

Penyelesaian Lengkap

Kertas Model SPM

Kertas 1

1 A

$$4 + 3 \div \frac{1}{2} - 6.8$$

$$= 4 + 6 - 6.8$$

$$= 3.2$$

2 B

3 D

$$\frac{5^2 \times 5^3}{5^{-5}}$$

$$= 5^{2+3-(-5)}$$

$$= 5^{10}$$

4 D

5 D

6 D

$$2211_3$$

$$= 2(3^3) + 2(3^2) + 1(3^1) + 1(3^0)$$

$$= 76$$

$$76 \times 3 = 228$$

Keuntungan/Profit

$$= 228 - 76$$

$$= 152$$

6	152	Baki/Remainder
6	25	2
6	4	1
	0	4

$$\therefore \text{RM}412_6$$

7 B

$$0.2 \times \text{RM}412\,000 = \text{RM}82\,400$$

$$\text{RM}82\,400 - \text{RM}8\,000 = \text{RM}74\,400$$

$$\text{RM}74\,400 \div 24 = \text{RM}3\,100$$

8 C

$$p : q : r = 3 : 4 : 10$$

$$q + r = 42$$

14 bahagian/parts = 42

1 bahagian/part = $42 \div 14 = 3$

$$p = 3(3) = 9$$

$$q = 3(4) = 12$$

$$r = 3(10) = 30$$

Maka/Thus,

$$r - p - q = 30 - 9 - 12$$

$$= 9$$

$$= \frac{3q}{4} = 0.75q$$

9 D

Jumlah Pendapatan – Pengecualian cukai – Pelepasan cukai

$$= 7\,800 \times 12 - 9\,300 - 20\,340$$

$$= \text{RM}63\,960$$

10 B

$\angle ABE$ ialah 70° .

Maka/Thus,

$$\angle BAE = \angle BEA$$

$$= \frac{180^\circ - 70^\circ}{2}$$

$$= 55^\circ$$

$$x = 180^\circ - 55^\circ$$

$$= 125^\circ$$

$$y = 55^\circ$$

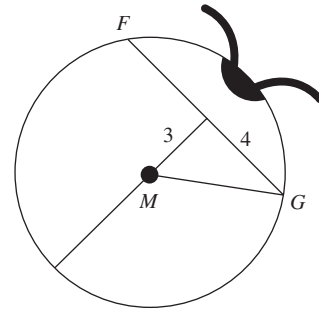
$$x - 2y$$

$$= 125^\circ - (2 \times 55^\circ)$$

$$= 125^\circ - 110^\circ$$

$$= 15^\circ$$

11 A



Panjang MG /Length of MG

$$= \sqrt{3^2 + 4^2}$$

$$= 5 \text{ cm}$$

Lilitan/Circumference

$$= 2 \times \frac{22}{7} \times 5$$

$$= \frac{220}{7} \text{ cm}$$

12 B

$$5380_9$$

$$= 5(9^3) + 3(9^2) + 8(9^1)$$

$$= 3\,960$$

Katakan harga telefon sebelum cukai jualan ialah x .

Let the price of phone before sales tax be x .

$$x + 0.1x = 3\,960$$

$$x = 3\,600$$

6	3 600	Baki/Remainder
6	600	0
6	100	0
6	16	4
6	2	4
	0	2

$$\therefore \text{RM}24400_6$$

13 A

$$\begin{aligned} kx + 5y &= 3 \\ kx &= -5y + 3 \\ mx + 10y &= 6 \\ \frac{m}{2}x &= -5y + 3 \\ kx &= \frac{m}{2}x \\ k &= \frac{m}{2} \end{aligned}$$

14 B

15 C

$$\begin{aligned} 4^r + 32 &= 2^{-2r} \\ 2^{2r} + 2^5 &= 2^{-2r} \\ 2^{2r-5} &= 2^{-2r} \\ 2r - 5 &= -2r \\ 4r &= 5 \\ r &= 1.25 \end{aligned}$$

16 C

17 C

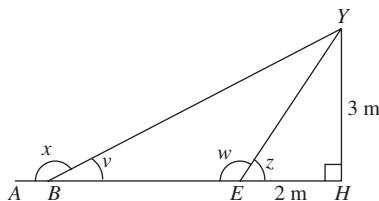
Katakan jumlah kos rawatan ialah x .
Let the total medical cost be x .
 $(x - 600) \times 0.8 = 32\,900$
 $x = 41\,725$

Kos rawatan yang ditanggung oleh Sam
Medical cost borne by Sam
 $= 600 + 0.2 \times (41\,725 - 600)$
 $= \text{RM}8\,825$

18 A

$$\begin{aligned} r &\propto \frac{1}{\sqrt{t}} \\ b &= \frac{k}{\sqrt{9}} \\ k &= 3b \\ 3 &= \frac{k}{\sqrt{4}} \\ k &= 6 \\ \therefore b &= 2 \end{aligned}$$

19 D

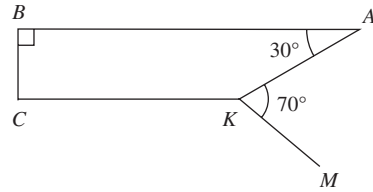


$$\begin{aligned} BE : EH &= 2 : 1 \\ BE &= 4 \text{ m} \\ \tan v &= \frac{3}{6} \\ v &= 26.57^\circ \\ x &= 180^\circ - 26.57^\circ \\ &= 153.43^\circ \\ \tan z &= \frac{3}{2} \\ z &= 56.31^\circ \end{aligned}$$

$$\begin{aligned} w &= 180^\circ - 56.31^\circ \\ &= 123.69^\circ \end{aligned}$$

$$\begin{aligned} x - w &= 153.43^\circ - 123.69^\circ \\ &= 29.74^\circ \end{aligned}$$

20 C



$$\begin{aligned} \angle AKC &= 360^\circ - 180^\circ - 30^\circ \\ &= 150^\circ \end{aligned}$$

$$\begin{aligned} \angle CKM &= 360^\circ - 150^\circ - 70^\circ \\ &= 140^\circ \end{aligned}$$

Katakan bilangan tepi poligon tersebut ialah x .
Let the number of sides of the polygon be x .

$$\frac{(x-2) \times 180^\circ}{x} = 140^\circ$$

$$\frac{x-2}{x} = \frac{7}{9}$$

$$9x - 18 = 7x$$

$$2x = 18$$

$$x = 9$$

21 A

$$y = 2x^2 - 8x + 15$$

Paksi simetri/Axis of symmetry:

$$x = -\frac{b}{2a}$$

$$x = -\frac{-8}{2(2)}$$

$$x = 2$$

$$y = 2(2^2) - 8(2) + 15$$

$$= 7$$

$$\therefore (2, 7)$$

22 A

$$(4x + 7y + 3z) \times 1.06 = 101.76$$

$$4x + 7y + 3z = 96$$

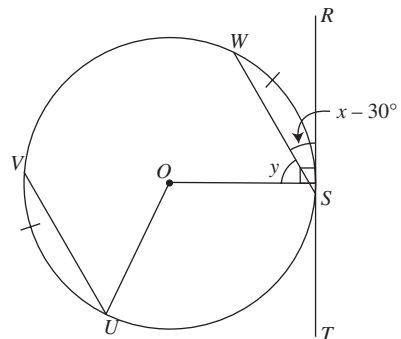
$$7y = 96 - 4x - 3z$$

$$y = \frac{96 - 4x - 3z}{7}$$

23 C

24 D

25 A



$$y = 90^\circ - (x - 30^\circ)$$

$$y = 120^\circ - x$$

26 C

$$r \binom{3}{2} - 4 \binom{4}{2} = \binom{5}{6}$$

$$\binom{3r}{2r} - \binom{16}{8} = \binom{5}{6}$$

$$3r - 16 = 5$$

$$r = 7$$

27 B

$$\frac{2}{4} \times \frac{1}{3} = \frac{1}{6}$$

28 C

Katakan koordinat pintasan- x ialah $(a, 0)$.

Let the coordinate of x -intercept is $(a, 0)$.

$(a, 0)$ $(3, -5)$

$$\text{Kecerunan/Gradient} = -\frac{5}{6}$$

$$\frac{-5}{3-a} = -\frac{5}{6}$$

$$a = -3$$

29 B

$$P = \begin{pmatrix} x-1 & -1 \\ y+z & \frac{x+y}{2} + 1 \end{pmatrix} \quad Q = \begin{pmatrix} 4 & -1 \\ 7 & -4z \end{pmatrix}$$

Secara perbandingan/As comparison,

$$x - 1 = 4$$

$$x = 5$$

$$y + z = 7 \dots \textcircled{1}$$

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

$$x + y + 2 = -8z$$

$$y + 7 = -8z$$

$$y + 8z = -7 \dots \textcircled{2}$$

$$\textcircled{2} - \textcircled{1}: 7z = -14$$

$$z = -2$$

Gantikan $z = -2$ ke dalam persamaan $\textcircled{1}$.

Substitute $z = -2$ into equation $\textcircled{1}$.

$$y = 7 + 2$$

$$= 9$$

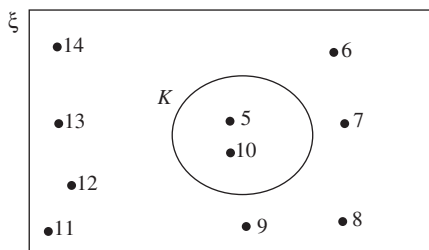
$$\therefore x = 5, y = 9, z = -2$$

30 A

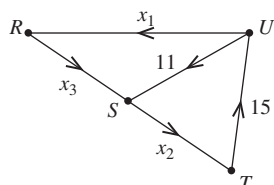
31 C

32 C

33 D



34 B



$$d_{in} = d_{out}$$

Bucu/Vertex U:

$$x_1 + 11 = 15$$

$$x_1 = 4$$

$$x_3 = 4 = x_1$$

Bucu/Vertex S:

$$x_1 + 11 = x_2$$

$$x_1 = x_2 - 11$$

35 D

$$\frac{5.44}{1.28 + 6.91 + 7.63 + 5.44} \times 2 \times \frac{22}{7} \times 4 = 6.4 \text{ cm}$$

36 C

Skor Score	6	7	8	9	10
Kekerapan Frequency	4	9	8	10	1
Kekerapan longgokan Cumulative frequency	4	13	21	31	32

$$\text{Median} = \frac{1}{2} \times 32$$

$$= \text{ke-}16/16^{\text{th}}$$

$$= 8$$

37 A

Bayaran pampasan = Jumlah insurans yang dibeli – Deduktibel

$$\begin{aligned} \text{Amount of compensation} &= \text{Amount of insurance} \\ &\quad \text{purchased} - \text{Deductible} \\ &= \text{RM}200\,000 - \text{RM}3\,000 \\ &= \text{RM}197\,000 \end{aligned}$$

38 B

$$\frac{36}{36 + 52} \times \frac{36}{36 + 52} = 0.1674$$

39 B

40 C

70% daripada jumlah kekerapan

70% of the total frequencies

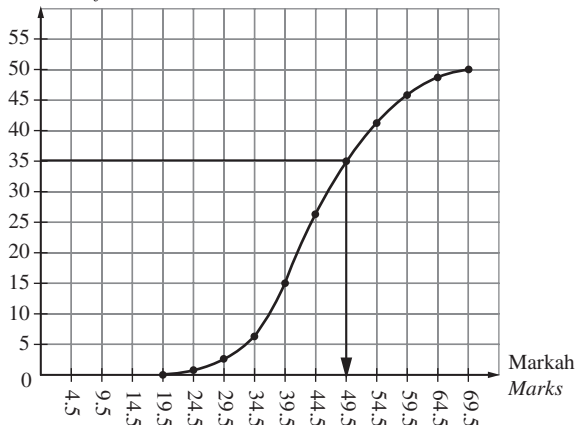
$$= 0.7 \times 50$$

$$= 35$$

Daripada ogif/From the ogive, $P_{70} = 49.5$

Bilangan murid

Number of students



Kertas 2

Bahagian/Section A

1 (a) $CD = 12 - 4$
 $= 8 \text{ unit/units}$
 $(12, 10)$

(b) $(0, 6) \quad (12, 10)$
 Jarak/Distance
 $= \sqrt{(12-0)^2 + (10-6)^2}$
 $= 12.65 \text{ unit/units}$

2 $\frac{x}{3} = \frac{2x+15}{x-6}$
 $x(x-6) = 3(2x+15)$
 $x^2 - 6x = 6x + 45$
 $x^2 - 12x - 45 = 0$
 $(x+3)(x-15) = 0$
 $x+3 = 0$ atau/ or $x-15 = 0$
 $x = -3$ atau/ or $x = 15$

- 3 (a) Sebilangan/Some
 (b) Antecedent: x ialah gandaan bagi 9.
 Antecedent: x is a multiple of 9.
 Akibat: x boleh dibahagi tepat dengan 3.
 Consequent: x is divisible by 3.
 (c) $6n^2 - n + 1$, di mana $n = 0, 1, 2, 3, \dots$
 $6n^2 - n + 1$, where $n = 0, 1, 2, 3, \dots$

- 4 Katakan x mewakili bilangan kemenangan dan y mewakili bilangan kekalahan.
 Let x represents the number of wins and y represents the number of losses.

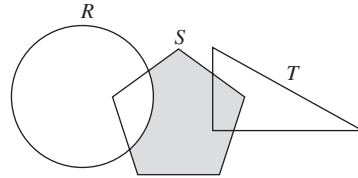
$$\begin{aligned} x + y &= 40 \\ 4x - 2y &= 100 \\ \begin{pmatrix} 1 & 1 \\ 4 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} &= \begin{pmatrix} 40 \\ 100 \end{pmatrix} \\ \begin{pmatrix} x \\ y \end{pmatrix} &= \frac{1}{1(-2) - 4(1)} \begin{pmatrix} -2 & -1 \\ -4 & 1 \end{pmatrix} \begin{pmatrix} 40 \\ 100 \end{pmatrix} \\ &= \frac{1}{-6} \begin{pmatrix} -180 \\ -60 \end{pmatrix} \\ &= \begin{pmatrix} 30 \\ 10 \end{pmatrix} \end{aligned}$$

Bilangan kemenangan/Number of wins: 30
 Bilangan kekalahan/Number of losses: 10

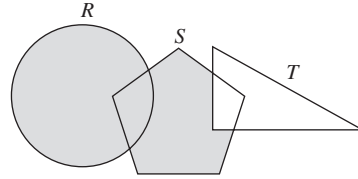
5 (a) $(-3, 10)$
 $y = -\frac{5}{2}x + c$
 $10 = -\frac{5}{2}(-3) + c$
 $c = \frac{5}{2}$
 $\therefore y = -\frac{5}{2}x + \frac{5}{2}$

(b) $y = -\frac{5}{2}x + \frac{5}{2}$
 Apabila/When $y = 0$,
 $\frac{5}{2}x = \frac{5}{2}$
 $x = 1$
 $\therefore M(1, 0)$

6 (a)



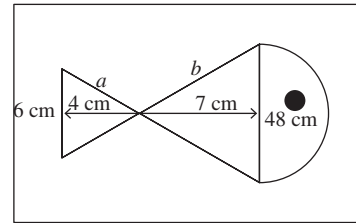
(b)



- 7 (a) Luas kedua-dua segi tiga/Area of both triangles = 180
 $(0.5 \times 6 \times 4) + (0.5 \times 7 \times y) = 180$
 $12 + \frac{7}{2}y = 180$
 $\frac{7}{2}y = 168$
 $y = 48$

$$\frac{180^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 24 = 75.43 \text{ cm}$$

(b)



$$a = \sqrt{3^2 + 4^2}$$

$$= 5 \text{ cm}$$

$$b = \sqrt{7^2 + 24^2}$$

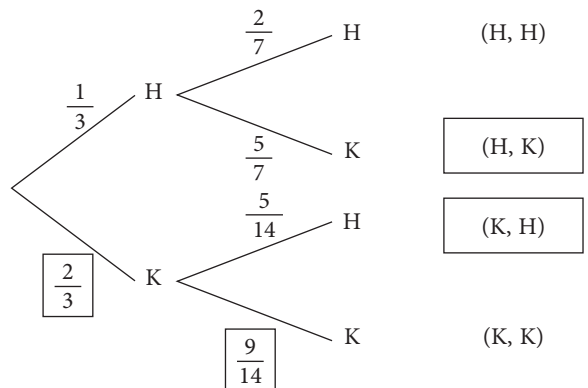
$$= 25 \text{ cm}$$

$$\text{Perimeter} = 5 + 25 + 75.43 + 25 + 5 + 6$$

$$= 141.43 \text{ cm}$$

8 (a)

Kad pertama First card	Kad kedua Second card	Kesudahan Outcome
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(b) 1 – Kebarangkalian mendapat dua kad kuning
 1 – Probability of getting two yellow cards

$$= 1 - \frac{2}{3} \times \frac{9}{14}$$

$$= \frac{4}{7}$$

9 (a) $d \propto \frac{e^2}{\sqrt[3]{f}}$

$$k = \frac{d^3 \sqrt[3]{f}}{e^2}$$

$$k = \frac{3^3 \sqrt[3]{216}}{2^2}$$

$$k = \frac{9}{2}$$

$$d = \frac{9e^2}{2^3 \sqrt[3]{f}}$$

(b) $2 = \frac{9\left(\frac{2}{3}\right)^2}{2^3 \sqrt[3]{f}}$

$$\sqrt[3]{f} = \frac{4}{4}$$

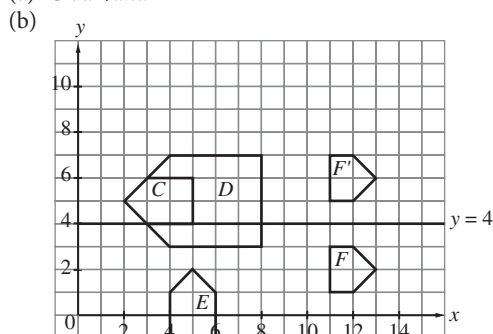
$$f = 1$$

10 (a) Julat antara kuartil/Interquartile range
 $= 12 - 6$
 $= 6$
 Julat antara kuartil yang baharu/New interquartile range
 $= 6 \times 4$
 $= 24$

(b) Median baharu/New median
 $= (8 \times 4) + 3$
 $= 35$

Bahagian/Section B

11 (a) C dan/and E



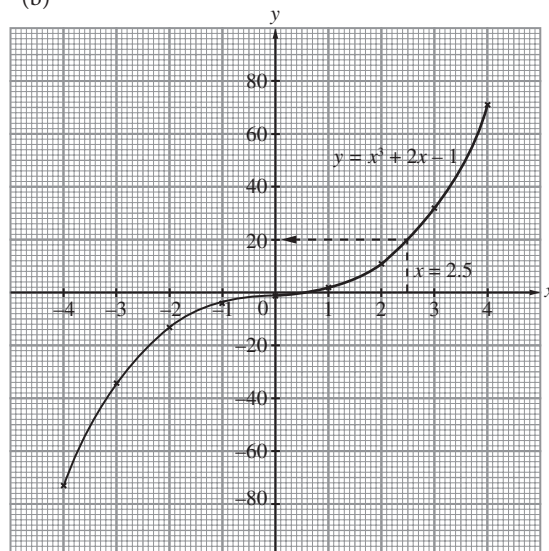
- (c) (i) Pembesaran dengan faktor skala $\frac{1}{2}$ pada pusat (2, 5).
 Enlargement with a scale factor of $\frac{1}{2}$ at centre (2, 5).
 (ii) Putaran 90° ikut arah jam pada pusat (2, 2).
 90° clockwise rotation at centre (2, 2).

12 (a) $y = x^3 + 2x - 1$
 Apabila/When $x = -3$,
 $y = (-3)^3 + 2(-3) - 1$
 $= -34$

Apabila/When $x = -1$,
 $y = (-1)^3 + 2(-1) - 1$
 $= -4$
 Apabila/When $x = 2$,
 $y = (2)^3 + 2(2) - 1$
 $= 11$

x	-4	-3	-2	-1	0	1	2	3	4
y	-73	-34	-13	-4	-1	2	11	32	71

(b)



(c) $y = 20$
 (d) $y = -x^3 - 2x + 1$

13 (a) $y = 4$
 (b) (0, 4), (3, 0)

$$y = \frac{4}{0-3}x + 4$$

$$BC: y = -\frac{4}{3}x + 4$$

Di/At (12, -4)

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

$$-4 = -\frac{4}{3}(12) + c$$

$$c = 12$$

$$DE: y = -\frac{4}{3}x + 12$$

(c) $y = -\frac{4}{3}x + 12$

Apabila/When $x = 3$,

$$y = -\frac{4}{3}(3) + 12$$

$$= 8$$

D(3, 8), E(12, -4)

Jarak/Distance

$$= \sqrt{(12-3)^2 + (-4-8)^2}$$

$$= 15 \text{ unit/units}^2$$

- 14 (a) (i) 3; 2 dan/and 4
 (ii) Alex:

$$\frac{1(1) + 3(4) + 4(2) + 5(3)}{1 + 4 + 2 + 3} = 3.6$$

Ben:

$$\frac{1(2) + 2(3) + 4(3) + 5(2)}{2 + 3 + 3 + 2} = 3$$

(b) Alex:

$$\sqrt{\frac{(1 \times 1^2) + (4 \times 3^2) + (2 \times 4^2) + (3 \times 5^2)}{1 + 4 + 2 + 3}} - 3.6^2$$

= 1.2

$$\text{Ben: } \sqrt{\frac{(2 \times 1^2) + (3 \times 2^2) + (3 \times 4^2) + (2 \times 5^2)}{2 + 3 + 3 + 2}} - 3^2$$

= 1.483

∴ Alex akan terpilih sebab nilai skornya lebih konsisten.

Alex will be chosen as his scores are more consistent.

- 15 (a) Pendapatan bercukai = Jumlah pendapatan tahunan – Pengecualian cukai – Pelepasan cukai
Chargeable income = Total annual income – Tax exemption – Tax relief
 Jumlah pendapatan tahunan tidak dikecualikan cukai
Total annual income not tax-exempt
 = RM69 600 – RM4 800
 = RM64 800
 Pendapatan bercukai/*Chargeable income*
 = RM64 800 – RM300 – RM17 850
 = RM46 650
- (b) Cukai pendapatan/*Income tax*
 = RM600 + $\left(\frac{8}{100} \times \text{RM}11\,650\right)$ – RM1 000
 = RM532
- (c) Jumlah PCB yang dibayar ialah/*Total PCB paid is*
 RM40 × 12 = 480.
 PCB yang dibayar adalah tidak mencukupi.
 Encik Rosli perlu membuat bayaran baki cukai pendapatan RM532 – RM480 = RM52 kepada Lembaga Hasil Dalam Negeri (LHDN).
PCB paid is not sufficient. Encik Rosli need to pay the balance income tax of RM532 – RM480 = RM52 to the Inland Revenue Board (IRB).
- (d) Seseorang individu yang mempunyai pendapatan bercukai kurang daripada RM35 000 boleh mendapat rebat cukai sebanyak RM400.
An individual who is having a chargeable income of less than RM35 000 is eligible for tax rebate of RM400.
- (e) Pelepasan cukai adalah pengurangan daripada jumlah pendapatan untuk memperoleh pendapatan bercukai anda.
 Rebate cukai ditolak daripada jumlah cukai sebenar yang dikenakan.
Tax relief is deduction from the total income to derive your chargeable income.
Tax rebate is deducted from the actual tax amount charged.

Bahagian/Section C

16 (a) (i) $3y + 5 + 3 + 6 + 2 + 4 + y + 6 + \frac{x}{2} = 49$

$$4y + 26 + \frac{x}{2} = 49$$

$$4y + \frac{x}{2} = 23 \dots \textcircled{1}$$

$$4 + y + 6 = 3y \dots \textcircled{2}$$

$$2y = 10$$

$$y = 5$$

Gantikan $y = 5$ ke dalam $\textcircled{1}$.

Substitute $y = 5$ into $\textcircled{1}$.

$$\frac{x}{2} = 23 - 4(5)$$

$$x = 6$$

$$\therefore x = 6, y = 5$$

(ii) $3 + 15 + 11 : 5 + 2 + 4 : 6$
 = 29 : 11 : 6

(b) $1 - \frac{3}{49} \times \frac{2}{48} = 0.9974$

(c) (i) $\sin \theta = -0.6947$

Sudut rujukan sepadan/*Corresponding reference angle*

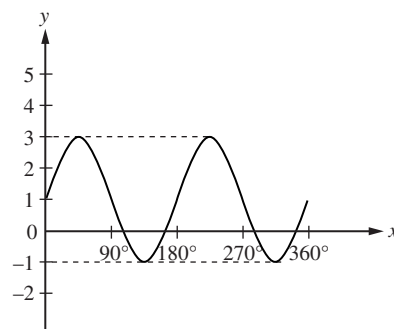
$$= \sin^{-1} 0.6947$$

$$= 44^\circ$$

$$\theta = 180^\circ + 44^\circ \text{ atau/or } 360^\circ - 44^\circ$$

$$= 224^\circ \text{ atau/or } 316^\circ$$

(ii)



(iii) a. 180°

b. 2

17 (a) • **Specific (Khusus)**

– Membeli sebuah pangsapuri bernilai RM420 000

Buy an apartment worth RM420 000

• **Measurable (Boleh diukur)**

– Menyediakan wang pendahuluan sebanyak RM42 000

Prepare a down payment of RM42 000

• **Attainable (Boleh dicapai)**

– Simpan $\frac{\text{RM}42\,000}{3 \times 12} = \text{RM}1\,166.67$ setiap bulan untuk mencapai matlamat tersebut

Save $\frac{\text{RM}42\,000}{3 \times 12} = \text{RM}1\,166.67$ every month to achieve the goal

- **Realistic (Realistik)**

– RM1 166.67 hanya $\frac{\text{RM1 } 166.67}{\text{RM7 } 000} \times 100\%$
 = 16.67% daripada jumlah pendapatannya
 RM1 166.67 is only $\frac{\text{RM1 } 166.67}{\text{RM7 } 000} \times 100\%$
 = 16.67% of her total income

- **Time bound (Tempoh masa)** – Dalam 3 tahun
 Within 3 years

(b) (i) $(0, 20), \left(\frac{30}{60}, v\right)$

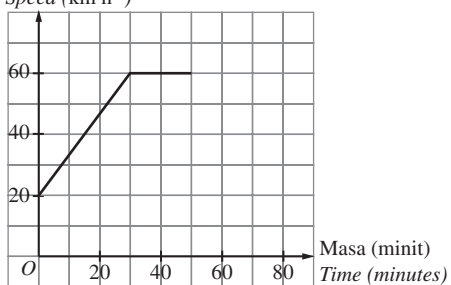
$$\frac{v - 20}{\frac{30}{60}} = 80$$

$$v - 20 = 40$$

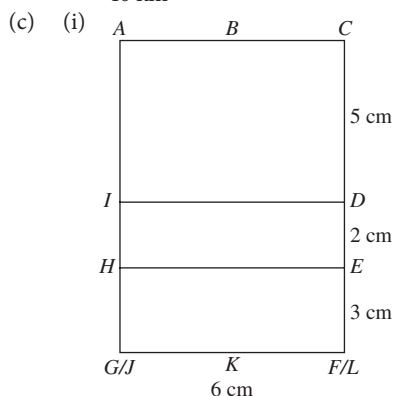
$$v = 60$$

Laju (km j^{-1})

Speed (km h^{-1})



(ii) $\left[0.5 \times (20 + 60) \times \frac{30}{60}\right] + \left(\frac{20}{60} \times 60\right)$
 = 40 km



(ii) $\frac{1}{2} \times 2 \times \frac{22}{7} \times 3 = 9.429 \text{ cm}$