm		8
	$n = 9$	NI 9	3	
(c)	$\frac{^{\bullet}300}{1-0.95}$	KI Use $S_\infty = \frac{^{\bullet}300}{1-0.95}$		
	6000	NI 6000	2	

Chapter 2: Linear Law

Kedah 2018 P2(B) Q11

11 Use the graph paper provided to answer this question.

Gunakan kertas graf yang disediakan untuk menjawab soalan ini.

Two variables, x and y are related by the equation $\frac{x}{y} = k + hx$, where k and h are constants.

A set of data x and y was obtained and shown in Table 11.

x	0·80	1·00	1·25	2·00	2·50	5·00
y	0·36	0·45	0·59	1·04	1·43	5·00

Table 11 / *Jadual* 11

(*a*) Based on Table 11, construct a table for the values of $\frac{1}{x}$ and $\frac{1}{y}$. [2 *marks*]

(*b*) Plot $\frac{1}{y}$ against $\frac{1}{x}$, using a scale of 2 cm to 0·2 unit on the $\frac{1}{x}$-*axis* and 2 cm to 0·5 unit on the $\frac{1}{y}$-*axis*. Hence draw the line of best fit. [3 *marks*]

(*c*) Use the graph in 11(*b*) to find the value of

(i) h,

(ii) k,

(iii) y when $x = 1·6$. [5 *marks*]

Dua pemboleh ubah, x dan y dihubungkan oleh persamaan $\frac{x}{y} = k + hx$, *dengan keadaan k dan h ialah pemalar. Satu set data bagi x dan y telah diperoleh dan ditunjukkan dalam Jadual* 11.

(*a*) *Berdasarkan Jadual* 11, *bina satu jadual bagi nilai-nilai* $\frac{1}{x}$ *dan* $\frac{1}{y}$. [2 *markah*]

(*b*) *Plot* $\frac{1}{y}$ *melawan* $\frac{1}{x}$, *dengan menggunakan skala* 2 cm *kepada* 0·2 unit *pada paksi* $-\frac{1}{x}$ *dan* 2 cm *kepada* 0·5 unit *pada paksi* $-\frac{1}{y}$. *Seterusnya lukis garis lurus penyuaian terbaik.* [3 *markah*]

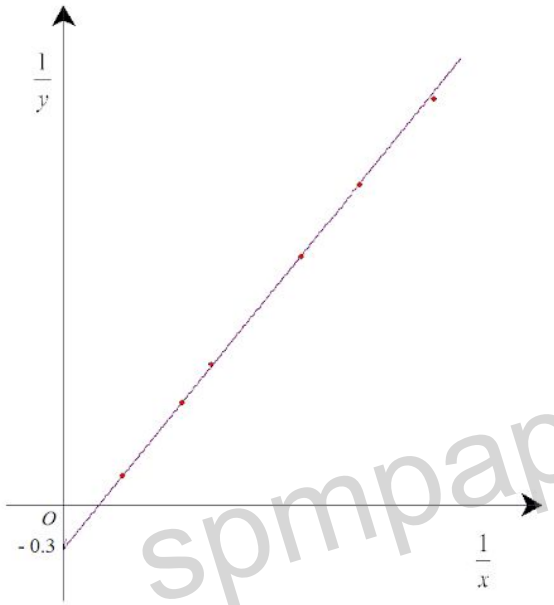
(*c*) *Gunakan graf di* 11(*b*) *untuk mencari nilai*

(i) h,

(ii) k,

(iii) y *apabila* $x = 1·6$. [5 *markah*]

Kedah 2018 P2(B) Q11 Answer

NO.	SOLUTION	MARKS
11		
(a)	$\frac{1}{x}$: 1·25, 1·00, 0·80, 0·50, 0·40, 0·20 $\frac{1}{y}$: 2·78, 2·22, 1·69, 0·96, 0·70, 0·20	N1 6 correct values N1 6 correct values
(b)		K1 plot / correct axes & uniform scale N1 6 points plotted correctly N1 line of best-fit
(c) (i)	$\frac{1}{y} = k\left(\frac{1}{x}\right) + h$	P1
(ii)	$h = -0 \cdot 3$ $k = 2 \cdot 48$	N1 for y-intercept N1 finding gradient
(iii)	$\frac{1}{y} = 1 \cdot 25 \leftrightarrow 1.30$ $y = 0 \cdot 8 \leftrightarrow 0.77$	K1 N1
		10

MRSM 2018 P2(B) Q9

9 Use the graph paper provided on page **23** to answer this question. Detach the graph paper and tie together with your answer booklet.

Gunakan kertas graf yang disediakan pada halaman **23** *untuk menjawab soalan ini. Ceraikan kertas graf itu dan ikat bersama-sama buku jawapan anda.*

Table 9 shows the values of two variables, x and y, obtained from an experiment. Variables x and y are related by the equation $y = p^{\sqrt{x}}q$, where p and q are constants.

Jadual 9 menunjukkan nilai-nilai bagi dua pembolehubah x dan y, yang diperoleh daripada suatu eksperimen. Pembolehubah x dan y dihubungkan oleh persamaan $y = p^{\sqrt{x}}q$, *dengan keadaan p dan q ialah pemalar.*

x	1	4	9	16	25	36
y	1·78	2·63	3·72	5·75	8·91	12·59

Table 9
Jadual 9

(*a*) Based on Table 9, construct a table for the values of $\log_{10} y$ and $\sqrt{x}$. [2 *marks*]

Berdasarkan Jadual 9, bina satu jadual bagi nilai-nilai $\log_{10} y$ *dan* $\sqrt{x}$.

[2 *markah*]

(*b*) Plot $\log_{10} y$ against $\sqrt{x}$, using a scale of 2 cm to 1 unit on the $\sqrt{x}$–axis and 2 cm to 0·1 unit on the $\log_{10} y$–axis.
Hence, draw the line of best fit. [3 *marks*]

Plot $\log_{10} y$ *melawan* $\sqrt{x}$, *menggunakan skala* 2 cm *kepada* 1 *unit pada paksi–*$\sqrt{x}$ *dan* 2 cm *kepada* 0·1 *unit pada paksi–*$\log_{10} y$.
Seterusnya, lukis garis lurus penyuaian terbaik.

[3 *markah*]

(*c*) Using the graph in 9(*b*), find the value of
Menggunakan graf di 9(*b*), *cari nilai*

(i) p,

(ii) q.

[5 *marks*]
[5 *markah*]

MRSM 2018 P2(B) Q9 Answer

No	Solution	Scheme	Sub marks	Marks
9				
(a)	$\sqrt{x}$: 1, 2, 3, 4, 5, 6 $\log y$: 0.25, 0.42, 0.57, 0.76, 0.95, 1.10	NI NI Note: at least two d.p	2	
(b)	Correct axes and uniform scale All points are correct *6 points plotted correctly Draw line of best fit	KI Plot log y against $\sqrt{x}$ with correct axes and uniform scale NI NI Line of best fit	3	
(c)	$\log y = (\log p)\sqrt{x} + \log q$ (i) $\log p = *0.17$ $p = 1.47 \leftrightarrow 1.48$ (ii) $\log q = *0.08$ $q = 1.18 \leftrightarrow 1.22$	PI seen or implied Use $*m = \log p$ KI NI $1.47 \leftrightarrow 1.48$ KI Use $*c = \log q$ NI $1.18 \leftrightarrow 1.22$	5	10
		Note: SS – 1 if, part of the scale is not uniform at the $\sqrt{x}$-axis and/or the log y-axis from the first point to the last point *or* does not use the given scale *or* does not use graph paper		

Chapter 3: Integration

Kedah 2018 P2(B) Q10

10 (*a*) Diagram 10 (*a*) shows a side elevation of a metal container without cover. The inner surface of the container can be represented by quadratic equation $y = 2x^2 + 1$. The height of the container is 9 cm.

Rajah 10 (*a*) *menunjukkan pandangan sisi bagi sebuah bekas logam tanpa penutup. Permukaan dalam bagi bekas itu boleh diwakili oleh persamaan kuadratik* $y = 2x^2 + 1$. *Tinggi bekas itu ialah* 9 cm.

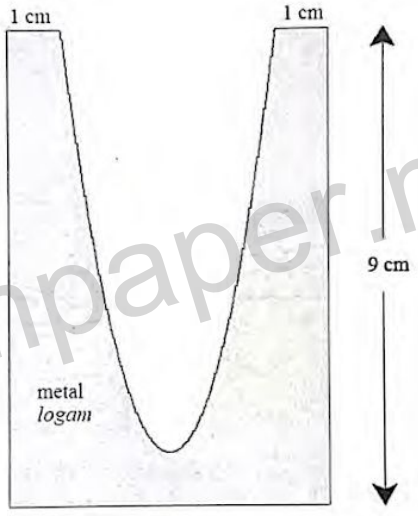


Diagram 10 (*a*) / *Rajah* 10 (*a*)

Find the volume, in cm^3, of metal needed to make the container.
Cari isipadu, dalam cm^3, *logam yang diperlukan untuk membuat bekas itu.*

[5 *marks*]
[5 *markah*]

(*b*) Diagram 10 (*b*) shows the straight line $2x-3y+6=0$ intersects the curve $y=\frac{4}{(x-2)^2}$ at point P.

Rajah 10 (*b*) *menunjukkan garis lurus* $2x-3y+6=0$ *menyilang lengkung* $y=\frac{4}{(x-2)^2}$ *pada titik P.*

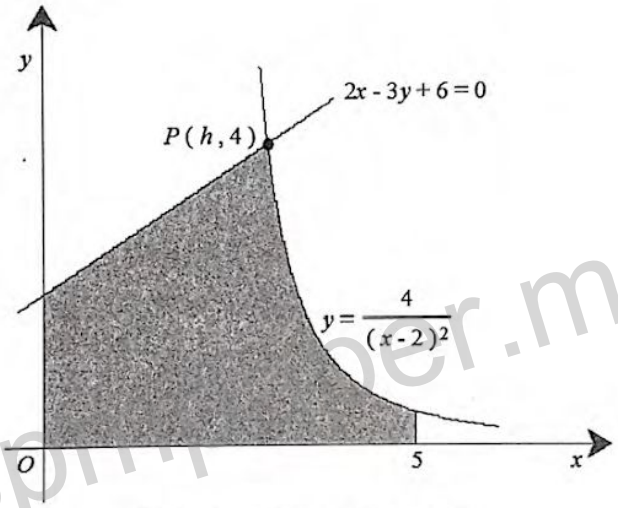


Diagram 10 (*b*) / *Rajah* 10 (*b*)

Find

Cari

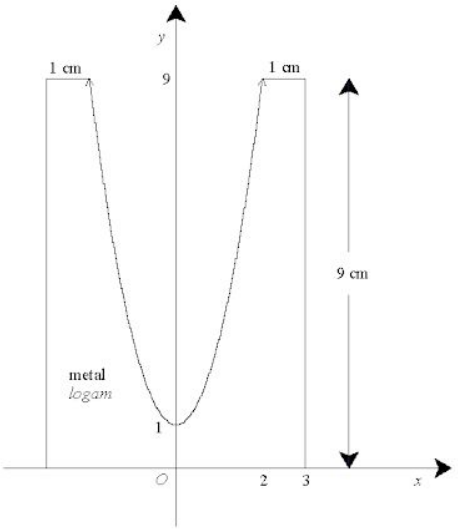
(i) the value of h, [1 *mark*]

nilai h, [1 *markah*]

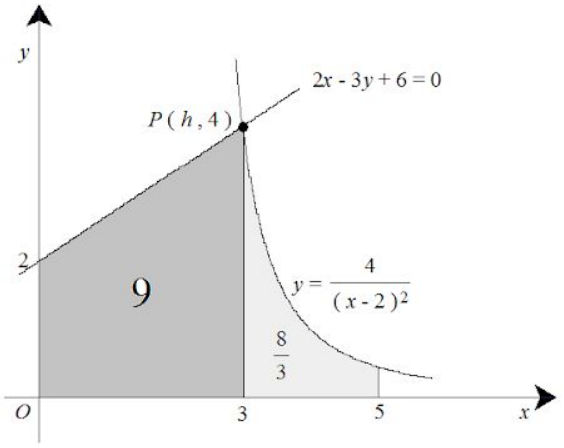
(ii) the area of the shaded region. [4 *marks*]

luas rantau yang berlorek. [4 *markah*]

Kedah 2018 P2(B) Q10 Answer

NO.	SOLUTION	MARKS
10 (a)		
	$y = 2x^2 + 1$ $y = 9$ $x = 2 \quad or \quad r = 3$	K1 Substitute $y = 9$ *to find* $x = 2 \quad or \quad r = 3$
	Volume of cylinder $= \pi(3^2)(9)$ $= 81\pi$	K1
	Volume $= \pi \int_1^9 \frac{y-1}{2}\, dy$ $= \frac{\pi}{2}\left[\frac{y^2}{2} - y\right]_1^9$ $= \frac{\pi}{2}\left[\left(\frac{81}{2} - 9\right) - \left(\frac{1}{2} - 1\right)\right]$ $= \frac{\pi}{2}(32)$ $= 16\pi$	K1 integrate and use the limit correctly
	Volume of metal $= 81\pi - 16\pi$ $= 65\pi$	K1 N1

(b)



(i)

$2x-3y+6=0$

$(h,4)$

$2h=6$

$h=3$

OR

$y=\frac{4}{(x-2)^2}$

$(h,4)$

$(h-2)^2=1$

$h=3$

N1

(ii)

Area of trapezium

$=\frac{1}{2}(2+4)(3)$

$=9$

K1

Area

$=\int_3^5 4(x-2)^{-2}\,dx$

$=-4\left[\frac{1}{x-2}\right]_3^5$

$=-4\left[\frac{1}{3}-\frac{1}{1}\right]$

$=-4\left[-\frac{2}{3}\right]$

$=\frac{8}{3}$

K1 integrate and use the limit correctly

	Area of the shaded region $=9+\frac{8}{3}$ $=\frac{35}{3}$ / $11\frac{2}{3}$ / 11·67	 K1 N1
		10

MRSM 2018 P2(A) Q3

3 Diagram 3 shows front view of an arch. Company *A* is assigned to paint the front wall of the arch. The entrance of the arch is represented by the equation of $y = ax^2 + c$, where a and c are constants.

Rajah 3 menunjukkan pandangan hadapan sebuah gerbang. Syarikat A ditugaskan untuk mengecat dinding hadapan pintu gerbang itu. Laluan masuk pintu gerbang itu diwakili oleh persamaan $y = ax^2 + c$, *dengan keadaan a dan c ialah pemalar.*

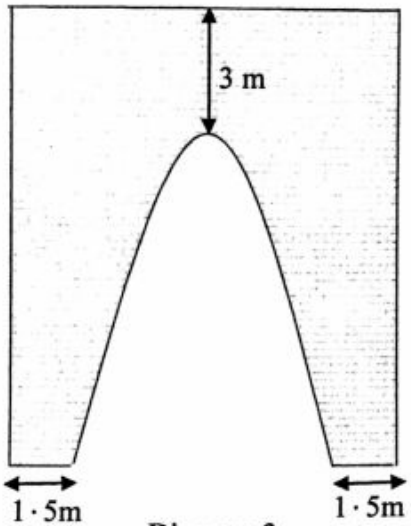


Diagram 3
Rajah 3

The width and the height of the wall is 7 m and 11 m respectively. Paint is sold in 5 litre bucket and 1 litre of paint can cover 10 m^2 of area of a single coating.

Find the minimum number of bucket of paint that is needed if the company has to complete the painting with 3 coatings.

Lebar dan tinggi dinding tersebut masing-masing ialah 7 m *dan* 11 m. *Cat dijual dalam bekas* 5 *liter dan* 1 *liter cat boleh meliputi keluasan* 10 m^2 *untuk satu lapisan cat.*

Cari bilangan minimum bekas cat yang diperlukan jika syarikat berkenaan dikehendaki mengecat dinding dengan 3 *lapisan.*

[7 *marks*]
[7 *markah*]

MRSM 2018 P2(A) Q3 Answer

3

$a(2-0)^2+8=0$ or $a(-2-0)^2+8=0$

$a=-2$

$y=-2x^2+8$

$A_1=7\times11$

$A_2=\int_{-2}^{2}-2x^2+8\,dx$

$=\left[-\frac{2x^3}{3}+8x\right]_{-2}^{2}$

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

$=21\frac{1}{3}$

Area of to be painted, $A_3=*A_1-*A_2$

$=*77-*21\frac{1}{3}$

$=55\frac{2}{3}$

$\frac{*55\frac{2}{3}}{10}\times3$

$=16.7\,l$

Minimum = 4 buckets

P1 $y=-2x^2+8$

K1 Finding the area of rectangle

K1 Integrate $*(-2x^2+8)$

Use limit -2 and 2

K1

K1 $*A_1-*A_2$

N1 $55\frac{2}{3}$

N1 4 buckets

7

Chapter 4: Vectors

Kedah 2018 P2(A) Q4

4

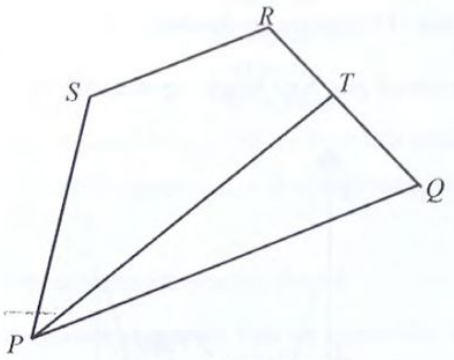


Diagram 4 / *Rajah* 4

Diagram 4 shows a trapezium $PQRS$. Given that $\overrightarrow{PQ} = 6\underset{\sim}{i} + 2\underset{\sim}{j}$, $\overrightarrow{PS} = \underset{\sim}{i} + 5\underset{\sim}{j}$, $\overrightarrow{PT} = 5\underset{\sim}{i} + 4\underset{\sim}{j}$ and $\overrightarrow{QT} = \frac{1}{2}\overrightarrow{QR}$.

Rajah 4 *menunjukkan satu trapezium* $PQRS$. *Diberi bahawa* $\overrightarrow{PQ} = 6\underset{\sim}{i} + 2\underset{\sim}{j}$, $\overrightarrow{PS} = \underset{\sim}{i} + 5\underset{\sim}{j}$, $\overrightarrow{PT} = 5\underset{\sim}{i} + 4\underset{\sim}{j}$ *dan* $\overrightarrow{QT} = \frac{1}{2}\overrightarrow{QR}$.

(*a*) Find / Cari

(i) $\overrightarrow{QR}$,

(ii) $\overrightarrow{SR}$.

(*b*) Prove that $\overrightarrow{SR}$ is parallel to $\overrightarrow{PQ}$.

Buktikan bahawa $\overrightarrow{SR}$ *adalah selari dengan* $\overrightarrow{PQ}$

[7 *marks*]

[7 *markah*]

Kedah 2018 P2(A) Q4 Answer

4 (a)	(i) $\overrightarrow{QT} = \overrightarrow{QP} + \overrightarrow{PT}$ $= \begin{pmatrix} -6 \\ -2 \end{pmatrix} + \begin{pmatrix} 5 \\ 4 \end{pmatrix}$ $= \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\overrightarrow{QR} = -2\underset{\sim}{i} + 4\underset{\sim}{j}$ (ii) $\overrightarrow{SR} = \overrightarrow{SP} + \overrightarrow{PQ} + \overrightarrow{QR}$ $= \begin{pmatrix} -1 \\ -5 \end{pmatrix} + \begin{pmatrix} 6 \\ 2 \end{pmatrix} + \begin{pmatrix} -2 \\ 4 \end{pmatrix}$ $= 3\underset{\sim}{i} + \underset{\sim}{j}$	K1 N1 K1 N1
(b)	$\overrightarrow{SR} = k\overrightarrow{PQ}$ $\begin{pmatrix} 3 \\ 1 \end{pmatrix} = k \begin{pmatrix} 6 \\ 2 \end{pmatrix}$ $k = \frac{1}{2}$ $\overrightarrow{SR}$ *is parallel to* $\overrightarrow{PQ}$	K1 N1 N1
		7

Chapter 5: Trigonometry Functions

Kedah 2018 P2(A) Q6

6 Diagram 6 shows a graph of trigonometric function, $y = f(x)$ for $0 \le x \le \pi$.

Rajah 6 menunjukkan sebuah graf bagi fungsi trigonometri, $y = f(x)$ *untuk* $0 \le x \le \pi$.

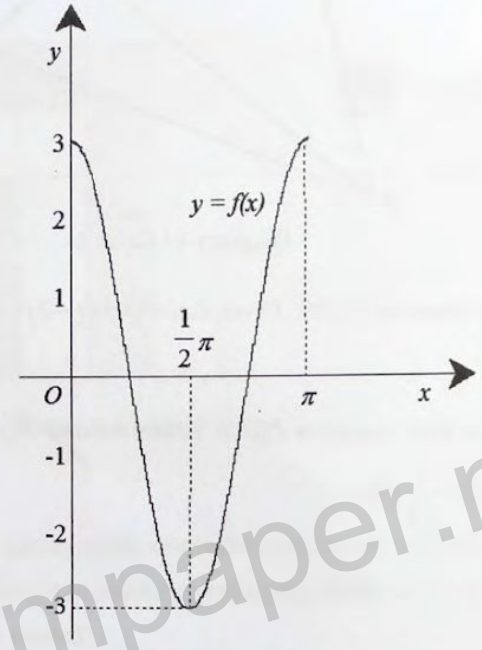


Diagram 6 / *Rajah 6*

(*a*) Write the equation of the graph of trigonometric function $y = f(x)$. [3 *marks*]

(*b*) Sketch the graph of $y = |f(x)+1|$ for $0 \le x \le \pi$. [2 *marks*]

(*c*) Hence, using the graph in (*b*), sketch a suitable straight line to find the number of solutions to the equation $\frac{\pi}{x}\left[\,|f(x)+1|-2\,\right] = 1$ for $0 \le x \le \pi$.

State the number of solutions. [3 *marks*]

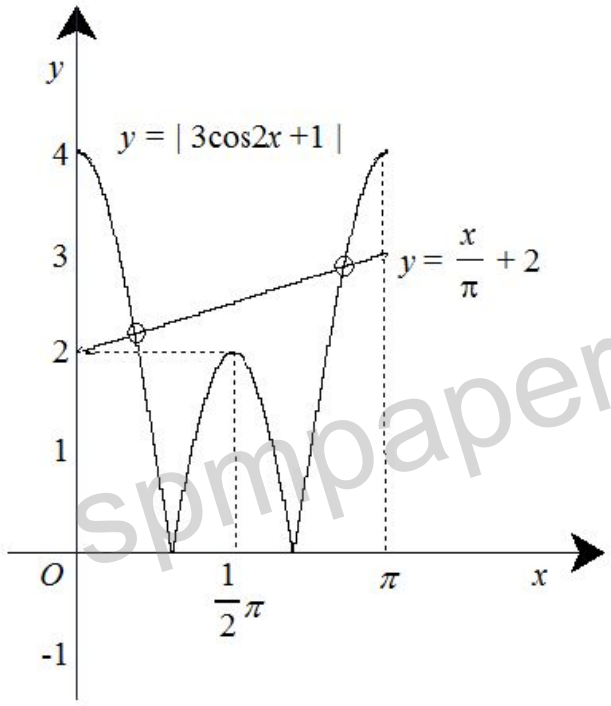
(*a*) *Tuliskan persamaan bagi graf fungsi trigonometri* $y = f(x)$. [3 *markah*]

(*b*) *Lakar graf* $y = |f(x)+1|$ *untuk* $0 \le x \le \pi$. [2 *markah*]

(*c*) *Seterusnya, dengan menggunakan graf di* (*b*), *lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan* $\frac{\pi}{x}\left[\,|f(x)+1|-2\,\right] = .1$ *untuk* $0 \le x \le \pi$.

Nyatakan bilangan penyelesaian itu. [3 *markah*]

Kedah 2018 P2(A) Q6 Answer

NO.	SOLUTION	MARKS
6		
(a)	$y = 3\cos 2x$	P1 graph cosine curve P1 amplitude 3 P1 2 cycle 0 to 2π
(b)		P1 shifted graph $y = f(x)+1$ P1 $y = \lvert f(x)+1 \rvert$ K1 line $y = \frac{x}{\pi} + 2$
(c)	$\lvert f(x)+1 \rvert - 2 = \frac{x}{\pi}$ $y = \frac{x}{\pi} + 2$ Number of solutions = 2	N1 equation $y = \frac{x}{\pi} + 2$ N1
		8

MRSM 2018 P2(A) Q2

2 (*a*) Prove that $\cot x(\cos 2x - 1) = -\sin 2x$. [2 *marks*]

Buktikan bahawa kot $x(\text{kos } 2x - 1) = -\sin 2x$. [2 *markah*]

(*b*) (i) Sketch the graph of $y = -\sin 2x$ for $0 \le x \le 2\pi$.

Lakar graf bagi $y = -\sin 2x$ *untuk* $0 \le x \le 2\pi$.

(ii) Hence, using the same axes, sketch a suitable straight line to find the number of solutions for the equation $\frac{x}{\pi} - \cot x \cos 2x + \cot x = 1$, for $0 \le x \le 2\pi$.

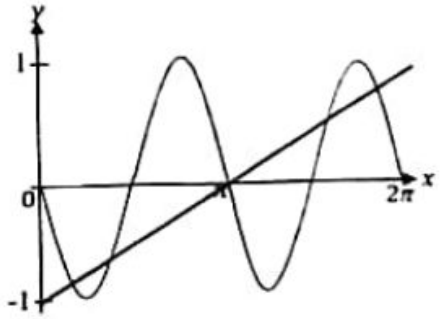
State the number of solutions.

Seterusnya, dengan menggunakan paksi yang sama, lakar satu garis lurus yang sesuai untuk mencari bilangan penyelesaian bagi persamaan $\frac{x}{\pi} - \text{kot } x \text{ kos } 2x + \text{kot } x = 1$ *untuk* $0 \le x \le 2\pi$.

Nyatakan bilangan penyelesaian itu. [6 *marks*]

[6 *markah*]

MRSM 2018 P2(A) Q2

No	Solution	Scheme	Sub marks	Marks
2				
(a)	$\text{LHS} = \frac{\cos x}{\sin x}(1 - 2\sin^2 x - 1)$ $= \cos x(-2\sin x)$ $= -\sin 2x$ $= \text{RHS}$	K1 Use $\cos 2x = 1 - 2\sin^2 x$ or $\cos 2x = 2\cos^2 x - 1$ or $\cot x = \frac{\cos x}{\sin x}$ N1 $-\sin 2x$	2	
(b)		P1 Shape of sine graph P1 2 cycles and amplitude = 1 P1 Reflection on the x-axis Note : 1. Do not accept tangent graph 2. Ignore graph outside the range	3	8
(c)	$y = \frac{x}{\pi} - 1$ Number of solution = 5	N1 K1 Sketch straight line with gradient or y-intercept correct N1 5	3	

Chapter 6: Permutation & Combination

Chapter 7: Probability

Kedah 2018 P2(B) Q7

7 (*a*) In a school, 40% of the students are wearing glasses.

(i) If 10 students are chosen at random, find the probability that more than 8 of them wearing glasses.

(ii) If the standard deviation of the distribution is 12, find the number of students in the school.

[4 *marks*]

(*b*) In an archery training centre, there are 120 trainers having a test. The scores for the test follow a normal distribution with a mean of 55 and a variance of 25. The trainers who obtain more than k scores will enter competition.

(i) A trainer is chosen at random. Find his z-scores if he obtains 72 scores for the test.

(ii) If 18·5% of the trainers are chosen to enter competition, calculate the value of k.

[6 *marks*]

(*a*) *Di sebuah sekolah* , 40% *daripada pelajar memakai cermin mata.*

(i) *Jika* 10 *orang pelajar dipilih secara rawak, cari kebarangkalian bahawa lebih daripada* 8 *orang pelajar memakai cermin mata.*

(ii) *Jika sisihan piawai bagi taburan tersebut ialah* 12, *cari bilangan pelajar dalam sekolah itu.*

[4 *markah*]

(*b*) *Di sebuah pusat latihan memanah, terdapat* 120 *pelatih yang akan mengambil ujian. Skor bagi ujian tersebut adalah mengikut taburan normal dengan min* 55 *dan varians* 25. *Pelatih yang mendapat lebih daripada skor k akan dipilih untuk menyertai pertandingan.*

(i) *Seorang pelatih dipilih secara rawak. Cari skor-z dia jika dia memperolehi* 72 *skor bagi ujian tersebut.*

(ii) *Jika* 18·5% *daripada pelatih dipilih untuk menyertai pertandingan, hitungkan nilai k.*

[6 *markah*]

Kedah 2018 P2(B) Q7 Answer

N0.	SOLUTION	MARKS
7		
(a)		
(i)	$p = 0\cdot4 \qquad q = 0\cdot6$	P1
	$P(X>8)$	
	$= P(X=9) + P(X=10)$	
	$= {}^{10}C_9(0\cdot4)^9(0\cdot6)^1 + {}^{10}C_{10}(0\cdot4)^{10}(0\cdot6)^0$	K1 use ${}^nC_r p^r q^{n-r}$
	$= 0\cdot001573 + 0\cdot0001049$	
	$= 0\cdot001678$	N1
(ii)		
	$\sqrt{n(0.4)(0.6)} = 12$	K1
	$n = 600$	N1
(b)		
(i)	$Z = \dfrac{72-55}{5}$	K1
	$= 3\cdot4$	N1
(ii)		
	$P(X>k) = 0.185$	K1 use score-z $Z = \dfrac{X-\mu}{\sigma}$
	$P\left(z > \dfrac{k-55}{5}\right) = 0\cdot185$	
	$\dfrac{k-55}{5} = 0\cdot896$	K1
	$k = 59\cdot48$	N1
		10

MRSM 2018 P2(A) Q6

6 Table 6 shows the frequency distribution of the mass of students in a school.
Jadual 6 menunjukkan taburan kekerapan bagi jisim pelajar dalam sebuah sekolah.

Mass (kg) *Jisim (kg)*	Number of students *Bilangan pelajar*
45 - 49	8
50 - 54	10
55 - 59	6
60 - 64	2
65 - 69	3
70 - 74	1

Table 6
Jadual 6

(*a*) Calculate
Hitung
(i) mean,
min,
(ii) standard deviation,
sisihan piawai,
of the mass of the students. [4 *marks*]
bagi jisim pelajar. [4 *markah*]

(*b*) Due to the malfunction of the weighing scale used, it is found that the mass recorded is 2·5 kg more than the actual mass.
Disebabkan kerosakan pada penimbang berat badan yang digunakan, didapati bahawa jisim yang dicatatkan adalah 2·5 kg *lebih daripada jisim sebenar.*

Find the actual
Cari nilai sebenar
(i) mean,
min,
(ii) standard deviation.
sisihan piawai.
of the mass of the students. [2 *marks*]
bagi jisim pelajar. [2 *markah*]

MRSM 2018 P2(A) Q6 Answer

No	Solution	Scheme	Sub marks
6 (a)	(i) $\bar{x} = \frac{8(47) + 10(52) + 6(57) + 2(62) + 3(67) + 72}{30}$ $= \frac{1635}{30}$ $= 54.5$	K1 Use $\frac{\Sigma f x}{\Sigma f}$ N1 54.5	2
	(ii) $\sigma = \sqrt{\frac{90545}{30} - \left(\frac{1635}{30}\right)^2}$ $= 6.922$	K1 Find $\Sigma f x^2$ and use formula for sd or var N1 6.922	2
(b)	(i) $\bar{x} = 52$ (ii) $\sigma = 6.922$	N1 Follow his a(i) N1 Follow his a(ii)	2

Chapter 8: Probability Distribution

MRSM 2018 P2(B) Q7

Section B
Bahagian B

[40 *marks*]
[40 *markah*]

Answer any **four** questions from this section.
Jawab mana-mana ***empat*** *soalan daripada bahagian ini.*

7 (*a*) In a school, 250 students sat for an examination. The marks obtained is normally distributed with a mean, μ and a standard deviation of 5.
Dalam sebuah sekolah, 250 pelajar menduduki suatu peperiksaan. Markah yang diperoleh adalah bertaburan secara normal dengan min, μ *dan sisihan piawai* 5.
Find
Cari

(i) the value of μ if the probability of a student chosen at random get marks less than 58 is 0·3085,
nilai μ *jika kebarangkalian seorang pelajar yang dipilih secara rawak mendapat markah kurang daripada* 58 *ialah* 0·3085,

(ii) the number of students who achieved marks more than 65.
bilangan pelajar yang mencapai markah lebih daripada 65.

[6 *marks*]
[6 *markah*]

(*b*) The probability of a consumer shops online is p. A sample of 6 consumers are chosen at random from a particular area.
Kebarangkalian bahawa seorang pengguna membeli-belah atas talian ialah p. *Suatu sampel* 6 *orang pengguna dipilih secara rawak daripada suatu kawasan.*
Calculate
Hitung

(i) the value of p if the probability that none of the consumers shop online is $\frac{1}{729}$,
nilai p *jika kebarangkalian tiada pengguna tersebut membeli-belah atas talian ialah* $\frac{1}{729}$,

(ii) the probability that less than 2 consumers shop online.
kebarangkalian bahawa terdapat kurang daripada 2 *pengguna membeli-belah atas talian.*

[4 *marks*]
[4 *markah*]

MRSM 2018 P2(B) Q7 Answer

No	Solution	Scheme	Sub marks	Marks
7 (a)	i) $P\left(z < \frac{58-\mu}{5}\right) = -0.5$	K1 Use of $Z = \frac{X-\mu}{\sigma}$		
	$\frac{58-\mu}{5} = -0.5$	K1 Equate $\frac{58-\mu}{5} = -0.5$	3	
	$\mu = 60.5$	N1 60.5		
	ii) $P\left(z > \frac{65-*60.5}{5}\right)$			
	$= 0.1841$	N1 0.1841		
	$\frac{n(A)}{250} = 0.1841$	K1 Use $\frac{n(A)}{250} = 0.1841$	3	10
	$n(A) = 46 // 47$	N1 46//47		
(b)	i) ${}^6C_0(p)^0(q)^6 = \frac{1}{729}$	K1 Use ${}^6C_r p^r q^{6-r}$	2	
	$p = \frac{2}{3}$	N1 $p = \frac{2}{3}$		
	ii) $P(X < 2) = P(X = 0) + P(X = 1)$	K1 Use ${}^6C_r p^r q^{6-r}$ and $p + q = 1$		
	$= \frac{1}{729} + {}^6C_1\left(\frac{2}{3}\right)^1\left(\frac{1}{3}\right)^5$		2	
	$= \frac{13}{729} = 0.01783$	N1 $\frac{13}{729}$		

Chapter 9: Motion Along a Straight Line

Kedah 2018 P2(C) Q12

12 A particle moves in a straight line and passes through a fixed point O. The velocity of the particle, v ms^{-1}, is given by $v = -t^2 + 2t + 8$ where t is the time, in s, after leaving O. [Assume motion to the right is positive.]

Find

(a) the initial velocity, in ms^{-1}, of the particle, [1 *mark*]

(b) the range of t during which the particle moves to the right, [3 *marks*]

(c) sketch the velocity-time graph of the motion of the particle for $0 \le t \le 5$, [2 *marks*]

(d) the total distance, in m, travelled by the particle in the first 5 seconds. [4 *marks*]

Suatu zarah bergerak di sepanjang suatu garis lurus melalui satu titik tetap O. Halaju zarah itu, v ms^{-1}, *diberi oleh* $v = -t^2 + 2t + 8$, *dengan keadaan t ialah masa, dalam* s, *selepas melalui O.*
[*Anggapkan gerakan ke arah kanan sebagai positif*]

Cari

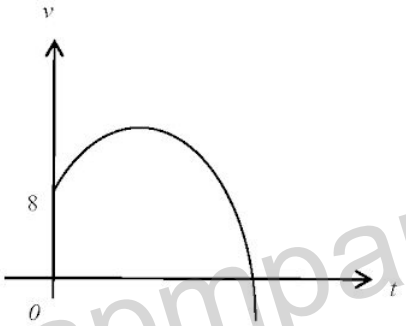
(a) *halaju awal, dalam* ms^{-1}, *bagi zarah itu,* [1 *markah*]

(b) *julat bagi t semasa zarah itu bergerak ke arah kanan,* [3 *markah*]

(c) *lakarkan graf halaju-masa gerakan zarah itu untuk* $0 \le t \le 5$, [2 *markah*]

(d) *jumlah jarak yang dilalui, dalam* m, *oleh zarah itu dalam 5 saat yang pertama.* [4 *markah*]

Kedah 2018 P2(C) Q12 Answer

N0.	SOLUTION	MARKS
12		
(a)	$8ms^{-1}$	N1
(b)	$-t^2+2t+8>0$	K1
	$(t+2)(t-4)<0$	K1
	$0<t<4$	N1
(c)		K1 N1
(d)	$S=-\frac{t^3}{3}+t^2+8t$	K1
	$t=4, S=-\frac{(4)^3}{3}+(4)^2+8(4)$ $t=5, S=-\frac{(5)^3}{3}+(5)^2+8(5)$	K1
	Distance= $26\frac{2}{3}+(26\frac{2}{3}-23\frac{1}{3})$ $=30$	K1 N1
		10

MRSM 2018 P2(C) Q12

Section C
Bahagian C

[20 *marks*]
[20 *markah*]

Answer any **two** questions from this section.
Jawab mana-mana **dua** *soalan daripada bahagian ini.*

12 A particle moves along a straight line and passes through a fixed point, O with a uniform acceleration $-4\ \text{ms}^{-2}$. The initial velocity of the particle is $5\ \text{ms}^{-1}$ and its displacement after 1 second is 10 m.

Suatu zarah bergerak di sepanjang suatu garis lurus dan melalui titik tetap, O dengan pecutan seragam $-4\ \text{ms}^{-2}$. *Halaju awal zarah itu ialah* $5\ \text{ms}^{-1}$ *dan sesarannya selepas* 1 *saat ialah* 10 m.

[Assume motion to the right is positive]
[*Anggapkan gerakan ke arah kanan sebagai positif*]

(*a*) Find
Cari

(i) the velocity function, $v(t)$,
fungsi halaju, $v(t)$,

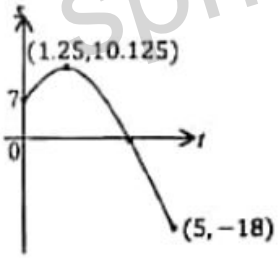
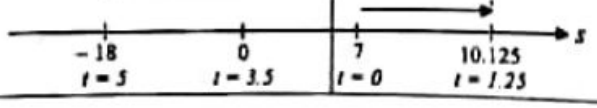
(ii) the displacement function, $s(t)$,
fungsi sesaran, $s(t)$,

such that t is the time in seconds. [4 *marks*]
dengan keadaan t ialah masa dalam saat. [4 *markah*]

(*b*) Calculate the maximum displacement of the particle. [2 *marks*]
Hitung sesaran maksimum zarah itu. [2 *markah*]

(*c*) Sketch a displacement-time graph for $0 \le t \le 5$. Hence, or otherwise, find the total distance travelled, in m, by the particle in the first 5 seconds. [4 *marks*]
Lakar graf sesaran-masa untuk $0 \le t \le 5$. *Seterusnya, atau dengan cara lain, cari jumlah jarak, dalam* m, *yang dilalui oleh zarah itu dalam 5 saat pertama.*
[4 *markah*]

MRSM 2018 P2(C) Q12 Answer

No	Solution	Scheme	Sub marks	Marks
12	(i) & (ii)	Find $v = \int -4\,dt$ or $s = \int v\,dt$ K1		
(a)	$v = \int -4\,dt = -4t + c$			
	$5 = -4(0) + c$			
	$v = -4t + 5$	N1 $v = -4t + 5$	4	
	$s = \int (-4t + 5)\,dt$	Use $t = 1$, $s = 10$ to find c of s K1		
	$= -2t^2 + 5t + c$			
	$-2(1)^2 + 5(1) + c = 10$			
	$c = 7$			
	$s = -2t^2 + 5t + 7$	N1 $s = -2t^2 + 5t + 7$		
(b)	$v = -4t + 5 = 0$	K1 Use $v = 0$ to find t and substitute into s	2	
	$t = 1.25$			
	$s = -2(1.25)^2 + 5(1.25) + 7$			
	$s = 10.125 \frac{81}{8} \frac{1}{8}$	N1 $10.125 \frac{81}{8} \frac{1}{8}$		
(c)		P1 maximum shape graph	2	
		P1 label all *3 points		
	$(10.125 - 7) + 10.125 + 18$ * graph	K1 use info from max quadratic graph		
	31.25	N1 31.25		
	OR Total Distance Travelled $= \int_0^{*1.25} (-4t + 5)\,dt + \int_3^{*1.25} (-4t + 5)\,dt$	K1 use $\int_0^{*1.25} v\,dt + \int_3^{*1.25} v\,dt$ or equivalent.	2	
	31.25	N1 31.25		
	OR Motion diagram 			

Chapter 10: Linear Programming

Kedah 2018 P2(C) Q14

14 Use the graph paper provided to answer this question.
Gunakan kertas graf yang disediakan untuk menjawab soalan ini.

A bakery shop produces x cake A and y cake B per week. Cake A takes 1 hour to complete while cake B takes 2 hours. The production of the cakes is based on the following constraints:

I : The total number of cake A and cake B produced is not more than 80.
II : The number of cake B produced is at most four times the number of cake A.
III : The total time used for making the cakes per week is not less than 60 hours.

(*a*) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all of the above constraints.
[3 *marks*]

(*b*) Using a scale of 2 cm to 10 cakes on both axes, construct and shade the region R which satisfies all of the above constraints.
[3 *marks*]

(*c*) Using the graph constructed in 14 (*b*), if the total sales obtained in a week is RM3550 and the selling price of one unit of cake A and one unit of cake B are RM35 and RM 50 respectively. Find the maximum number of cake A can be sold.
[4 *marks*]

Sebuah kedai membuat x kek A dan y kek B dalam seminggu. Kek A memerlukan 1 jam *untuk disiapkan manakala kek B memerlukan* 2 jam. *Penghasilan kek-kek itu adalah berdasarkan kepada kekangan berikut:*

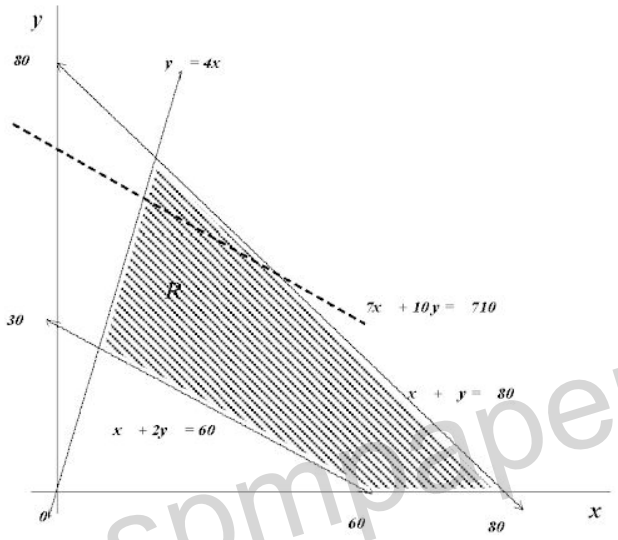
I : *Jumlah bilangan kek A dan kek B yang dihasilkan tidak melebihi* 80.
II : *Bilangan kek B yang dihasilkan adalah selebih-lebihnya* 4 *kali bilangan kek A.*
III : *Jumlah masa yang digunakan untuk membuat kek-kek dalam seminggu adalah tidak kurang daripada* 60 *jam.*

(*a*) *Tulis tiga ketaksamaan, selain daripada* $x \geq 0$ *dan* $y \geq 0$ *yang memenuhi semua kekangan di atas.*
[3 *markah*]

(*b*) *Menggunakan skala* 2 cm *kepada* 10 *kek pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.*
[3 *markah*]

(*c*) *Menggunakan graf yang dibina di* 14(*b*), *jika jumlah jualan yang diperolehi dalam seminggu ialah* RM 3550 *dan harga jualan sebiji kek A dan sebiji kek B ialah* RM 35 *dan* RM 50 *masing-masing. Cari bilangan maksimum kek A yang boleh dijual.*
[4 *markah*]

Kedah 2018 P2(C) Q14 Answer

N0.	SOLUTION	MARKS
14		
(a)	$x + y \leq 80$	N1
	$y \leq 4x$	N1
	$x + 2y \geq 60$	N1
(b)		
	• At least one straight line is drawn correctly from inequalities involving x and y.	N1
	• All the three straight lines are drawn correctly	N1
	• Region is correctly shaded	N1
(c)	$35x + 50y = 3550$ *or* $7x + 10y = 710$	K1
	Draw a straight line in the graph.	K1
	X=30	K1
	Maximum .number of cake A = 30	N1
		10

MRSM 2018 P2(C) Q13

13 Use the graph paper provided on page **25** to answer this question. Detach the graph paper and tie together with your answer booklet.

Gunakan kertas graf yang disediakan pada halaman **25** *untuk menjawab soalan ini. Ceraikan kertas graf itu dan ikat bersama-sama buku jawapan anda.*

A laundry shop wants to buy x units of type P and y units of type S washing machine. Table 13 shows the types of washing machine and its number of laundry per day.

Sebuah kedai dobi ingin membeli x unit *mesin basuh jenis* P *dan* y unit *mesin basuh jenis* S. *Jadual* 13 *menunjukkan jenis mesin basuh dan bilangan cucian setiap hari.*

Types of washing machine *Jenis mesin basuh*	Number of laundry per day *Bilangan cucian setiap hari*
P	24
S	32

Table 13
Jadual 13

The laundry services are based on the following constraints:
Perkhidmatan cucian ini berdasarkan kepada kekangan berikut:

I : The total number of washing machines to be bought is at least 10 units.
Jumlah mesin basuh yang akan dibeli ialah sekurang-kurangnya 10 unit.

II : The ratio of the number of type P washing machines to the number of type S washing machines is at most 3 : 2.
Nisbah bilangan mesin basuh jenis P *kepada bilangan mesin basuh jenis* S *ialah selebih-lebihnya* 3 : 2.

III : The maximum number of laundry per day is 480.
Bilangan maksimum cucian sehari ialah 480.

(*a*) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. [3 *marks*]

Tulis tiga ketaksamaan, selain daripada $x \geq 0$ *dan* $y \geq 0$, *yang memenuhi semua kekangan di atas.* [3 *markah*]

(*b*) Using a scale of 2 cm to 2 washing machines on both axes, construct and shade the region *R* which satisfies all the above constraints. [3 *marks*]

Menggunakan skala 2 cm *kepada* 2 *buah mesin basuh pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.* [3 *markah*]

(*c*) Using the graph constructed in **13**(*b*), find

Menggunakan graf yang dibina di **13**(*b*), *cari*

(i) the range of the number of type *P* washing machines if 7 units of type *S* washing machines are bought,

julat bilangan mesin basuh jenis P jika 7 *buah mesin basuh jenis S dibeli,*

(ii) the minimum maintenance cost that has to be paid if the maintenance cost for a type *P* washing machines is RM360 and the maintenance cost of a type *S* washing machines is RM540.

kos penyelenggaraan minimum yang perlu dibayar jika kos penyelenggaran sebuah mesin basuh jenis P ialah RM360 *dan kos penyelenggaraan sebuah mesin basuh jenis S ialah* RM540.

[4 *marks*]

[4 *markah*]

MRSM 2018 P2(C) Q13 Answer

No	Solution	Scheme	Sub marks	Marks
13 (a)	$x + y \geq 10$	N1		
	$\frac{x}{y} \leq \frac{3}{2}$ or equivalent	N1	3	
	$24x + 32y \leq 480$ or equivalent	N1		
(b)	Refer graph	K1 Draw correctly at least one straight line from the *inequalities involves x and y N1 Draw correctly all the three *straight lines N1 Region shaded correctly	3	
(c)	(i) $3 \leq x \leq 10$	N1		10
	(ii) Minimum point $(6, 4)$	N1 $(6,4)$	2	
	$k = 360(6) + 540(4)$	K1 Substitute any point in *shaded region into $360x + 540y$		
	$= 4320$	N1 4320	2	

Note : SS-1 only once if
in (a)(i) the symbol '=' is not used at all
(ii) more than 3 inequalities given
OR
in (b)(i) does not use given scale
(ii) axes interchanged
(iii) not using graph paper