



SPM PAPER 2

- 1** Solve the simultaneous equations
Selesaikan persamaan serentak

$$\begin{aligned}x - 4y + 7 &= 0 \\x^2 + xy - 27 &= 0\end{aligned}$$

[5 marks]
[5 markah]

- 2** Diagram 1 shows a triangle ABC with an area of 138.5 unit². Given B(10, -3) and C(-9, 9). The equation of the straight line AC is $19x + 7y + 108 = 0$. The point D lies on the x-axis and divides the straight line AC in the ratio $p : q$.

Rajah 1 menunjukkan segi tiga ABC dengan luas 138.5 unit². Diberi B(10, -3) dan C(-9, 9). Persamaan garis lurus AC ialah $19x + 7y + 108 = 0$. Titik D terletak pada paksi-x dan membahagikan garis lurus AC dalam nisbah $p : q$.

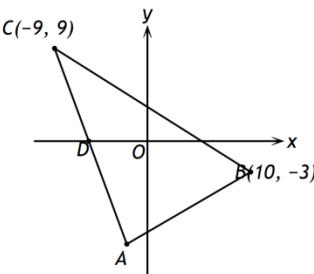


Diagram 1
Rajah 1

Find
Carikan

- (a) the coordinates of the point A,
koordinat titik A,

[8 marks]
[8 markah]

- (b) $p : q$

[2 marks]
[2 markah]

- 3** (a) Sketch the graph of $y = |5 \sin 2x|$ for $0 \leq x \leq 2\pi$.
Lakarkan graf bagi $y = |5 \sin 2x|$ bagi $0 \leq x \leq 2\pi$.

[4 marks]
[4 markah]

- (b) Hence, using the same axes, draw a suitable straight line to find the number of solutions to the equation $4 - |5 \sin 2x| = -\frac{x}{2\pi}$ for $0 \leq x \leq 2\pi$.

State the number of solutions.

Seterusnya, dengan menggunakan paksi yang sama, lukiskan satu garis lurus yang sesuai



untuk mencari bilangan penyelesaian bagi persamaan $4 - |5 \sin 2x| = -\frac{x}{2\pi}$ bagi $0 \leq x \leq 2\pi$.
Nyatakan bilangan penyelesaian itu.

[3 marks]
[3 markah]

-
- 4 A curve with a gradient function $\frac{dy}{dx} = 68x + \frac{68}{x^2}$ has a turning point of $(p, 54)$.

Suatu lengkung dengan fungsi kecerungan $\frac{dy}{dx} = 68x + \frac{68}{x^2}$ mempunyai titik pusingan di $(p, 54)$.

- (a) Find the value of p .

Cari nilai p .

[3 marks]
[3 markah]

- (b) Determine whether the turning point is a maximum or a minimum point.

Tentukan sama ada titik pusingan ini adalah titik maksimum atau titik minimum.

[2 marks]
[2 markah]

- (c) Find the equation of the curve.

Cari persamaan lengkung itu.

[3 marks]
[3 markah]

-
- 5 Table 1 shows the scores distribution of a group of player in a game.

Jadual 1 menunjukkan taburan skor bagi sekumpulan pemain dalam suatu pertandingan.

Scores Skor	Frequency Kekerapan
2	5
3	9
4	33
5	25
6	2

Table 1
Jadual 1

Determine the variance and standard deviation of the data.

Tentukan varians dan sisihan piawai data itu.

[6 marks]
[6 markah]

-
- 6 Diagram 2 shows the side elevation of part of stairs built of wood blocks.

Rajah 2 menunjukkan sisi sebahagian tangga yang dibina daripada blok-blok kayu.

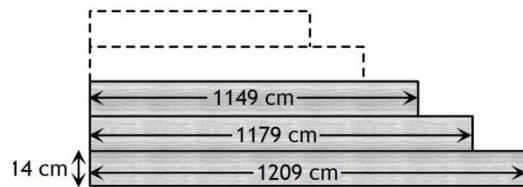


Diagram 2
Rajah 2

The length of the first block is 1209 cm. The length of each subsequent block is 30 cm less than the preceding blocks. The height of each block is 14 cm.

Panjang blok yang pertama ialah 1209 cm. Panjang setiap blok yang berturutan ialah 30 cm kurang daripada blok yang sebelumnya. Tinggi setiap blok itu ialah 14 cm.

- (a) If the height of the stairs is 3.08 m, calculate

Jika tinggi tangga yang dibina itu ialah 3.08 m, hitung

- the length of the topmost block.
panjang blok yang paling atas.
- the total length of the blocks.
jumlah panjang blok-blok itu.

[5 marks]
[5 markah]

- (b) Calculate the maximum height of the stairs.

Hitung tinggi maksimum tangga itu.

[3 marks]
[3 markah]

- 7 Use graph paper to answer this question.

Gunakan kertas graf untuk menjawab soalan ini.

Table 2 shows the values of two variables, x and y , obtained from an experiment. The

variables x and y are related by the equation $y = 8px^2 + \frac{p}{q}x$, where p and q are constants.

Jadual 2 menunjukkan nilai-nilai bagi dua pemboleh ubah, x dan y , yang diperoleh daripada satu eksperimen. Pemboleh ubah x dan y dihubungkan oleh persamaan $y = 8px^2 + \frac{p}{q}x$, dengan keadaan p dan q ialah pemalar.

x	3	4	5	6	7	8
y	12.2	17.2	22.3	28.4	34.6	40.8

Table 2
Jadual 2

- (a) Plot $\frac{y}{x}$ against x , by using a scale of 2 cm to 1 units on the x -axis and 2 cm to 0.5 units on the $\frac{y}{x}$ axis. Hence, draw the line of best fit.

Plotkan $\frac{y}{x}$ melawan x , dengan menggunakan skala 2 cm kepada 1 unit pada paksi-x dan 2cm



kepada 0.5 unit pada paksi- $\frac{y}{x}$. Seterusnya, lukiskan garis lurus penyuaian terbaik.

[4 marks]
[4 markah]

- (b) Use your graph in (a) to find the value of
Gunakan graf anda di (a) untuk mencari nilai
- (i) p
 - (ii) q
 - (iii) y when $x = 6$
y apabila x = 6

[6 marks]
[6 markah]

- 8 Diagram 3 shows a triangle ABC . The point D lies on AC and the point E lies on AB . The straight line BD intersects the straight line CE at the point F .

Rajah 3 menunjukkan segi tiga ABC. Titik D terletak pada AC dan titik E terletak pada AB. Garis lurus BD bersilang dengan garis lurus CE pada titik F.

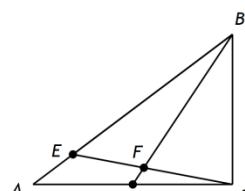


Diagram 3
Rajah 3

It is given that $\angle ACB = 90^\circ$, $\overrightarrow{AC} = 8\hat{x}$, $\overrightarrow{CB} = 6\hat{y}$, $\overrightarrow{AC} : \overrightarrow{DC} = 2 : 1$ and $\overrightarrow{AB} : \overrightarrow{AE} = 5 : 1$.

Diberi bahawa $\angle ACB = 90^\circ$, $\overrightarrow{AC} = 8\hat{x}$, $\overrightarrow{CB} = 6\hat{y}$, $\overrightarrow{AC} : \overrightarrow{DC} = 2 : 1$ dan $\overrightarrow{AB} : \overrightarrow{AE} = 5 : 1$.

- (a) Express in terms of \hat{x} and \hat{y} .

Ungkapkan dalam sebutan \hat{x} dan \hat{y} .

- (i) \overrightarrow{BD}
- (ii) \overrightarrow{CE}

[3 marks]
[3 markah]

- (b) Using $\vec{CF} = h\vec{CE}$ and $\vec{BF} = k\vec{BD}$, where h and k are constants, find the value of h and k .

Dengan menggunakan $\vec{CF} = h\vec{CE}$ dan $\vec{BF} = k\vec{BD}$, dengan keadaan h dan k ialah pemalar, cari nilai h dan k .

[5 marks]
[5 markah]

- (c) Given that $|\underline{x}| = 3$ units and $|\underline{y}| = 2$ units, find $|\vec{AB}|$.

Diberi $|\underline{x}| = 3$ unit dan $|\underline{y}| = 2$ unit, cari $|\vec{AB}|$.

[2 marks]
[2 markah]

- 9 Diagram 4 shows a semicircle $JEMGK$ with centre H and a rhombus $EFGH$.
Rajah 4 menunjukkan semi bulatan $JEMGK$ yang berpusat H dan rombos $EFGH$.

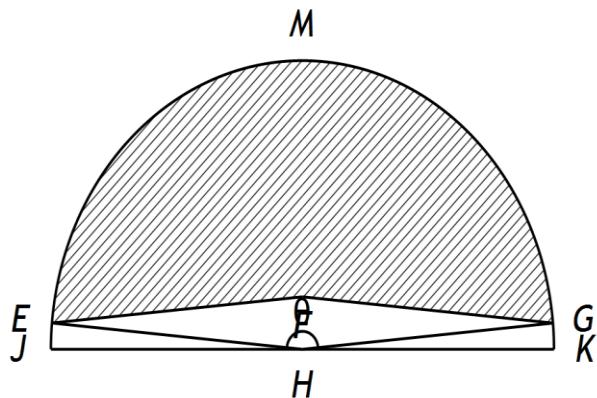


Diagram 4
Rajah 4

Given $F(10, 3)$, $H(10, 1)$ and $K(21, 1)$, calculate
Diberi $F(10, 3)$, $H(10, 1)$ and $K(21, 1)$, kirakan

- (a) radius of the semicircle $JEMGK$,
jejari semi bulatan $JEMGK$,

[1 mark]
[1 markah]

- (b) angle θ in radians,
sudut θ dalam radian,

[2 marks]
[2 markah]

- (c) area of sector $HEMG$,
luas sektor $HEMG$,

[3 marks]
[3 markah]

- (d) area of the shaded region.

luas rantau berlorek.

[4 marks]
[4 markah]

- 10 Diagram 5 shows the curve $y = (x - 3)^3 + 30$.

Rajah 5 menunjukkan lengkung $y = (x - 3)^3 + 30$.

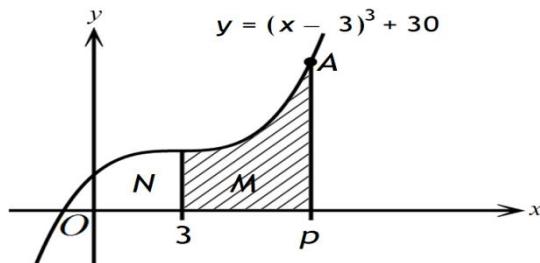


Diagram 5
Rajah 5

The curve intersects the straight line $x = p$ at point A. At point A, $\frac{dy}{dx} = 48$.

Lengkung itu bersilang dengan garis lurus $x = p$ di titik A. Di titik A, $\frac{dy}{dx} = 48$.

- (a) Find the value of p .

Cari nilai p .

[3 marks]
[3 markah]

- (b) Hence, calculate the area of shaded region M.

Seterusnya, hitung luas rantau berlorek M.

[3 marks]
[3 markah]

- (c) the volume generated, in terms of π , when the region N which is bounded by the curve, the x-axis and the y-axis, is revolved through 360° about the x-axis.

isi padu janaan, dalam sebutan π , apabila rantau berlorek N yang dibatasi oleh lengkung itu, paksi-x dan paksi-y, dikisarkan melalui 360° pada paksi-x.

[4 marks]
[4 markah]

- 11 (a) It is found that 40% of the chickens in a farm have white feathers. If 10 chickens from the farm are chosen at random, calculate the probability that

Didapati bahawa 40% ayam di sebuah ladang mempunyai bulu putih. Jika 10 ekor ayam dari ladang itu dipilih secara rawak, hitungkan kebarangkalian bahawa

- (i) exactly 3 of the chickens have white feathers.

tepat 3 ekor ayam mempunyai bulu putih.



(ii) less than 4 of the chickens have white feathers.

kurang daripada 4 ekor ayam mempunyai bulu putih.

[5 marks]
[5 markah]

(b) The masses of students in a school follow a normal distribution with a mean of 51 kg and a standard deviation of 14 kg.

Jisim murid di sebuah sekolah mengikut taburan normal dengan min 51 kg dan sisihan piawai 14 kg.

Find

Carikan

(i) the probability that a student chosen randomly from the school has a mass of not more than 68.1 kg.

kebarangkalian seorang murid yang dipilih secara rawak dari sekolah mempunyai jisim yang tidak melebihi 68.1 kg.

(ii) the value of m if 80% of the students from the school have a mass of more than m kg.

nilai m jika 80% daripada murid-murid sekolah itu mempunyai jisim melebihi m kg.

[5 marks]
[5 markah]

- 12 A particle moving along a straight line with velocity, v m s⁻¹, given by $v = pt^2 + qt$ where p and q are constants. t is the time in seconds after passing through a fixed point O . Given that the velocity of the particle is -324 m s⁻¹ when $t = 6$ and the distance travelled in the 6th second is $275\frac{2}{3}$ m.

Sebutir zarah yang bergerak dalam garis lurus dengan halaju, v m s⁻¹, diberi oleh $v = pt^2 + qt$, di mana p dan q adalah pemalar. t ialah masa dalam saat selepas melepassi titik tetap O .

Diberi halaju zarah itu ialah -324 m s⁻¹ apabila $t = 6$ dan jarak yang dilalui pada saat ke-6 ialah $275\frac{2}{3}$ m.

Find

Carikan

(a) the values of p and q ,

nilai-nilai p dan q ,

[7 marks]
[7 markah]

(b) the total distance travelled in the first 3 seconds.

jumlah jarak yang dilalui oleh 3 saat.

[3 marks]
[3 markah]

- 13 Table 3 shows the prices and the price indices for the year 1994 based on the year 1993 of four components, P , Q , R and S , used to make a type of toy. Diagram 6 shows a pie chart which represents the relative quantity of the components used.

Jadual 3 menunjukkan harga dan indeks harga pada tahun 1994 berdasarkan tahun 1993 bagi empat komponen, P , Q , R dan S , yang digunakan untuk membina sejenis mainan. Rajah 6 menunjukkan carta pai yang mewakili kuantiti relatif bagi komponen-komponen yang digunakan.

Component <i>Komponen</i>	Price per unit (RM) <i>Harga per unit (RM)</i>		Price index <i>Indeks harga</i>
	Year 1993 <i>Tahun 1993</i>	Year 1994 <i>Tahun 1994</i>	
P	3.90	3.90	100
Q	x	2.54	127
R	7.80	7.25	w
S	7.50	7.35	98

Table 3
Jadual 3

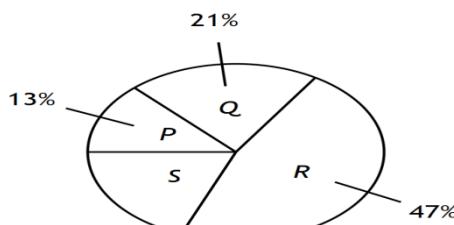


Diagram 6
Rajah 6

- (a) Find the values of
Carikan nilai-nilai

- (i) w
(ii) x

[4 marks]
[4 markah]

- (b) Calculate the composite price index for the production cost of the toy in the year 1994 based on the year 1993.

Kirakan indeks harga gubahan bagi kos pengeluaran bagi mainan pada tahun 1994 berdasarkan tahun 1993.

[2 marks]
[2 markah]

- (c) The composite price index for the production cost of the toy increases by 48% from the year 1994 to the year 1995. Calculate

Indeks harga gubahan bagi kos pengeluaran mainan itu bertambah sebanyak 48% dari tahun 1994 ke tahun 1995. Kirakan



- (i) the composite price index for the production cost of the toy in the year 1995 based on the year 1993,
indeks harga gubahan bagi kos pengeluaran mainan itu pada tahun 1995 berdasarkan tahun 1993,
- (ii) the price of a box of the toy in the year 1995 if its price in the year 1993 is RM19.30.
harga sekotak mainan itu pada tahun 1995 jika harganya pada tahun 1993 ialah RM19.30.

[4 marks]
[4 markah]

- 14 Use graph paper to answer this question.

Gunakan kertas graf untuk menjawab soalan ini.

A factory produces two toys, M and N. In a particular day, the factory produces x units of M and y units of N. The profit from the sales of a unit of toy M is RM25 and a unit of toy N is RM20. The production of the toys per day is based on the following constraints:

Sebuah kilang menghasilkan dua mainan, M dan N. Pada satu hari tertentu, kilang itu menghasilkan x unit M dan y unit N. Keuntungan daripada penjualan seunit mainan M ialah RM25 dan seunit mainan N ialah RM20. Penghasilan mainan-mainan itu dalam sehari adalah berdasarkan kekangan berikut:

- I The total number of toys produced is at most 350.
Jumlah mainan yang dihasilkan adalah selebih-lebihnya 350.
- II The number of toy M produced is not more than 4 times the number of toy N.
Bilangan mainan M yang dihasilkan tidak melebihi 4 kali bilangan mainan N.
- III The minimum total profit for both toys is RM7 000.
Jumlah keuntungan minimum bagi kedua-dua mainan adalah RM7 000.

- (a) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints.

Tulis tiga ketaksamaan, selain $x \geq 0$ and $y \geq 0$, yang memenuhi semua kekangan di atas.

[3 marks]
[3 markah]

- (b) Using a scale of 2 cm to 50 toys on both axes, construct and shade the region R which satisfies all the above constraints.

Dengan menggunakan skala 2 cm kepada 50 unit mainan pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.

[3 marks]
[3 markah]

- (c) Using the graph constructed in (b), find

Dengan menggunakan graf yang dibina di (b), cari

- (i) the minimum number of units of toy N if the number of units of component M produced on particular day is 50.
bilangan minimum mainan N jika bilangan mainan M yang dihasilkan pada satu hari tertentu adalah 50.
- (ii) the maximum total profit per day.
jumlah keuntungan maksimum dalam sehari.

[4 marks]
[4 markah]

- 15 Diagram 7 shows a quadrilateral $PQRS$ with $PR = 6.8\text{cm}$, $PS = 14.7\text{ cm}$, $RS = 10.5\text{ cm}$, $QR = 4.5\text{ cm}$, $\angle QPR = 40.5^\circ$ and $\angle PQR$ is an acute angle.

Rajah 7 menunjukkan sisi empat $PQRS$ dengan $PR = 6.8\text{cm}$, $PS = 14.7\text{ cm}$, $RS = 10.5\text{ cm}$, $QR = 4.5\text{ cm}$, $\angle QPR = 40.5^\circ$ dan $\angle PQR$ adalah sudut tirus.

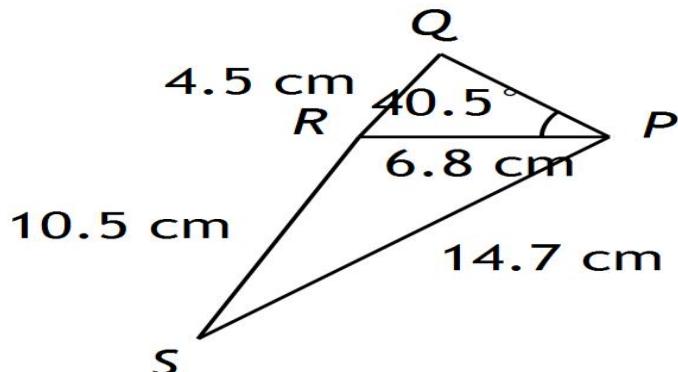


Diagram 7
Rajah 7

- (a) Calculate
Kirakan
 (i) $\angle PQR$
 (ii) $\angle PSR$
 (iii) the area of quadrilateral $PQRS$.
luas sisi empat PQRS.

[6 marks]
[6 markah]

- (b) A triangle $P'Q'R'$ with measurements of $P'R' = 6.8\text{ cm}$, $Q'R' = 4.5\text{ cm}$ and $\angle Q'P'R' = 40.5^\circ$ has a different shape if compared to triangle PQR .

Satu segitiga $P'Q'R'$ dengan ukuran $=P'R' = 6.8\text{ cm}$, $Q'R' = 4.5\text{ cm}$ dan $\angle Q'P'R' = 40.5^\circ$ mempunyai bentuk yang berbeza dengan segitiga PQR .



- (i) Sketch the triangle $P'Q'R'$.

Lakarkan segitiga $P'Q'R'$.

- (ii) Calculate $\angle P'Q'R'$.

Kirakan $\angle P'Q'R'$.

[4 marks]
[4 markah]



ANSWER FOR SPM PAPER 2

1 $x - 4y + 7 = 0 \quad \text{--- (1)}$
 $x^2 + xy - 27 = 0 \quad \text{--- (2)}$
From (1),
 $x = 4y - 7 \quad \text{--- (3)}$

Substitute (3) into (2),
 $(4y - 7)^2 + (4y - 7)y - 27 = 0$
 $16y^2 - 56y + 49 + 4y^2 - 7y - 27 = 0$
 $20y^2 - 63y + 22 = 0$
 $(4y - 11)(5y - 2) = 0$
 $\therefore y = \frac{11}{4} \text{ or } y = \frac{2}{5}$

When $y = \frac{11}{4}$,
 $x = 4\left(\frac{11}{4}\right) - 7$
 $= 4$

When $y = \frac{2}{5}$,
 $x = 4\left(\frac{2}{5}\right) - 7$
 $= -\frac{27}{5}$

$\therefore x = 4, y = 2\frac{3}{4} \text{ or } x = -5\frac{2}{5}, y = \frac{2}{5}$

2 (a) Area of ΔABC
 $= \frac{1}{2} \begin{vmatrix} x & 10 & -9 & x \\ y & -3 & 9 & y \end{vmatrix}$
 $= 138.5$
 $\frac{1}{2} |-3x + 90 - 9y - 10y - 27 - 9x| = 138.5$
 $-12x - 19y + 63 = 277$
 $-12x - 19y - 214 = 0$

$19x + 7y = -108 \quad \text{--- (1)}$
 $-12x - 19y = 214 \quad \text{--- (2)}$

From (1),
 $x = -\frac{7}{19}y - \frac{108}{19} \quad \text{--- (3)}$

Substitute (3) into (2),



$$-12\left(-\frac{7}{19}y - \frac{108}{19}\right) - 19y = 214$$

$$\frac{84}{19}y + \frac{1296}{19} - 19y = 214$$

$$-\frac{277}{19}y = \frac{2770}{19}$$

$$y = -10$$

Substitute $y = -10$ into (1),

$$19x + 7(-10) = -108$$

$$19x = -38$$

$$x = -2$$

$$\text{Hence } A = (-2, -10)$$

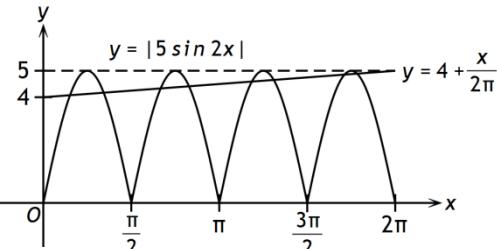
$$(b) \frac{q(-10) + p(9)}{p + q} = 0$$

$$-10q + 9p = 0$$

$$\frac{p}{q} = \frac{10}{9}$$

$$\therefore p : q = 10 : 9$$

3 (a)



$$(b) 4 - |5 \sin 2x| = -\frac{x}{2\pi}$$

$$|5 \sin 2x| = 4 + \frac{x}{2\pi}$$

$$y = 4 + \frac{x}{2\pi}$$

$$\text{When } x = 0, y = 4$$

$$\text{When } x = 2\pi, y = 5$$

Number of solutions = 8

$$4 (a) \frac{dy}{dx} = 68x + \frac{68}{x^2}$$

$$\text{At turning point } (p, 54), \frac{dy}{dx} = 0$$

$$68p + \frac{68}{p^2} = 0$$

$$68p^3 + 68 = 0$$

$$p = -1$$



$$(b) \frac{d^2y}{dx^2} = 68 - \frac{136}{x^3}$$

When $x = -1$,

$$\frac{d^2y}{dx^2} = 68 - \frac{136}{(-1)^3}$$

$$= 204 > 0$$

Therefore $(-1, 54)$ is a minimum point.

$$(c) y = \int (68x + \frac{68}{x^2}) dx$$

$$= 34x^2 - \frac{68}{x} + c$$

When $x = -1$, $y = 54$,

$$54 = 34(-1)^2 - \frac{68}{-1} + c$$

$$c = -48$$

Equation:

$$y = 34x^2 - \frac{68}{x} - 48$$

5

x	f	fx	$f(x - \bar{x})^2$
2	5	10	22.898
3	9	27	11.6964
4	33	132	0.6468
5	25	125	18.49
6	2	12	6.9192
$\sum f = 74$		$\sum fx = 306$	$\sum f(x - \bar{x})^2 = 60.6504$

$$\text{Mean, } \bar{x} = \frac{306}{74}$$

$$= 4.14$$

$$\text{Variance, } \sigma^2 = \frac{60.6504}{74}$$

$$= 0.82$$

$$\text{Standard deviation, } \sigma = \sqrt{0.82}$$

$$= 0.91$$

6 (a) (i) $a = 1209$, $d = -30$

$$n = \frac{308}{14}$$

$$= 22$$

$$T_{22} = 1209 + 21(-30)$$

$$= 579 \text{ cm}$$

$$(ii) S_{22} = \frac{22}{2} (1209 + 579)$$

$$= 19668 \text{ cm}$$

(b) $T_n > 0$

$$1209 + (n - 1)(-30) > 0$$

$$1209 - 30n + 30 > 0$$

$$30n < 1239$$

$$n < 41.3$$

$$n = 41$$

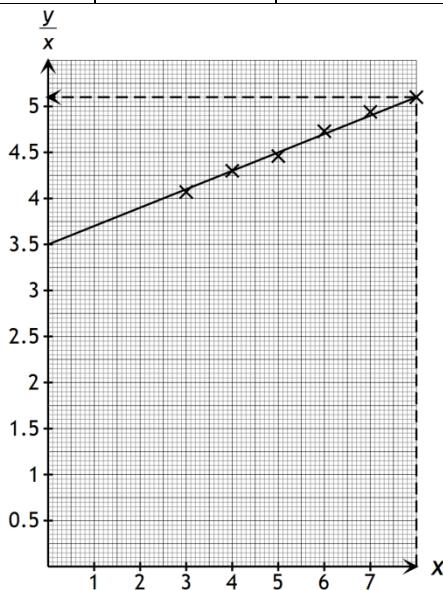
Maximum height

$$= 41 \times 14$$

$$= 574 \text{ cm}$$

7 (a)

x	3	4	5	6	7	8
$\frac{y}{x}$	4.07	4.3	4.46	4.73	4.94	5.1



(b) $y = 8px^2 + \frac{p}{q}x$

$$\frac{y}{x} = 8px + \frac{p}{q}$$

(i) $8p = \text{Gradient of the graph}$

$$= 0.2$$

$$p = 0.025$$

(ii) $\frac{p}{q} = Y\text{-intercept}$

$$\frac{0.025}{q} = 3.5$$

$$q = 0.007143$$

(iii) $x = 8$

$$\frac{y}{x} = 5.1$$

$$y = 40.8$$

8 (a) (i) $\vec{BD} = \vec{CD} - \vec{CB}$

$$= \frac{1}{2} \vec{CA} - \vec{CB}$$



$$= \frac{1}{2} (-8\underline{x}) - 6\underline{y}$$

$$= -4\underline{x} - 6\underline{y}$$

$$\begin{aligned}\text{(ii)} \quad \overrightarrow{CE} &= \overrightarrow{CB} + \overrightarrow{BE} \\ &= \overrightarrow{CB} + \frac{4}{5} \overrightarrow{BA} \\ &= \overrightarrow{CB} + \frac{4}{5} (\overrightarrow{CA} - \overrightarrow{CB}) \\ &= 6\underline{y} + \frac{4}{5} (-8\underline{x} - 6\underline{y}) \\ &= -\frac{32}{5} \underline{x} + \frac{6}{5} \underline{y}\end{aligned}$$

$$\begin{aligned}\text{(b)} \quad \overrightarrow{CF} &= h \overrightarrow{CE} \\ \overrightarrow{BF} &= k \overrightarrow{BD} \\ \overrightarrow{BF} &= \overrightarrow{CF} - \overrightarrow{CB} \\ k \overrightarrow{BD} &= h \overrightarrow{CE} - \overrightarrow{CB} \\ k(-4\underline{x} - 6\underline{y}) &= h(-\frac{32}{5} \underline{x} + \frac{6}{5} \underline{y}) - 6\underline{y} \\ -4k\underline{x} - 6k\underline{y} &= -\frac{32}{5} h\underline{x} + (\frac{6}{5} h - 6)\underline{y} \\ -4k &= -\frac{32}{5} h \\ k &= \frac{8}{5} h \quad \text{--- (1)} \\ -6k &= \frac{6}{5} h - 6 \quad \text{--- (2)}\end{aligned}$$

Substitute (1) into (2),

$$-6(\frac{8}{5} h) = \frac{6}{5} h - 6$$

$$-\frac{54}{5} h = -6$$

$$h = \frac{5}{9}$$

$$k = \frac{8}{5} h$$

$$= \frac{8}{5} (\frac{5}{9})$$

$$= \frac{8}{9}$$

$$\begin{aligned}\text{(c)} \quad |\overrightarrow{AB}|^2 &= |\overrightarrow{AC}|^2 + |\overrightarrow{CB}|^2 \\ &= (8|\underline{x}|)^2 + (6|\underline{y}|)^2 \\ &= [8(3)]^2 + [6(2)]^2 \\ &= 720\end{aligned}$$

$$|\overrightarrow{AB}| = 26.83 \text{ unit}$$



9 (a) $HK = 21 - 10$

$= 11 \text{ cm}$

(b) $\cos \frac{\theta}{2} = \frac{1}{11}$

$\frac{\theta}{2} = 84.78^\circ$

$\theta = 169.56^\circ$

$= 2.9598 \text{ rad.}$

(c) Area of sector $HEMG$

$$= \frac{1}{2} \times 11^2 \times 2.9598$$

$$= 179.068 \text{ cm}^2$$

(d) Area of rhombus $HEFG$

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

$$= 2 \times \frac{1}{2} \times 11 \times 11 \times \sin 2.9598$$

$$= 21.876 \text{ cm}^2$$

Area of shaded region

$$= 179.068 - 21.876$$

$$= 157.192 \text{ cm}^2$$

10 (a) $y = (x - 3)^3 + 30$

$$y = x^3 - 9x^2 + 27x + 3$$

$$\frac{dy}{dx} = 3x^2 - 18x + 27$$

$$3x^2 - 18x + 27 = 48$$

$$x = 7$$

$$p = 7$$

(b) Area of the shaded region M

$$= \int_3^7 (x^3 - 9x^2 + 27x + 3) dx$$

$$= \left[\frac{1}{4}x^4 - 3x^3 + \frac{27}{2}x^2 + 3x \right]_3^7$$

$$= \frac{1015}{4} - \frac{279}{4}$$

$$= 184 \text{ unit}^2$$

(c) $y = (x - 3)^3 + 30$

$$y^2 = (x - 3)^6 + 60(x - 3)^3 + 900$$

Volume generated

$$= \pi \int_0^3 y^2 dx$$

$$= \pi \int_0^3 ((x - 3)^6 + 60(x - 3)^3 + 900) dx$$

$$= \pi \left[\frac{(x - 3)^7}{7} + \frac{60(x - 3)^4}{4} + 900x \right]_0^3$$



$$= \pi [2700 - (-312\frac{3}{7} + 1215)]$$

$$= 1797\frac{3}{7}\pi \text{ unit}^3$$

11 (a) (i) $n = 10, p = 0.4, q = 0.6$
 $P(X = 3) = {}^{10}C_3(0.4)^3(0.6)^7$

$$= 0.215$$

(ii) $P(X < 4)$

$$\begin{aligned} &= P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3) \\ &= {}^{10}C_0(0.4)^0(0.6)^{10} + {}^{10}C_1(0.4)^1(0.6)^9 + {}^{10}C_2(0.4)^2(0.6)^8 + {}^{10}C_3(0.4)^3(0.6)^7 \\ &= 0.006047 + 0.04031 + 0.1209 + 0.215 \\ &= 0.3823 \end{aligned}$$

(b) (i) $\mu = 51, \sigma = 14$

$$P(X \leq 68.1) = P(Z \leq \frac{68.1 - 51}{14})$$

$$= P(Z \leq 1.221)$$

$$= 1 - P(Z \geq 1.221)$$

$$= 1 - 0.111$$

$$= 0.889$$

(ii) $P(X > m) = 0.8$

$$\begin{aligned} P(X < m) &= 1 - 0.8 \\ &= 0.2 \end{aligned}$$

$$P(Z > 0.842) = 0.2$$

$$\frac{m - 51}{14} = -0.842$$

$$m = 39.21$$

12 (a) $v = pt^2 + qt$

$$\text{When } t = 6, v = -324$$

$$p(6)^2 + q(6) = -324$$

$$6p + q = -54 \quad (1)$$

$$\begin{aligned} s &= \int v dt \\ &= \int (pt^2 + qt) dt \\ &= \frac{pt^3}{3} + \frac{qt^2}{2} + c, \end{aligned}$$

where c is a constant.

$$\text{When } t = 0, s = 0, \text{ thus } c = 0$$

$$\text{Therefore, } s = \frac{pt^3}{3} + \frac{qt^2}{2}$$

$$[\text{Displacement at } t = 6] - [\text{Displacement at } t = 5] = 275\frac{2}{3}$$

$$72p + 18q - (\frac{125}{3}p + \frac{25}{2}q) = \frac{827}{3}$$

$$\frac{91}{3}p + \frac{11}{2}q = \frac{827}{3}$$



$$182p + 33q = 1654 \quad \text{--- (2)}$$

$$6p + q = -54 \quad \text{--- (1)}$$

$$182p + 33q = 1654 \quad \text{--- (2)}$$

From (1),

$$p = -\frac{1}{6}q - 9 \quad \text{--- (3)}$$

Substitute (3) into (2),

$$182\left(-\frac{1}{6}q - 9\right) + 33q = 1654$$

$$-\frac{91}{3}q - 1638 + 33q = 1654$$

$$\frac{8}{3}q = 3292$$

$$q = \frac{2469}{2}$$

Substitute $q = \frac{2469}{2}$ into (1),

$$6p + \left(\frac{2469}{2}\right) = -54$$

$$6p = -\frac{2577}{2}$$

$$p = -\frac{859}{4}$$

(b) $v = 0$

$$-8t^2 - 6t = 0$$

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

$$t = -\frac{3}{4} \text{ or } t = 0$$

The particle did not change its direction.

When $t = 3$,

$$s = -\frac{8}{3}t^3 - 3t^2$$

$$= -\frac{8}{3}(3)^3 - 3(3)^2$$

$$= -72 - 27$$

$$= -99$$

\therefore Distance travelled = 99 m

13 (a) (i) Price index $I = \frac{P_{1994}}{P_{1993}} \times 100$

$$w = \frac{7.25}{7.8} \times 100$$

$$= 93$$

$$(ii) 127 = \frac{2.54}{x} \times 100$$

$$x = 2.00$$

$$(b) T = \frac{13 \times 100 + 21 \times 127 + 47 \times 93 + 19 \times 98}{13 + 21 + 47 + 19}$$

$$= \frac{10200}{100}$$

$$= 102$$

$$(c) (i) I_{1995} = \frac{148}{100} \times 102$$

$$= 150.96$$

$$(ii) P_{1995} = \frac{150.96}{100} \times 19.3$$

$$= \text{RM}29.14$$

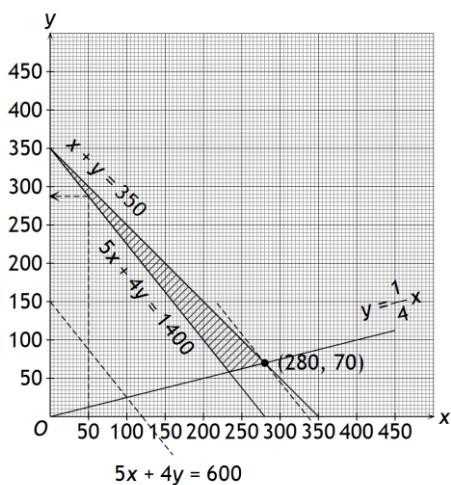
14 (a) I: $x + y \leq 350$

II: $y \geq \frac{1}{4}x$

III: $25x + 20y \geq 7000$

$5x + 4y \geq 1400$

(b)



(c) (i) Based on the graph, when $x = 50$, the minimum value of $y = 288$.
The minimum number of units of toy N produced is 288.

(ii) $25x + 20y = k$

When $x = 0$ and $y = 150$, $k = 3000$

$5x + 4y = 600$

Based on the graph, the maximum total profit are obtained at point (280, 70).

Maximum total profit

$$= 25(280) + 20(70)$$

$$= \text{RM}8\ 400$$

15 (a) (i) $\frac{6.8}{\sin \angle PQR} = \frac{4.5}{\sin 40.5^\circ}$



$$\sin \angle PQR = \frac{6.8 \times \sin 40.5^\circ}{4.5}$$

$$= 0.9814$$

$$\angle PQR = 78.93^\circ$$

$$(ii) 6.8^2 = 14.7^2 + 10.5^2 - 2 \times 14.7 \times 10.5 \times \cos \angle PSR$$

$$\cos \angle PSR = \frac{6.8^2 - 14.7^2 - 10.5^2}{-2 \times 14.7 \times 10.5}$$

$$= 0.9074$$

$$\angle PSR = 24.86^\circ$$

$$(iii) \angle PRQ = 180^\circ - 40.5^\circ - 78.93^\circ$$

$$= 60.57^\circ$$

Area of ΔPQR

$$= \frac{1}{2} \times 6.8 \times 4.5 \times \sin 60.57^\circ$$

$$= 13.33 \text{ cm}^2$$

Area of ΔPRS

$$= \frac{1}{2} \times 14.7 \times 10.5 \times \sin 24.86^\circ$$

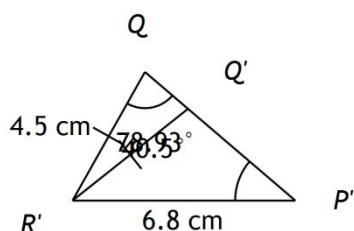
$$= 32.44 \text{ cm}^2$$

Area of quadrilateral $PP'Q'R'$

$$= 13.33 + 32.44$$

$$= 45.77 \text{ cm}^2$$

(b) (i)



$$(ii) \angle P'Q'R' = 180^\circ - 78.93^\circ$$

$$= 101.07^\circ$$