Yakin

Jawapan

Yakin Classroom

MATEMATIK

BAB 1

SK 1.1

A

1 bertambah
increase

2 berkurang
decrease

3 bertambah dua kali ganda
be doubled

4 berkurang separuh
decrease by half

5 ubahan langsung
direct variation

B

1

$\frac{y}{x}$	$\frac{40}{10} = 4$	$\frac{80}{20} = 4$	$\frac{120}{30} = 4$	$\frac{160}{40} = 4$	$\frac{200}{50} = 4$

y berubah secara langsung dengan x kerana nilai $\frac{y}{x}$ ialah pemalar. Maka, $y \propto x$.

y varies directly as x because the value of $\frac{y}{x}$ is a constant. Hence, $y \propto x$.

2

$\frac{y}{x^2}$	$\frac{10}{10^2} = 0.1$	$\frac{40}{20^2} = 0.1$	$\frac{90}{30^2} = 0.1$	$\frac{160}{40^2} = 0.1$	$\frac{250}{50^2} = 0.1$

y berubah secara langsung dengan x^2 kerana nilai $\frac{y}{x^2}$ ialah pemalar. Maka, $y \propto x^2$.

y varies directly as x^2 because the value of $\frac{y}{x^2}$ is a constant. Hence, $y \propto x^2$.

C

1 (*a*) (i) $m \propto n^2$
(ii) $p \propto \sqrt[3]{r}$
(iii) $t \propto \sqrt{u}$
(*b*) (i) $m = kn^2$
(ii) $p = k\sqrt[3]{r}$
(iii) $s = k\sqrt{u}$

2 (*a*) (i) $V \propto j^3$
(ii) $s \propto x$
(*b*) (i) $V = kj^3$
(ii) $s = kx$

D

1 $y \propto x$

$y = kx$

$16 = k(4)$

$k = \frac{16}{4}$

$k = 4,\ \therefore y = 4x$

2 $y \propto x^2$

$y = kx^2$

$36 = k(2)^2$

$k = \frac{36}{4}$

$k = 9,\ \therefore y = 9x^2$

3 $y \propto x^2$

$y = kx^2$

$1.2 = k(0.2)^2$

$k = \frac{1.2}{0.04}$

$k = 30,\ \therefore y = 30x^2$

4 $y \propto x^3$

$y = kx^3$

$81 = k(3)^3$

$k = \frac{81}{27}$

$k = 3,\ \therefore y = 3x^3$

5 $y \propto \sqrt{x}$

$y = k\sqrt{x}$

$36 = k\sqrt{9}$

$k = \frac{36}{3}$

$k = 12,\ \therefore y = 12\sqrt{x}$

6 $y \propto \sqrt[3]{x}$

$y = k\sqrt[3]{x}$

$10 = k\sqrt[3]{125}$

$k = \frac{10}{5}$

$k = 2,\ \therefore y = 2\sqrt[3]{x}$

E

1 $y \propto x$

$y = kx$

$8 = k(2)$

$k = 4$

$m = 4(3)$

$m = 12$

2 $s \propto t$

$s = kt$

$10 = k(5)$

$k = 2$

$m = 2(6)$

$m = 12$

3 $v \propto u^2$

$v = ku^2$

$16 = k(2)^2$

$k = 4$

$m = 4(3)^2$

$m = 36$

4 $p \propto q^3$

$p = kq^3$

$25 = k(0.2)^3$

$k = 3\ 125$

$m = 3\ 125(1.2)^3$

$m = 5\ 400$

5 $t \propto \sqrt{v}$

$t = k\sqrt{v}$

$50 = k\sqrt{25}$

$k = 10$

$30 = 10\sqrt{m}$

$m = 9$

6 $y \propto \sqrt[3]{x}$

$y = k\sqrt[3]{x}$

$24 = k\sqrt[3]{64}$

$k = 6$

$36 = 6\sqrt[3]{m}$

$m = 216$

F

1 (*a*) (i) $m \propto p^3q$

(ii) $t \propto \sqrt{x}n^2$

(*b*) (i) $m = kp^3q$

(ii) $t = k\sqrt{x}n^2$

2 (*a*) (i) $m \propto \sqrt[3]{n}p$

(ii) $x \propto y^3z^2$

(iii) $V \propto j^2t$

(*b*) (i) $m = k\sqrt[3]{n}p$

(ii) $x = ky^3z^2$

(iii) $V = kj^2t$

G

1 $y \propto xz$

$y = kxz$

$16 = k(2)(4)$

$k = \frac{1}{2},\ \therefore y = \frac{1}{2}xz$

2 $s \propto tu$

$s = ktu$

$24 = k(3)(2)$

$k = 4,\ \therefore s = 4tu$

3 $y \propto x\sqrt{z}$

$y = kx\sqrt{z}$

$2 = k(3)\sqrt{4}$

$k = \frac{1}{3},\ \therefore y = \frac{1}{3}x\sqrt{z}$

4 $m \propto p^3q$

$m = kp^3q$

$8 = k(2^3)(5)$

$k = \frac{1}{5},\ \therefore y = \frac{1}{5}p^3q$

5 $p \propto \sqrt[3]{tv^2}$

$p = k\sqrt[3]{tv^2}$

$64 = k\sqrt[3]{8}(4)^2$

$k = 2,\ \therefore p = \sqrt[3]{tv^2}$

6 $T \propto UV^2$

$T = kUV^2$

$96 = k(4)(7)^2$

$k = \frac{1}{2},\ \therefore y = \frac{1}{2}UV^2$

H

1 $r = k\sqrt{z}w$

$60 = k\sqrt{9}(10)$

$k = \frac{60}{30}$

$k = 2,\ \therefore r = 2\sqrt{z}w$

$80 = 2\sqrt{p}(20)$

$p = 2^2$

$p = 4$

2 $t = ksv^2$

$10 = k(5)(2)^2$

$k = \frac{10}{20}$

$k = \frac{1}{2},\ \therefore t = \frac{1}{2}sv^2$

$8 = \frac{1}{2}(4)(p)^2$

$p = \sqrt{4}$

$p = 2$

I

1 (*a*) $L \propto jh$

$L = kjh$

$1\,200 = k(25)(12)$

$k = 4$

$\therefore L = 4jh$

(*b*) $L = (4)(30)(16)$

$= 1\,920\ \text{cm}^2$

SK 1.2

A

1 berkurang
decrease

2 bertambah
increase

3 berkurang dua kali ganda
decrease doubled

4 bertambah separuh
increase by half

5 ubahan songsang
inverse variation

B

1

xy	2 000	2 000	2 000	2 000	2 000

y berubah secara songsang dengan x kerana nilai xy ialah pemalar. Maka, $y \propto \frac{1}{x}$.

y varies inversely as x because the value of xy is a constant. Hence, $y \propto \frac{1}{x}$.

2

xy	200	200	200	200	200

y berubah secara songsang dengan x kerana nilai xy ialah pemalar. Maka, $y \propto \frac{1}{x}$.

y varies inversely as x because the value of xy is a constant. Hence, $y \propto \frac{1}{x}$.

3

xy	600	600	600	600	600

y tidak berubah secara songsang dengan x kerana nilai xy bukan pemalar.
y is not varies inversely as x because the value of xy is not a constant.

C

1 (*a*) (i) $y \propto \frac{1}{x^3}$

(ii) $y \propto \frac{1}{\sqrt{x}}$

(*b*) (i) $y = \frac{k}{x^3}$

(ii) $y = \frac{k}{\sqrt{x}}$

2 (*a*) (i) $m \propto \frac{1}{n^2}$

(ii) $p \propto \frac{1}{\sqrt[3]{r}}$

(iii) $L \propto \frac{1}{T}$

(*b*) (i) $m = \frac{k}{n^2}$

(ii) $p = \frac{k}{\sqrt[3]{r}}$

(iii) $L = \frac{k}{T}$

D

1 $t \propto \frac{1}{u}$

$t = \frac{k}{u}$

$12 = \frac{k}{5}$

$k = 60,\ \therefore t = \frac{60}{u}$

2 $t \propto \frac{1}{u}$

$t = \frac{k}{u}$

$2 = \frac{k}{4}$

$k = 8,\ \therefore t = \frac{8}{u}$

3 $y \propto \frac{1}{x^2}$

$y = \frac{k}{x^2}$

$16 = \frac{k}{4}$

$k = 64,\ \therefore y = \frac{64}{x^2}$

4 $y \propto \frac{1}{x^2}$

$y = \frac{k}{x^2}$

$7 = \frac{k}{9}$

$k = 63,\ \therefore y = \frac{63}{x^2}$

5 $y \propto \frac{1}{x^3}$

$y = \frac{k}{x^3}$

$3.5 = \frac{k}{8}$

$k = 28,\ \therefore y = \frac{28}{x^3}$

6 $m \propto \frac{1}{\sqrt[3]{p}}$

$m = \frac{k}{\sqrt[3]{p}}$

$k = 20,\ \therefore m = \frac{20}{\sqrt[3]{p}}$

E

1 $y \propto \frac{1}{x}$

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

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

$k = 40$

$y = \frac{40}{10}$

$m = \frac{40}{10}$

$\therefore m = 4$

2 $t \propto \frac{1}{u^2}$ $\quad y = \frac{36}{4^2}$

$t = \frac{k}{u^2}$ $\quad m = \frac{36}{16}$

$9 = \frac{k}{4}$ $\quad \therefore m = \frac{9}{4}$

$k = 36$

3 $t \propto \frac{1}{\sqrt{u}}$ $\quad 3 = \frac{18}{\sqrt{m}}$

$t = \frac{k}{\sqrt{u}}$ $\quad \sqrt{m} = \frac{18}{3}$

$2 = \frac{k}{9}$ $\quad m = 6^2$

$k = 18$ $\quad \therefore m = 36$

F

1 (*a*) $S \propto \frac{1}{T}$

$S = \frac{k}{T}$

$120 = \frac{k}{2}$

$k = 240$

$\therefore S = \frac{240}{T}$

(*b*) $100 = \frac{240}{T}$

$T = 2.4$ jam atau 2 jam 24 minit/2.4 *hours or* 2 *hours* 24 *minutes*

Waktu Puan Zabedah sampai Kulai/ *Time Puan Zabeda arrive at Kulai* = 8:45 a.m. + 2 jam 24 minit/2 *hours* 24 *minutes*

= 11:09 a.m.

SK 1.3

A

1 (*a*) (i) $a \propto \frac{b^2}{\sqrt{c}}$

(ii) $t \propto \frac{u}{\sqrt{v}}$

(iii) $y \propto \frac{x^2}{\sqrt{z}}$

(*b*) (i) $a = \frac{kb^2}{\sqrt{c}}$

(ii) $t = \frac{ku}{\sqrt{v}}$

(iii) $y = \frac{kx^2}{\sqrt{z}}$

2 (*a*) (i) $a \propto \frac{1}{mb^3}$

(ii) $x \propto \frac{yz}{p^3}$

(iii) $y \propto \frac{x^2z}{\sqrt[3]{w}}$

(*b*) (i) $a = \frac{k}{mb^3}$

(ii) $x = \frac{kyz}{p^3}$

(iii) $y = \frac{kx^2z}{\sqrt[3]{w}}$

B

1 $p \propto \frac{q^2}{\sqrt[3]{r}}$

$p = \frac{kq^2}{\sqrt[3]{r}}$

$18 = \frac{k(3)^2}{\sqrt[3]{8}}$

$k = 4,\ \therefore w = \frac{4q^2}{\sqrt[3]{r}}$

2 $w \propto \frac{\sqrt{t}}{u^3}$

$w = \frac{k\sqrt{t}}{u^3}$

$2 = \frac{k\sqrt{16}}{5^3}$

$k = \frac{125}{2},\ \therefore w = \frac{125\sqrt{t}}{2u^3}$

C

1 $p \propto \frac{q^2}{r}$ $\qquad p = \frac{10q^2}{r}$

$p = \frac{kq^2}{r}$ $\qquad m = \frac{10(6)^2}{9}$

$4 = \frac{k(2)^2}{5}$ $\qquad \therefore m = 40$

$k = 10$

$p = \frac{10q^2}{r}$

2 $p \propto \frac{\sqrt{q}}{r^3}$ $\qquad p = \frac{1\ 024\sqrt{q}}{r^3}$

$p = \frac{k\sqrt{q}}{r^3}$ $\qquad m = \frac{1\ 024\sqrt{16}}{1^3}$

$12 = \frac{k\sqrt{36}}{8^3}$ $\qquad \therefore m = 4\ 096$

$k = 1\ 024$

$p = \frac{1\ 024\sqrt{q}}{r^3}$

D

1 (*a*) $F \propto \frac{m_1 m_2}{r^2}$

$F = \frac{km_1 m_2}{r^2}$

$1.5912 \times 10^{-13} = \frac{k(150)(100)}{2\ 500^2}$

$k = 6.63 \times 10^{-11}$

$\therefore F = \frac{6.63 \times 10^{-11} m_1 m_2}{r^2}$

(*b*) $F = \frac{6.63 \times 10^{-11}(170)(120)}{2\ 500^2}$

$= 2.164 \times 10^{-13}$ N

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 **B** **2** **B** **3** **C** **4** **A** **5** **C**

Kertas 2/*Paper 2*

1 (*a*) $m = kn^2$

$2 = k(3)^2$

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

$m = \frac{2}{9}n^2$

(*b*) $m = \frac{2}{9}(6)^2$

$m = 8$

2 (*a*) $x = k\frac{\sqrt{y}}{z}$

$2 = k\frac{\sqrt{49}}{14}$

$k = 4$

$x = 4\frac{\sqrt{y}}{z}$

(*b*) $4 = 4\frac{\sqrt{m}}{4}$

$m = 16$

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 1/*Paper 1*

1 D 2 B 3 C 4 A 5 C 6 B 7 B 8 A 9 A

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 (*a*) Ubahan langsung

Direct variation

(*b*) (i) $y \propto x$

$y = kx$

$15 = k(6)$

$k = \frac{5}{2}$

$y = \frac{5}{2}x$

(ii) $40 = \frac{5}{2}x$

$x = 16$

2 (*a*) $N \propto \frac{D}{P}$

$N = \frac{kD}{P}$

$480 = \frac{k(5\,000)}{80}$

$k = 7.68$

$N = \frac{7.68D}{P}$

(*b*) $D = 75\,000, P = 80$

$$N = \frac{(7.68)(75\,000)}{80} = 7\,200$$

BAB 2

SK 1.2

A

1 $\begin{bmatrix} 9 & 11 \\ 20 & 6 \\ 10 & 12 \end{bmatrix}$

2 $\begin{bmatrix} 140 & 110 & 120 \\ 143 & 105 & 130 \end{bmatrix}$

3 $\begin{bmatrix} 7 & 3 \\ 9 & 2 \\ 5 & 1 \end{bmatrix}$

4 $\begin{bmatrix} 10 & 21 & 9 \\ 13 & 18 & 8 \end{bmatrix}$

B

	Bilangan baris *Number of rows*	**Bilangan lajur** *Number of columns*	**Peringkat matriks** *Order of matrix*
1	2	2	2×2
2	3	2	3×2
3	3	1	3×1
4	2	3	2×3
5	1	3	1×3

C

1 Matriks tidak sama kerana unsur sepadan tidak sama.
Different matrix because the corresponding element are different.

2 Matriks sama kerana unsur sepadan dan peringkat matriks adalah sama.
Equal matrix because the corresponding elements and order of matrix are equal.

3 Matriks tidak sama kerana unsur sepadan tidak sama.
Different matrix because the corresponding element are different.

4 Matriks tidak sama kerana peringkat matriks adalah tidak sama.
Different matrix because their matrix orders are different.

D

1 $x = 2$ dan/*and* $5 = y + x$

Gantikan $x = 2$ ke dalam $5 = y + x$
Substitute $x = 2$ *into* $5 = y + x$
$5 = y + 2$
$y = 5 - 2$
$y = 3$

Maka/*Thus*,
$x = 2, y = 3$

2 $2x = 10$
$x = 5$

$y^2 - 3 = 13$
$y^2 = 16$
$y = \sqrt{16}$
$y = 4$

Maka/*Thus*,
$x = 5, y = 4$

3 $x = -3, y = 4$

$-2y + 1 = z$
$-2(4) + 1 = z$
$-8 + 1 = z$
$z = -7$

Maka/*Thus*,
$x = -3, y = 4$ dan/*and* $z = -7$

4 $2x^2 = 18$ $\qquad$ $y + 3 = 1$
$x^2 = 9$ $\qquad$ $y = -2$
$x = \sqrt{9}$
$x = 3$
$\frac{x}{2} = z^3$
$z^3 = \frac{3}{24}$
$z^3 = \frac{1}{8}$
$z^3 = \sqrt{\frac{1}{8}} = \frac{1}{2}$

Maka/*Thus*,
$x = 3, y = -2$, dan/*and* $z = \frac{1}{2}$

SK 2.2

A

1 $\begin{bmatrix} 2+(-3) & -1+5 \\ 4+9 & 3+2 \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 13 & 5 \end{bmatrix}$

2 $\begin{bmatrix} -1+(-3) & 4+5 \\ -2+2 & 0+(-1) \end{bmatrix} = \begin{bmatrix} -4 & 9 \\ 0 & -1 \end{bmatrix}$

3 $\begin{bmatrix} 2+(-5) & 3+9 \\ 1+0 & 0+2 \\ -1+(-1) & 4+7 \end{bmatrix} = \begin{bmatrix} -3 & 12 \\ 1 & 2 \\ -2 & 11 \end{bmatrix}$

4 $\begin{bmatrix} -3-(-1) & 5-3 \\ 4-9 & 2-8 \end{bmatrix} = \begin{bmatrix} -2 & 2 \\ -5 & -6 \end{bmatrix}$

5 $\begin{bmatrix} -2-(-5) & 7-3 \\ 15-9 & 8-(-2) \end{bmatrix} = \begin{bmatrix} 3 & 4 \\ 6 & 10 \end{bmatrix}$

6 $\begin{bmatrix} 3-(-2) & 0-1 & 4-2 \\ 9-6 & 8-(-6) & 7-5 \end{bmatrix} = \begin{bmatrix} 5 & -1 & 2 \\ 3 & 14 & 2 \end{bmatrix}$

B

1 $\begin{bmatrix} 9 \\ 8 \end{bmatrix} - \begin{bmatrix} 3 \\ -5 \end{bmatrix} = \begin{bmatrix} 9-3 \\ 8-(-5) \end{bmatrix}$
$= \begin{bmatrix} 6 \\ 13 \end{bmatrix}$

Kaedah alternatif
Alternative method
$= \begin{bmatrix} 7+2-3 \\ -2+10-(-5) \end{bmatrix}$
$= \begin{bmatrix} 6 \\ 13 \end{bmatrix}$

2 $\begin{bmatrix}-4 & 8\\ 5 & 10\end{bmatrix}+\begin{bmatrix}2 & 7\\ -2 & 5\end{bmatrix}=\begin{bmatrix}-4+2 & 8+7\\ 5+(-2) & 10+5\end{bmatrix}$

$=\begin{bmatrix}-2 & 15\\ 3 & 15\end{bmatrix}$

3 $\begin{bmatrix}13 & 2 & 11\\ 3 & 4 & 10\end{bmatrix}-\begin{bmatrix}3 & 3 & 6\\ -6 & 4 & 7\end{bmatrix}$

$=\begin{bmatrix}13-3 & 2-3 & 11-6\\ 3-(-6) & 4-4 & 10-7\end{bmatrix}$

$=\begin{bmatrix}10 & -1 & 5\\ 9 & 0 & 3\end{bmatrix}$

4 $\begin{bmatrix}-2 & -8\\ 6 & 6\\ 2 & -11\end{bmatrix}+\begin{bmatrix}-8 & 9\\ 0 & 8\\ -4 & 2\end{bmatrix}=\begin{bmatrix}-10 & 1\\ 6 & 14\\ -2 & -9\end{bmatrix}$

C

1 $\begin{bmatrix}-3+a\\ 4+2\end{bmatrix}=\begin{bmatrix}4\\ 3b\end{bmatrix}$

Maka/*Thus*,

$-3+a=4$ $\qquad$ $6=3b$

$a=4+3$ $\qquad$ $b=\frac{6}{3}$

$a=7$ $\qquad$ $b=2$

2 $[5+a-4 \quad 5-b \quad 6-3]=[1 \quad 3 \quad 3]$

Maka/*Thus*,

$5+a-4=1$ $\qquad$ $5-b=3$

$a+1=1$ $\qquad$ $-b=3-5$

$a=0$ $\qquad$ $-b=-2$

$b=2$

3 $\begin{bmatrix}2+2 & 3+a\\ 4+3 & -2-a+5\end{bmatrix}=\begin{bmatrix}4 & 5\\ 7 & b\end{bmatrix}$

Maka/*Thus*,

$3+a=5$ $\qquad$ $-2-a+5=b$

$a=5-3$ $\qquad$ $-2-(2)+5=b$

$a=2$ $\qquad$ $b=1$

4 $\begin{bmatrix}2a+3\\ 8+b-5\\ 13+(-3)\end{bmatrix}=\begin{bmatrix}-1\\ 5\\ 10\end{bmatrix}$

Maka/*Thus*,

$2a+3=-1$ $\qquad$ $8+b-5=5$

$2a=-4$ $\qquad$ $b+3=5$

$a=-2$ $\qquad$ $b=2$

5 $\begin{bmatrix}2+5 & -a+4+7\\ b^2+4 & 3-(-6)\end{bmatrix}=\begin{bmatrix}7 & 5\\ 13 & -3\end{bmatrix}$

Maka/*Thus*,

$-a+11=5$ $\qquad$ $b^2+4=13$

$-a=5-11$ $\qquad$ $b^2=9$

$-a=-6$ $\qquad$ $b=3$

$a=6$

6 $\begin{bmatrix} \frac{a}{3} - 7 \\ 5 - (a + b) \end{bmatrix} = \begin{bmatrix} -2 \\ 3 \end{bmatrix}$

Maka/*Thus*,

$\frac{a}{3} - 7 = -2$ $\qquad 5 - (a + b) = 3$

$\frac{a}{3} = 5$ $\qquad 5 - 15 - b = 3$

$a = 15$ $\qquad -10 - b = 3$

$-b = 13$

$b = -13$

D

1 $[6 \quad -15]$

2 $\begin{bmatrix} 8 & -8 \\ 20 & 12 \end{bmatrix}$

3 $\begin{bmatrix} 6 \\ -12 \\ -18 \end{bmatrix}$

4 $\begin{bmatrix} 4 & \frac{1}{4} & -2 \\ -2 & 1 & \frac{3}{4} \end{bmatrix}$

5 $\begin{bmatrix} -0.4 & 1.0 & 2.0 \\ 1.6 & -0.8 & 0.6 \end{bmatrix}$

6 $\begin{bmatrix} 3m & mx \\ my & -4m \end{bmatrix}$

7 $\begin{bmatrix} -20 & 8 \\ 0 & -12 \\ 2 & 3 \end{bmatrix}$

8 $\begin{bmatrix} 4 & -1 & 2 \\ -\frac{1}{5} & 3 & 1 \\ -2 & \frac{2}{5} & 5 \end{bmatrix}$

9 $[a^2 \quad ab \quad -3a]$

10 $\begin{bmatrix} 1.2 \\ -0.8 \\ 2.0 \end{bmatrix}$

E

1 $\begin{bmatrix} 2 \\ -6 \end{bmatrix} + 3\begin{bmatrix} -1 \\ 4 \end{bmatrix} = \begin{bmatrix} 2 \\ -6 \end{bmatrix} + \begin{bmatrix} -3 \\ 12 \end{bmatrix}$

$= \begin{bmatrix} 2 + (-3) \\ -6 + 12 \end{bmatrix}$

$= \begin{bmatrix} -1 \\ 6 \end{bmatrix}$

2 $\begin{bmatrix} 4 & -7 \\ 3 & -3 \end{bmatrix} - \begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} 4 - 4 & -7 - 2 \\ 3 - (-1) & -3 - 3 \end{bmatrix}$

$= \begin{bmatrix} 0 & -9 \\ 4 & -6 \end{bmatrix}$

3 $\begin{bmatrix}3 & -4\\1 & -2\end{bmatrix}-\begin{bmatrix}-6 & 10\\4 & 2\end{bmatrix}=\begin{bmatrix}3-(-6) & -4-10\\1-4 & -2-2\end{bmatrix}$

$=\begin{bmatrix}9 & -14\\-3 & -4\end{bmatrix}$

4 $\begin{bmatrix}4 & -5\\3 & 2\end{bmatrix}-\begin{bmatrix}-3 & 3\\6 & 12\end{bmatrix}+\begin{bmatrix}12 & -8\\-20 & 12\end{bmatrix}$

$=\begin{bmatrix}7 & -8\\-3 & -10\end{bmatrix}+\begin{bmatrix}12 & -8\\-20 & 12\end{bmatrix}$

$=\begin{bmatrix}7+12 & -8+(-8)\\-3+(-20) & -10+12\end{bmatrix}$

$=\begin{bmatrix}19 & -16\\-23 & 2\end{bmatrix}$

5 $\begin{bmatrix}-12 & 6\\9 & -3\end{bmatrix}+\begin{bmatrix}4 & -3\\2 & 5\end{bmatrix}-\begin{bmatrix}1 & -2\\5 & -4\end{bmatrix}$

$=\begin{bmatrix}-12+4-1 & 6-3+2\\9+2-5 & -3+5+4\end{bmatrix}$

$=\begin{bmatrix}-9 & 5\\6 & 6\end{bmatrix}$

6 $\begin{bmatrix}3\\-4\\5\end{bmatrix}-\begin{bmatrix}10\\-15\\5\end{bmatrix}+\begin{bmatrix}3\\2\\-1\end{bmatrix}=\begin{bmatrix}3-10+3\\-4+15+2\\5-5-1\end{bmatrix}$

$=\begin{bmatrix}-4\\13\\-1\end{bmatrix}$

F

1 $\begin{bmatrix}4a\\16\\26\end{bmatrix}+\begin{bmatrix}2\\b-5\\-2\end{bmatrix}=\begin{bmatrix}14\\13\\24\end{bmatrix}$

Maka/*Thus*,

$4a+2=14$ $\qquad$ $16+b-5=13$

$4a=12$ $\qquad$ $b+11=13$

$a=3$ $\qquad$ $b=2$

2 $\begin{bmatrix}-9-2 & 7-\frac{1}{5}a\\2+1 & -3-3\end{bmatrix}=\begin{bmatrix}-11 & 8\\b & -6\end{bmatrix}$

Maka/*Thus*,

$7-\frac{1}{5}a=8$ $\qquad$ $b=2+1$

$-\frac{1}{5}a=1$ $\qquad$ $b=3$

$a=-5$

3 $\begin{bmatrix}2+6 & 3+3b\\-a+2 & 6+4\end{bmatrix}=\begin{bmatrix}8 & 12\\-7 & 10\end{bmatrix}$

Maka/*Thus*,

$3+3b=12$ $\qquad$ $-a+2=-7$

$3b=9$ $\qquad$ $-a=-9$

$b=3$ $\qquad$ $a=9$

4 $\begin{bmatrix} -6 \\ 4a \\ -6b \end{bmatrix} - \begin{bmatrix} 8 \\ -4 \\ -8b \end{bmatrix} = \begin{bmatrix} -14 \\ -4a \\ 8 \end{bmatrix}$

Maka/*Thus*,

$4a + 4 = -4a \qquad -6b + 8b = 8$

$4a + 4a = -4 \qquad 2b = 8$

$8a = -4 \qquad b = 4$

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

G

	Peringkat matriks *Order of matrix*		Adakah *AB* wujud? *Does AB exist?*	Peringkat *AB* *Order of AB*
	A	***B***		
1	2 × 2	2 × 1	Ya/*Yes*	2 × 1
2	1 × 2	2 × 2	Ya/*Yes*	1 × 2
3	2 × 1	2 × 1	Tidak/*No*	–
4	1 × 3	1 × 2	Tidak/*No*	–
5	2 × 2	2 × 3	Ya/*Yes*	2 × 3

H

1 $[(4 \times 2) + (3 \times 4)] = (8 + 12)$
$= 20$

2 $[(-5 \times 4) + (1 \times 7)] = (-20 + 7)$
$= -13$

3 $\begin{bmatrix} 3 \times 1 & 3 \times 7 \\ -5 \times 1 & -5 \times 7 \end{bmatrix} = \begin{bmatrix} 3 & 21 \\ -5 & -35 \end{bmatrix}$

4 $\begin{bmatrix} 4 \times 2 & 4 \times -3 \\ -2 \times 2 & -2 \times (-3) \end{bmatrix} = \begin{bmatrix} 8 & -12 \\ -4 & 6 \end{bmatrix}$

5 $\begin{bmatrix} (2 \times -1) + (1 \times 2) \\ (4 \times -1) + (0 \times 2) \end{bmatrix} = \begin{bmatrix} (-2 + 2) \\ (-4) + 0 \end{bmatrix}$
$= \begin{bmatrix} 0 \\ -4 \end{bmatrix}$

6 $\begin{bmatrix} (2 \times -3) + (4 \times 2) \\ [(-3) \times (-3)] + (1 \times 2) \end{bmatrix} = \begin{bmatrix} -6 + 8 \\ 9 + 2 \end{bmatrix}$
$= \begin{bmatrix} 2 \\ 11 \end{bmatrix}$

7 $[(1 \times 1) + (3 \times 3) \quad (1 \times 2) + (3 \times 4)]$
$= [1 + 9 \quad 2 + 12]$
$= [10 \quad 14]$

8 $[-3 + 12 \quad 0 + (-4)] = [9 \quad -4]$

9 $[0 + 4 \quad 10 + 12] = [4 \quad 22]$

10 $\begin{bmatrix}1 & 3\\2 & 4\end{bmatrix}\begin{bmatrix}-1 & 5\\-3 & 2\end{bmatrix}=\begin{bmatrix}-1+(-9) & 5+6\\-2+(-12) & 10+8\end{bmatrix}$

$=\begin{bmatrix}-10 & 11\\-14 & 18\end{bmatrix}$

11 $\begin{bmatrix}0+(-6) & 0+(-2)\\10+18 & -2+6\end{bmatrix}=\begin{bmatrix}-6 & -2\\28 & 4\end{bmatrix}$

12 $\begin{bmatrix}-2+(-6) & -6+15\\1+(-8) & 3+20\end{bmatrix}=\begin{bmatrix}-8 & 9\\-7 & 23\end{bmatrix}$

I

1 $\begin{bmatrix}4x-3\\8-y\end{bmatrix}=\begin{bmatrix}8\\5\end{bmatrix}$

Maka/*Thus*,

$4x-3=8$ $\qquad$ $8-y=5$

$4x=11$ $\qquad$ $-y=5-8$

$x=\frac{11}{4}$ $\qquad$ $-y=-3$

$y=3$

2 $[3x-6x \quad xy+6]=[24 \quad -6]$

Maka/*Thus*,

$3x-6x=24$ $\qquad$ $xy+6=-6$

$-3x=24$ $\qquad$ $(-8)y=-6-6$

$x=-8$ $\qquad$ $-8y=-12$

$y=\frac{12}{8}$ atau/*or* $\frac{3}{2}$

3 $\begin{bmatrix}3+0 & 6+1\\-1+0 & -2+x\end{bmatrix}=\begin{bmatrix}y & 7\\-1 & 4\end{bmatrix}$

Maka/*Thus*,

$y=3$ $\qquad$ $-2+x=4$

$x=4+2$

$x=6$

J

1 segi empat sama/*square matrix*

2 0 dan/*and* 1

3 $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}\begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{bmatrix}$

K

1 $\begin{bmatrix}-4 & 0\\2 & -5\end{bmatrix}$

2 $\begin{bmatrix}5 & -7\\2 & 4\\-1 & 3\end{bmatrix}$

L

	AB	*BA*	Ya/Tidak *Yes/No*
1	$\begin{bmatrix}2 & 0\\0 & 2\end{bmatrix}$	$\begin{bmatrix}2 & 0\\0 & 2\end{bmatrix}$	Tidak *No*
2	$\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$	$\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$	Ya *Yes*

M

1 Katakan/*Let* $A^{-1} = \begin{bmatrix}a & b\\c & d\end{bmatrix}$

$AA^{-1} = I$

$$\begin{bmatrix}4 & 1\\3 & 1\end{bmatrix}\begin{bmatrix}a & b\\c & d\end{bmatrix} = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$$

$$\begin{bmatrix}4a+c & 4b+d\\3a+c & 3b+d\end{bmatrix} = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$$

$4a + c = 1$ ..... ① $\quad 4b + d = 0$ ..... ③

$3a + c = 0$ ..... ② $\quad 3b + d = 1$ ..... ④

① − ② : $a = 1$

Gantikan $a = 1$ ke dalam ①,

Substitute $a = 1$ *into* ①,

$4(1) + c = 1$

$4 + c = 1$

$c = 1 - 4$

$c = -3$

③ − ④ : $b = -1$

Gantikan $b = -1$ ke dalam ③,

Substitute $b = -1$ *into* ③,

$4(-1) + d = 0$

$-4 + d = 0$

$d = 4$

Maka/*Thus*, $A^{-1} = \begin{bmatrix}1 & -1\\-3 & 4\end{bmatrix}$

2 Katakan/*Let* $B^{-1} = \begin{bmatrix}a & b\\c & d\end{bmatrix}$

$$\begin{bmatrix}4 & -8\\2 & -6\end{bmatrix}\begin{bmatrix}a & b\\c & d\end{bmatrix} = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$$

$$\begin{bmatrix}4a-8c & 4b-8d\\2a-6c & 2b-6d\end{bmatrix} = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$$

$4a - 8c = 1$ ..... ① $\quad 4b - 8d = 0$ ..... ④

$2a - 6c = 0$ ..... ② × 2 $\quad 2b - 6d = 1$ ..... ⑤ × 2

$4a - 12c = 0$ ..... ③ $\quad 4b - 12d = 2$ ..... ⑥

① − ③ : $4c = 1$

$c = \frac{1}{4}$

Gantikan $c = \frac{1}{4}$ ke dalam ①,

Substitute $c = \frac{1}{4}$ *into* ①,

$$4a - 8\left[\frac{1}{4}\right] = 1$$
$$4a - 2 = 1$$
$$4a = 3$$
$$a = \frac{3}{4}$$

④ − ⑥ : $4d = -2$

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

Gantikan $d = -\frac{1}{2}$ ke dalam ④,

Substitute $d = -\frac{1}{2}$ *into* ④,

$$4b - 8\left[-\frac{1}{2}\right] = 0$$
$$4b + 4 = 0$$
$$4b = -4$$
$$b = -1$$

Maka/*Thus*,

$$B^{-1} = \begin{bmatrix} \frac{3}{4} & -1 \\ \frac{1}{4} & -\frac{1}{2} \end{bmatrix}$$

1 $M^{-1} = \dfrac{1}{(1 \times 6) - [-3 \times (-4)]} \begin{bmatrix} 6 & 4 \\ 3 & 1 \end{bmatrix}$

$$= \frac{1}{6 - 12} \begin{bmatrix} 6 & 4 \\ 3 & 1 \end{bmatrix}$$
$$= -\frac{1}{6} \begin{bmatrix} 6 & 4 \\ 3 & 1 \end{bmatrix}$$
$$= \begin{bmatrix} -1 & -\frac{2}{3} \\ -\frac{1}{2} & -\frac{1}{6} \end{bmatrix}$$

2 $J^{-1} = \dfrac{1}{[(5 \times -4) - (3 \times -7)]} \begin{bmatrix} -4 & 7 \\ -3 & 5 \end{bmatrix}$

$$= \frac{1}{-20 + 21} \begin{bmatrix} -4 & 7 \\ -3 & 5 \end{bmatrix}$$
$$= 1 \begin{bmatrix} -4 & 7 \\ -3 & 5 \end{bmatrix}$$
$$= \begin{bmatrix} -4 & 7 \\ -3 & 5 \end{bmatrix}$$

3 $K^{-1} = \dfrac{1}{[(3 \times 2) - (1 \times -2)]} \begin{bmatrix} 2 & 2 \\ -1 & 3 \end{bmatrix}$

$$= \frac{1}{6 - (-2)} \begin{bmatrix} 2 & 2 \\ -1 & 3 \end{bmatrix}$$
$$= \frac{1}{8} \begin{bmatrix} 2 & 2 \\ -1 & 3 \end{bmatrix}$$
$$= \begin{bmatrix} \frac{1}{4} & \frac{1}{4} \\ -\frac{1}{8} & \frac{3}{8} \end{bmatrix}$$

O

1 $-6 - 5(2 - m) = 0$

$-6 - 10 + 5m = 0$

$-16 + 5m = 0$

$5m = 16$

$m = \frac{16}{5}$

2 $24 + 6m = 0$

$6m = -24$

$m = -4$

3 $2m - 12 = 0$

$2m = 12$

$m = 6$

P

1 $\begin{bmatrix} 2 & -2 \\ 4 & -3 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ -2 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-6-(-8)}\begin{bmatrix} -3 & 2 \\ -4 & 2 \end{bmatrix}\begin{bmatrix} 6 \\ -2 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2}\begin{bmatrix} -18 + (-4) \\ -24 + (-4) \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2}\begin{bmatrix} -22 \\ -28 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -11 \\ -14 \end{bmatrix}$

Maka/*Thus*, $x = -11$, $y = -14$

2 $\begin{bmatrix} 5 & 4 \\ 3 & -6 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ 24 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-30-12}\begin{bmatrix} -6 & -4 \\ -3 & 5 \end{bmatrix}\begin{bmatrix} 12 \\ 24 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{42}\begin{bmatrix} -72 - 96 \\ -36 + 120 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{42}\begin{bmatrix} -168 \\ 84 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ -2 \end{bmatrix}$

Maka/*Thus*, $x = 4$, $y = -2$

3 $\begin{bmatrix} 3 & -1 \\ 4 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-6-(-4)}\begin{bmatrix} -2 & 1 \\ -4 & 3 \end{bmatrix}\begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{2}\begin{bmatrix} -2 - 2 \\ -4 - 6 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{2}\begin{bmatrix} -4 \\ -10 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$

Maka/*Thus*, $x = 2$, $y = 5$

Q

1 (*a*) Matriks songsang bagi $\begin{bmatrix} 2 & 5 \\ 1 & 2 \end{bmatrix}$

Inverse matrix of

$$= \frac{1}{4-5}\begin{bmatrix} 2 & -5 \\ -1 & 2 \end{bmatrix}$$

$$= -\frac{1}{1}\begin{bmatrix} 2 & -5 \\ -1 & 2 \end{bmatrix}$$

Maka/*Thus*, $m = -1$, $n = -5$

(*b*) $\begin{bmatrix} 2 & 5 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 5 \end{bmatrix}$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{4-5}\begin{bmatrix} 2 & -5 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} -3 \\ 5 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = -1\begin{bmatrix} -6 + (-25) \\ 3 + 10 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = -1\begin{bmatrix} -31 \\ 13 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 31 \\ -13 \end{bmatrix}$$

Maka/*Thus*, $x = 31$, $y = -13$

R

1 (*a*) $x + y = 46.50$

$2x + 3y = 120 - 6$

$2x + 3y = 114$

(*b*) $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 46.50 \\ 114.00 \end{bmatrix}$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{3-2}\begin{bmatrix} 3 & -1 \\ -2 & 1 \end{bmatrix}\begin{bmatrix} 46.50 \\ 114.00 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = 1\begin{bmatrix} 139.50 - 114.00 \\ -93 + 114.00 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 25.50 \\ 21.00 \end{bmatrix}$$

Maka, harga bagi sebuah buku rujukan matematik ialah RM25.50 dan sebuah buku rujukan fizik ialah RM21.
Thus, *the price for the mathematics reference book is* RM25.50 *and the physics reference book is* RM21.

2 $35x + 5y = 340$

$37x + 15y = 340$

(*a*) $\begin{bmatrix} 35 & 5 \\ 37 & 15 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 340 \\ 340 \end{bmatrix}$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{525 - 185}\begin{bmatrix} 15 & -5 \\ -37 & 35 \end{bmatrix}\begin{bmatrix} 340 \\ 340 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{340}\begin{bmatrix} 5\,100 - 1\,700 \\ -12\,580 + 11\,900 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{340}\begin{bmatrix} 3\,400 \\ -680 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ -2 \end{bmatrix}$$

Maka/*Thus*, $x = 10$, $y = -2$

(*b*) Pasukan Ibnu Sina/*Ibnu Sina's team*:

$7x + 2y = 7(10) + 2(-2)$

$= 70 - 4$

$= 66$

Pasukan Al-Ghazali/*Al-Ghazali's team*:

$8x + 6y = 8(10) + 6(-2)$

$= 80 - 12$

$= 68$

Pasukan Al-Ghazali yang memenangi pertandingan kuiz matematik tersebut.
Al-Ghazali's team that won the mathematics quiz competition.

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1	**B**	**2**	**C**	**3**	**D**	**4**	**C**	**5**	**A**
6	**B**	**7**	**A**	**8**	**A**	**9**	**B**	**10**	**C**

Kertas 2/*Paper 2*

1 (*a*) $\frac{1}{21-32}\begin{bmatrix}7 & -4\\ -8 & 3\end{bmatrix} = -\frac{1}{11}\begin{bmatrix}7 & -4\\ -8 & 3\end{bmatrix}$

(*b*) $3x + 2y = 81.00$

$2x + y = 51.50$

$\begin{bmatrix}3 & 2\\ 2 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}81.00\\ 51.50\end{bmatrix}$

$\begin{bmatrix}x\\ y\end{bmatrix} = \frac{1}{3-4}\begin{bmatrix}1 & -2\\ -2 & 3\end{bmatrix}\begin{bmatrix}81.00\\ 51.50\end{bmatrix}$

$\begin{bmatrix}x\\ y\end{bmatrix} = -1\begin{bmatrix}81.00 - 103.00\\ -162.00 + 154.50\end{bmatrix}$

$\begin{bmatrix}x\\ y\end{bmatrix} = -1\begin{bmatrix}-22.00\\ -7.50\end{bmatrix}$

$\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}22.00\\ 7.50\end{bmatrix}$

Maka, harga daging ialah RM22 sekilogram dan ikan ialah RM7.50 sekilogram.
Hence, the price of meat is RM22 *per kilogram and fish is* RM7.50 *per kilogram.*

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 1/*Paper 1*

1	**B**	**2**	**A**	**3**	**A**	**4**	**A**	**5**	**C**	**6**	**A**	**7**	**D**	**8**	**B**

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 Katakan pelitup muka = m
Let face mask = m

Katakan pensanitasi tangan = k
Let hand sanitizer = k

$3m + 4k = 148.40$

$2(2m + 6k) = 301.20$

$4m + 12k = 301.20$

$$\begin{bmatrix}3 & 4\\4 & 12\end{bmatrix}\begin{bmatrix}m\\k\end{bmatrix}=\begin{bmatrix}148.40\\301.20\end{bmatrix}$$

$$\begin{bmatrix}m\\k\end{bmatrix}=\frac{1}{(3)(12)-(4)(4)}\begin{bmatrix}12 & -4\\-4 & 3\end{bmatrix}\begin{bmatrix}148.40\\301.20\end{bmatrix}$$

$$\begin{bmatrix}m\\k\end{bmatrix}=\frac{1}{20}\begin{bmatrix}(12\times 148.40)+(-4\times 301.20)\\(-4\times 148.40)+(3\times 301.20)\end{bmatrix}$$

$$\begin{bmatrix}m\\k\end{bmatrix}=\frac{1}{20}\begin{bmatrix}576\\310\end{bmatrix}$$

$$\begin{bmatrix}m\\k\end{bmatrix}=\begin{bmatrix}28.8\\15.5\end{bmatrix}$$

m = RM28.80
k = RM15.50

Bahagian B/*Section* B

2 (*a*) $x+3=-1$
$x=-4$

$5y=-2$
$y=-\frac{2}{5}$

(*b*) (i) $3x+2y=55$
$4x+3y=55+20$
$4x+3y=75$

$$\begin{bmatrix}3 & 2\\4 & 3\end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}55\\75\end{bmatrix}$$

$$\begin{bmatrix}x\\y\end{bmatrix}=\frac{1}{(3)(3)-(2)(4)}\begin{bmatrix}3 & -2\\-4 & 3\end{bmatrix}\begin{bmatrix}55\\75\end{bmatrix}$$

$$\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}(3\times 55)+(-2\times 75)\\(-4\times 55)+(3\times 75)\end{bmatrix}$$

$$\begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}15\\5\end{bmatrix}$$

Sekotak sushi / *A box of sushi* = RM15
Seketul ayam goreng / *A piece of fried chicken* = RM5

(ii) $15\times\frac{80}{100}=$ RM12

$5\times\frac{60}{100}=$ RM3

$$[2\quad 8]\begin{bmatrix}12\\3\end{bmatrix}=\text{RM48}$$

Dia mempunyai wang cukup kerana hanya RM48 diperlukan.
She has enough money as only RM48 *is needed.*

3 (*a*) $JK=\begin{pmatrix}2\\5\end{pmatrix}(4\quad -3)$

$$=\begin{pmatrix}2\times 4 & 2\times(-3)\\5\times 4 & 5\times(-3)\end{pmatrix}$$

$$=\begin{pmatrix}8 & -6\\20 & -15\end{pmatrix}$$

$\therefore 2\times 2$

(*b*) (i) Katakan umur Rokiah / *Let the age of Rokiah* = R
Katakan umur Nuha / *Let the age of Nuha* = N

$$R = 3N$$
$$R - 3N = 0 \text{.....①}$$
$$\frac{R+N}{2} = 36$$
$$R + N - 72 = 0 \text{.....②}$$

(ii) $R - 3N = 0$
$R + N = 72$

$$\begin{pmatrix} 1 & -3 \\ 1 & 1 \end{pmatrix}\begin{pmatrix} R \\ N \end{pmatrix} = \begin{pmatrix} 0 \\ 72 \end{pmatrix}$$

$$\begin{pmatrix} R \\ N \end{pmatrix} = \frac{1}{(1)(1)-(-3)(1)}\begin{pmatrix} 1 & 3 \\ -1 & 1 \end{pmatrix}\begin{pmatrix} 0 \\ 72 \end{pmatrix}$$

$$= \frac{1}{4}\begin{pmatrix} 216 \\ 72 \end{pmatrix}$$

$$= \begin{pmatrix} 54 \\ 18 \end{pmatrix}$$

$R = 54$
$N = 18$

4 (*a*) p = piza / *pizza*, c = kek cawan / *cup cake*

$3p + 6c = 45$ ..... ①
$7p = 45 + c$
$7p - c = 45$ ..... ②

$$\begin{pmatrix} 3 & 6 \\ 7 & -1 \end{pmatrix}\begin{pmatrix} p \\ c \end{pmatrix} = \begin{pmatrix} 45 \\ 45 \end{pmatrix}$$

$$\begin{pmatrix} p \\ c \end{pmatrix} = \frac{1}{3(-1)-6(7)}\begin{pmatrix} -1 & -6 \\ -7 & 3 \end{pmatrix}\begin{pmatrix} 45 \\ 45 \end{pmatrix}$$

$$\begin{pmatrix} p \\ c \end{pmatrix} = \frac{1}{-45}\begin{pmatrix} -1(45)+(-6)(45) \\ -7(45)+3(45) \end{pmatrix}$$

$$\begin{pmatrix} p \\ c \end{pmatrix} = \frac{1}{-45}\begin{pmatrix} -315 \\ -180 \end{pmatrix}$$

$$\begin{pmatrix} p \\ c \end{pmatrix} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$$

$p = 7$, $c = 4$

(*b*) Baucar ketiga / *Third voucher* = 125 − 45 − 45
= 35

$4p + 2c$

$$= (4 \quad 2)\begin{pmatrix} p \\ c \end{pmatrix}$$

$$= (4 \quad 2)\begin{pmatrix} 7 \\ 4 \end{pmatrix}$$

$= 4(7) + 2(4)$
$= 36$

Nilai belian ialah RM36 manakala nilai baucar ialah RM35.
The purchase value is RM36 *while the voucher value is* RM35.
∴ Nilai baucar tidak mencukupi. / *Voucher value is insufficient.*

SK 3.1

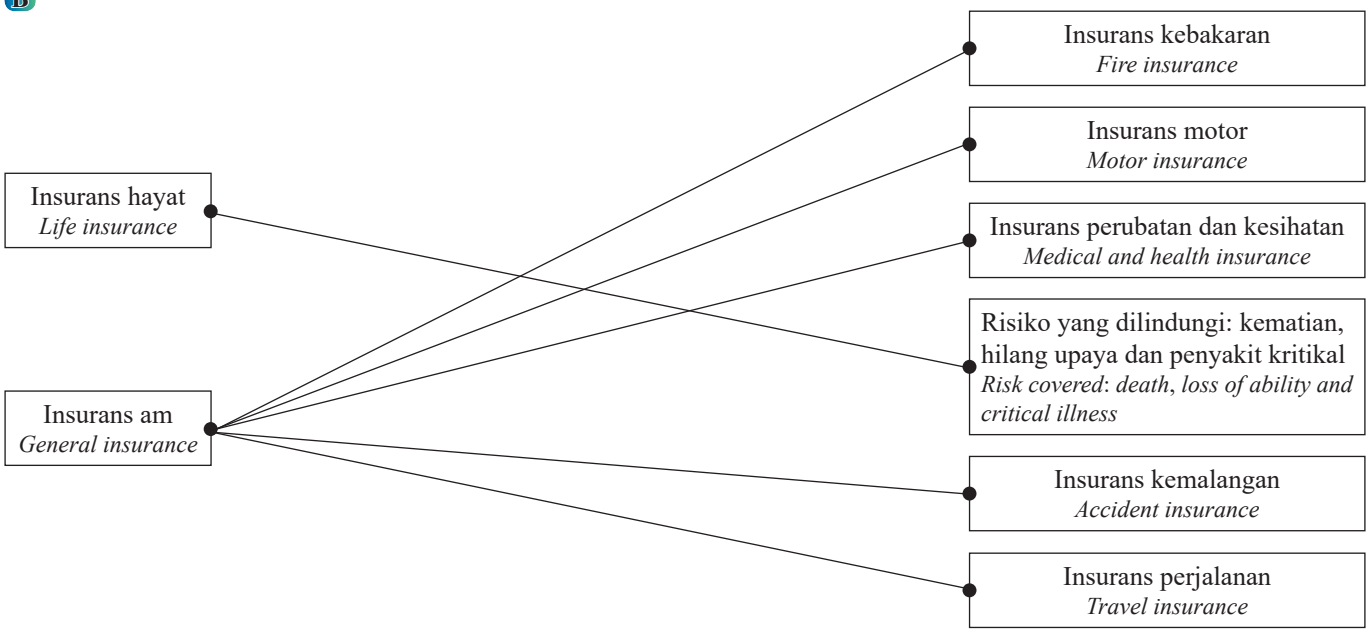
A

1 Risiko ialah kemungkinan berlaku musibah yang tidak dapat dielakkan.
A risk a possibility of unfortunate events happened.

2 Insurans bertujuan memindahkan risiko daripada individu kepada organisasi insurans.
Insurance intends to transfer risk from individual to insurance organisation.

3 Pemegang polisi perlu membayar premium kepada syarikat insurans manakala syarikat insurans perlu membayar pampasan premium yang dibuat oleh pemegang polisi.
Policyholders need to pay premium to the insurance company while the insurance company will pay compensation premium paid by the policyholders.

B



C

1 Premium tahunan/*Annual premium* $= \frac{\text{RM}100\,000}{\text{RM}1\,000} \times \text{RM}2.12$
$= \text{RM}212$

2 Premium tahunan/*Annual premium* $= \frac{\text{RM}450\,000}{\text{RM}1\,000} \times \text{RM}2.80$
$= \text{RM}1\,260$

3 Premium tahunan/*Annual premium* $= \frac{\text{RM}250\,000}{\text{RM}1\,000} \times \text{RM}2.03$
$= \text{RM}507.50$

D

1 Premium asas tahunan/*Annual basic premium* $= \frac{\text{RM}300\,000}{\text{RM}1\,000} \times \text{RM}1.45$
$= \text{RM}435$

Premium penyakit kritikal/*Premium critical illness* $= \frac{\text{RM}150\,000}{\text{RM}1\,000} \times \text{RM}1.67$
$= \text{RM}250.50$

$\therefore$ Jumlah premium tahunan/*Amount of annual premium* $= \text{RM}435 + \text{RM}250.50$
$= \text{RM}685.50$

2 Premium asas tahunan/*Annual basic premium* $= \frac{\text{RM250 000}}{\text{RM1 000}} \times \text{RM3.47}$

$= \text{RM867.50}$

Premium penyakit kritikal/*Premium critical illness* $= \frac{\text{RM100 000}}{\text{RM1 000}} \times \text{RM1.74}$

$= \text{RM174}$

$\therefore$ Jumlah premium tahunan/*Amount of annual premium* $= \text{RM867.50} + \text{RM174}$

$= \text{RM1 041.50}$

E

1 Polisi komprehensif/*Comprehensive policy*:

Premium asas *Basis premium*	$\text{RM372.60} + \left(\text{RM26} \times \frac{60\,000 - 1\,000}{1\,000}\right)$ $= \text{RM1 906.60}$
NCD	$\frac{30}{100} \times 1\,906.60 = \text{RM571.98}$
Premium kasar *Gross premium*	RM1 906.60 – RM571.98 = RM1 334.62

Polisi pihak ketiga/*Third party policy*:

Premium asas *Basis premium*	RM167.40
NCD	$\frac{30}{100} \times 167.40 = \text{RM50.22}$
Premium kasar *Gross premium*	RM167.40 – RM50.22 = RM117.18

Polisi pihak ketiga, kebakaran dan kecurian:
Third party, fire and theft policy:

Premium asas *Basis premium*	75% × RM1 906.60 = RM1 429.95
NCD	$\frac{30}{100} \times 1\,429.95 = \text{RM428.99}$
Premium kasar *Gross premium*	RM1 429.95 – RM428.99 = RM1 000.96

2 Polisi komprehensif/*Comprehensive policy*

Premium asas *Basis premium*	$\text{RM273.80} + \left(\text{RM26} \times \frac{84\,000 - 1\,000}{1\,000}\right)$ $= \text{RM2 431.80}$
NCD	$\frac{45}{100} \times 2\,431.80 = \text{RM1 094.31}$
Premium kasar *Gross premium*	RM2 431.80 – RM1 094.31 = RM1 337.49

Polisi pihak ketiga/*Third party policy*:

Premium asas *Basis premium*	RM120.60
NCD	$\frac{45}{100} \times 120.60 = \text{RM}54.27$
Premium kasar *Gross premium*	RM120.60 – RM54.27 = RM66.33

Polisi pihak ketiga, kebakaran dan kecurian:
Third party, fire and theft policy:

Premium asas *Basis premium*	75% × RM2 431.80 = RM1 823.85
NCD	$\frac{45}{100} \times 1\,823.85 = \text{RM}820.73$
Premium kasar *Gross premium*	RM1 823.85 – RM820.73 = RM1 003.12

F

1 Kos ditanggung oleh Encik Nabil/*Cost borne by Encik Nabil*
= Deduktibel/*Deductible*
= RM500
Kos ditanggung oleh syarikat insurans/*Cost borne by insurance company*
= RM1 200 – RM500
= RM700

2 Kos ditanggung oleh Encik Hamid/*Cost borne by Encik Hamid*
= Deduktibel/*Deductible*
= RM1 000
Kos ditanggung oleh syarikat insurans/*Cost borne by insurance company*
= RM4 500 – RM1 000
= RM3 500

3 Kos ditanggung oleh Puan Hanipah/*Cost borne by Puan Hanipah*
= RM18 000
Kos ditanggung oleh syarikat insurans/*Cost borne by insurance company*
= Tiada/*None*

4 Kos ditanggung oleh Cik Zulaikha/*Cost borne by Cik Zulaikha*
= Deduktibel/*Deductible*
= RM14 000
Kos ditanggung oleh syarikat insurans/*Cost borne by insurance company*
= RM21 000 – RM14 000
= RM7 000

G

1

Nilai boleh insurans/*Insurable value*: RM420 000
Peruntukan ko-insurans/*Insurance provision*: 75%
Insurans harus dibeli/*Required insurance*: RM315 000
Deduktibel/*Deductible*: RM80 000
Kerugian/*Loss*: RM200 000

Jumlah insurans yang perlu dibeli/*Amount of required insurance*:
$= \frac{70}{100} \times \text{RM}420\,000$
= RM315 000

Bayaran pampasan/*Compensation*
= RM200 000 – RM80 000
= RM120 000

2

Nilai boleh insurans/*Insurable value*: RM600 000
Peruntukan ko-insurans/*Insurance provision*: 90%
Insurans harus dibeli/*Required insurance*: RM540 000
Deduktibel/*Deductible*: RM45 000
Kerugian/*Loss*: RM300 000

Jumlah insurans yang perlu dibeli/*Amount of required insurance*:
$= \frac{90}{100} \times$ RM600 000
= RM540 000
Bayaran pampasan/*Compensation*
$= \frac{480\,000}{540\,000} \times$ RM300 000 – RM45 000
= RM221 666.67

3

Nilai boleh insurans/*Insurable value*: RM520 000
Peruntukan ko-insurans/*Insurance provision*: 85%
Insurans harus dibeli/*Required insurance*: –
Deduktibel/*Deductible*: RM45 000
Kerugian/*Loss*: RM300 000

Bayaran pampasan/*Compensation*
= RM380 000 – RM35 000
= RM345 000

4

Nilai boleh insurans/*Insurable value*: RM340 000
Peruntukan ko-insurans/*Insurance provision*: 80%
Insurans harus dibeli/*Required insurance*: RM272 000
Deduktibel/*Deductible*: RM25 000
Kerugian/*Loss*: RM180 000

Jumlah insurans yang perlu dibeli/*Amount of required insurance*:
$= \frac{80}{100} \times$ RM340 000
= RM272 000
Bayaran pampasan/*Compensation*
$= \frac{180\,000}{272\,000} \times$ RM180 000 – RM25 000
= RM94 117.65

H

1 Kos perubatan selepas deduktibel/*Medical cost after deductible*
= RM32 000 – RM1 000
= RM31 000
Kos perubatan ditanggung oleh pemegang polisi/*Medical cost are borne by the policyholder*
$= \frac{20}{100} \times$ RM31 000 + RM1 000
= RM7 200
Kos perubatan ditanggung oleh syarikat insurans/*Medical cost are borne by the insurance company*
$= \frac{80}{100} \times$ RM31 000
= RM24 800

2 Kos perubatan selepas deduktibel/*Medical cost after deductible*
= RM23 000 – RM450
= RM22 550
Kos perubatan ditanggung oleh pemegang polisi/*Medical cost are borne by the policyholder*
$= \frac{15}{100} \times$ RM22 550 + RM450
= RM3 832.50
Kos perubatan ditanggung oleh syarikat insurans/*Medical cost are borne by the insurance company*
$= \frac{85}{100} \times$ RM22 550
= RM19 167.50

3 Kos perubatan selepas deduktibel/*Medical cost after deductible*
= RM54 000 – RM1 200
= RM52 800
Kos perubatan ditanggung oleh pemegang polisi/*Medical cost are borne by the policyholder*
$= \frac{10}{100} \times$ RM52 800 + RM1 200
= RM6 480
Kos perubatan ditanggung oleh syarikat insurans/*Medical cost are borne by the insurance company*
$= \frac{90}{100} \times$ RM52 800
= RM47 520

4 Kos perubatan selepas deduktibel/*Medical cost after deductible*
= RM8 000 – RM300
= RM7 700
Kos perubatan ditanggung oleh pemegang polisi/*Medical cost are borne by the policyholder*
$= \frac{20}{100} \times$ RM7 700 + RM300
= RM1 840
Kos perubatan ditanggung oleh syarikat insurans/*Medical cost are borne by the insurance company*
$= \frac{80}{100} \times$ RM7 700
= RM6 160

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 A 2 D 3 B 4 C

Kertas 2/*Paper 2*

1 (*a*) Premium tahunan/*Annual premium* $= \frac{450\,000}{1\,000} \times 1.71$
= RM769.50

(*b*) Jumlah perlindungan/*Total coverage* $= \frac{45}{100} \times 450\,000$
= RM202 500

Premium tahunan bagi penyakit kritikal $= \frac{202\,500}{100} \times 1.80$
Annual premium for critical illness
= RM364.50

Premium tahunan = Premium asas tahunan + Premium tambahan tahunan penyakit kritikal
Annual premium = Annual basic premium + Annual additional premium for critical illness
= RM769.50 + RM364.50
= RM1 134

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 1/*Paper 1*

1 A 2 D

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 (*a*) Tidak, kerana nilai deduktibel adalah lebih tinggi daripada kos rawatan.
No, because the deductible value is higher than the cost of treatment.

(*b*) $\frac{15}{100}(29\,900 - 1\,500) + 1\,500$
$= \text{RM}5\,760$

2 (*a*) $\frac{80}{100} \times 300\,000 = 240\,000$

Bayaran pampasan / *Amount of compensation*
$= \frac{\text{Jumlah insurans yang telah dibeli}}{\text{Jumlah insurans yang harus dibeli}} \times \text{Jumlah kerugian} - \text{Deduktibel}$
$\frac{\textit{Amount of insurance purchased}}{\textit{Amount of insurance to be purchased}} \times \textit{Total loss} - \textit{Deductible}$
$= \frac{200\,000}{240\,000} \times 30\,000 - 2\,500$
$= \text{RM}22\,500$

(*b*) Penalti ko-insurans / *Co-insurance penalty*
$= 30\,000 - \left(\frac{200\,000}{240\,000} \times 30\,000\right)$
$= \text{RM}5\,000$

3 Kos perubatan selepas deduktibel / *Medical cost after deductible*
$= 27\,000 - 2\,000$
$= \text{RM}25\,000$

Kos yang ditanggung oleh Athar / *Cost borne by Athar*
$= \left(\frac{10}{100} \times 25\,000\right) + 2\,000$
$= \text{RM}4\,500$

Bahagian B/*Section* B

4 Premium asas / *Basic premium*
$= \text{RM}339.10 + \text{RM}26 \times \frac{90\,000 - 1\,000}{1\,000}$
$= \text{RM}2\,653.10$

NCD $= \text{RM}2\,653.10 \times 55\%$
$= \text{RM}1\,459.21$

Premium kasar / *The gross premium*
$= \text{RM}2\,653.10 - \text{RM}1\,459.21$
$= \text{RM}1\,193.89$

Bahagian C/*Section C*

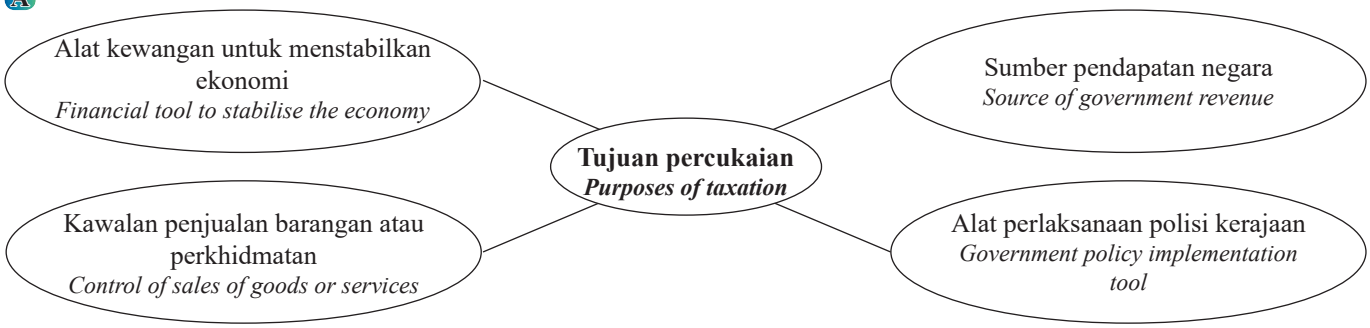
5 (*c*) (i) RM30 000 – RM600
= RM29 400
RM29 400 × $\frac{20}{100}$ + RM600 = RM6 480

(ii) RM0
Kos rawatan RM450 adalah kurang daripada deduktibel RM600.
The treatment cost of RM450 *is less than the deductible of* RM600.

BAB 4

SK 4.1

A



B

1 Cukai pintu/*Property assessment tax*
2 Cukai pendapatan/*Income tax*
3 Cukai tanah/*Quit rent*
4 Cukai jalan/*Road tax*
5 Cukai jualan/*Sales tax*
6 Cukai perkhidmatan/*Service tax*

C

1 Taksir sendiri/*Self-assessment*
(*a*) 2020
(*b*) 30 April
(*c*) 30 Jun/*June*

2 Simpan rekod/*Keep records*
(*a*) 7 tahun/7 *years*

3 Bayaran/*Payment*
(*a*) Lembaga Hasil Dalam Negeri (LHDN), potongan cukai bulanan (PCB)
Inland Revenue Board (IRB), *monthly tax deduction* (PCB)

D

1 Boleh didenda RM1 000 hingga RM20 000 atau penjara tidak lebih 3 tahun atau kedua-duanya dan penalti 300% atas cukai terkurang lapor.
Fine of RM1 000 *up to* RM20 000 *or imprisonment of not exceeding* 3 *years or both and penalty of* 300% *of the amount of tax which has been undercharged.*
2 Boleh didenda tidak melebihi RM2 000.
Fine of not exceeding RM2 000.
3 Tanah boleh dirampas atau dilucut hak.
The land can be seized.

E

1 Pendapatan bercukai/*Chargeable income*
= Jumlah pendapatan tahunan/*Total annual income* – pengecualian cukai/*tax exemption* – pelepasan cukai/*tax relief*
= RM95 400 – RM2 300 – RM11 200
= RM81 900

2 Pendapatan bercukai/*Chargeable income*
= Jumlah pendapatan tahunan/*Total annual income* – pengecualian cukai/*tax exemption* – pelepasan cukai/*tax relief*
= RM78 000 – RM7 500 – RM12 500
= RM58 000

3 Pendapatan bercukai/*Chargeable income*
= Jumlah pendapatan tahunan/*Total annual income* – pelepasan cukai/*tax relief*
= RM113 500 – (RM9 000 + RM6 850 + RM2 300)
= RM113 500 – RM18 150
= RM95 350

F

1 Cukai bagi 100 000 pertama = RM10 900
Tax on the first 100 000

Cukai atas baki berikutnya
Tax on the next balance
= (RM105 200 – RM100 000) × 24%
= RM1 248

Cukai pendapatan/*Income tax*
= RM10 900 + RM1 248
= RM12 148

2 Cukai bagi RM50 000 pertama = RM1 800
Tax on the first RM50 000

Cukai atas baki berikutnya
Tax on the next balance
= (RM51 250 – RM50 000) × 14%
= RM175

Cukai pendapatan/*Income tax*
= RM1 800 + RM175 – RM1 050
= RM925

3 Cukai bagi RM35 000 pertama = RM600
Tax on the first RM35 000

Cukai atas baki berikutnya
Tax on the next balance
= (RM35 380 – RM35 000) × 8%
= RM30.40

Cukai pendapatan/*Income tax*:
RM600 + RM30.40 – RM300 = RM330.40

G

1 Pendapatan bercukai/*Chargeable income*
= jumlah pendapatan/*total annual income* – pengecualian cukai/*tax exemption* – pelepasan cukai/*tax relief*
= RM52 350 – RM400 – RM18 500
= RM33 450

Cukai bagi RM20 000 pertama = RM150
Tax on the first RM20 000

Cukai atas baki berikutnya
Tax on the next balance
= (RM33 450 – RM20 000) × 3%
= RM403.50

Rebat yang layak
Eligible rebate
= RM400

Cukai pendapatan yang perlu dibayar
Income tax payable
= RM150 + RM403.50 – RM400
= RM153.50

2 Pendapatan bercukai/*Chargeable income*
= jumlah pendapatan/*total income* – pelepasan cukai/*tax relief*
= RM73 210 – RM18 200
= RM55 010

Cukai bagi RM50 000 pertama = RM1 800
Tax on the first RM50 000

Cukai atas baki berikutnya
Tax the next balance
= (RM55 010 – RM50 000) × 14%
= RM701.40

Rebat yang layak (Zakat) = RM600
Eligible rebate

Cukai pendapatan yang perlu dibayar
Income tax payable
= RM1 800 + RM701.40 – RM600
= RM1 901.40

Jumlah PCB yang dipotong
Total PCB *deduction*
= RM250 × 12
= RM3 000

Cukai yang perlu dibayar < PCB
Tax payable < PCB

Lebihan potongan
Excess deduction
= RM3 000 – RM1 901.40
= RM1 098.60

Maka, lebihan potongan PCB akan dipulangkan oleh LHDN ke dalam akaun bank Puan Ramlah sebanyak RM1 098.60.
Then, *excess deduction of* PCB *will be refunded by* IRB *to Puan Ramlah's bank account as much as* RM1 098.60.

H

1

Perkara *Item*	**Taksiran cukai bersama** *Joint tax assessment*	**Taksiran cukai berasingan** *Separate tax assessment*	
	Suami dan isteri/*Husband and wife*	**Suami/*Husband***	**Isteri/*Wife***
Jumlah pendapatan/*Total income*	RM81 600 + RM66 000 = RM147 600	RM81 600	RM66 000
Jumlah pengecualian (derma) *Total exemption* (*donation*)	RM1 000	RM500	RM500
Pelepasan cukai/*Tax relief*			
Individu/*Individual*	RM9 000	RM9 000	RM9 000
Gaya hidup (Had RM2 500) *Lifestyle* (*Limited to* RM2 500)	RM2 500	RM2 500	RM2 500
Suami/Isteri (had RM4 000) *Husband/Wife* (*limited* RM4 000)	RM4 000	RM0	RM0
Insurans hayat (Had RM7 000) *Life insurance* (*Limited to* RM7 000)	RM7 000	RM4 500	RM3 800
Insurans perubatan (Had RM3 000) *Medical insurance* (*Limited to* RM3 000)	RM3 000	RM2 500	RM1 850
Pendapatan bercukai ***Chargeable income***	RM121 100	RM62 600	RM48 350
Cukai dasar *Base tax*	RM10 900 (100 000 pertama) (*On the first* 100 000)	RM1 800 (50 000 pertama) (*On the first* 50 000)	RM600 (35 000 pertama) (*On the first* 35 000)
Cukai atas baki *Tax on the next balance*	Baki/*Balance* RM121 100 – RM100 000 = RM21 100 RM21 100 × 24% = RM5 040	Baki/*Balance* RM62 000 – RM50 000 = RM12 600 RM12 600 × 14% = RM1 764	Baki/*Balance* RM48 350 – RM35 000 = RM13 350 RM13 350 × 8% = RM1 068
Rebat cukai/*Tax rebate*	RM0	RM0	RM0
Cukai pendapatan yang perlu dibayar *Income tax payable*	RM10 900 + RM5 040 = RM15 940	RM1 800 + RM1 764 = RM3 564	RM600 + RM1 068 = RM1 668
		RM5 232	

2

Perkara *Item*	**Taksiran cukai bersama** *Joint tax assessment*	**Taksiran cukai berasingan** *Separate tax assessment*	
	Suami dan isteri/*Husband and wife*	**Suami/*Husband***	**Isteri/*Wife***
Jumlah pendapatan tahunan *Annual income*	RM62 400 + RM55 000 = RM117 400	RM62 400	RM55 000
Pelepasan cukai/*Tax relief*			
Individu/*Individual*	RM9 000	RM9 000	RM9 000
Gaya hidup (Had RM2 500) *Lifestyle* (*Limited to* RM2 500)	RM2 500	RM2 200	RM2 500
Suami/Isteri (had RM4 000) *Husband/Wife* (*limited* RM4 000)	RM4 000	RM0	RM0
Tabung bersih/*Net deposit in* SSPN (Had/*Limited to* RM8 000)	RM8 000	RM5 500	RM5 000

Insurans hayat dan KWSP (Had RM7 000) *Life insurance and EPF (Limited to* RM7 000)	RM7 000	RM6 600	RM5 500
Pendapatan bercukai *Chargeable income*	RM86 900	RM39 100	RM33 000
Cukai dasar *Base tax*	RM4 600 (RM70 000 pertama) (*On the first* RM70 000)	RM600 (RM35 000 pertama) (*On the first* RM35 000)	RM150 (RM20 000 pertama) (*On the first* RM20 000)
Cukai atas baki *Tax on the next balance*	Baki/*Balance* RM86 900 – RM70 000 = RM16 900 = RM16 900 × 21% = RM3 549	Baki/*Balance* RM39 100 – RM35 000 = RM4 100 × 8% = RM328	Baki/*Balance* RM33 000 – RM20 000 = RM13 000 = RM13 000 × 3% = RM390
Rebat cukai/*Tax rebate* (zakat)	RM1 000	RM500	RM500
Cukai pendapatan yang perlu dibayar *Income tax payable*	RM4 600 + RM3 549 – RM1 000 = RM7 149	RM600 + RM328 – RM500 = RM428	RM150 + RM390 – RM500 = RM40
		RM468	

I

1 Cukai jalan motosikal/*Road tax for motorcycle* (153 cc) = RM30.00
Cukai jalan kereta/*Road tax for car* (1 650 cc)
= RM200 + (1 650 – 1 600) × RM0.40
= RM200 + RM20
= RM220

2 Jumlah cukai pintu/*Property assessment tax*
= kadar cukai pintu/*property assessment tax rate* × nilai tahunan/*annual value*
= 5% × (RM1 600 × 12)
= RM960 setahun/*per year*

3 Jumlah cukai tanah/*Quit rent*
= kadar cukai tanah setiap unit keluasan/*quit rent rate per unit area* × jumlah keluasan tanah/*total land area*
= RM0.50 × 145
= RM72.50

4 Cukai perkhidmatan/*Service tax*
= RM54.50 × 6%
= RM3.27

Jumlah yang perlu dibayar/*Amount to be paid*
= RM54.50 + RM3.27
= RM57.77

J

1 (*a*) Jumlah rebat cukai/*Total tax rebate*
= RM400 + RM100
= RM500

(*b*) Pendapatan bercukai = RM33 050
Chargeable income

Cukai bagi RM20 000 pertama = RM150
Tax on the first RM20 000

Cukai atas baki berikutnya
Tax on the next balance
= (RM33 050 – RM20 000) × 3%
= RM391.50

Cukai pendapatan/*Income tax*
= RM150 + RM391.50 – RM500
= RM41.50

2 (*a*) Pendapatan bercukai/*Chargeable income*
= (RM5 100 × 12) – (RM9 000 + RM2 500 + RM4 000 + RM6 000 + RM5 300)
= RM34 400

(*b*) Pendapatan bercukai < RM 35 000, Encik Firdaus layak mendapat rebat cukai RM400.
Chargeable income < RM35 000, *Encik Firdaus eligible to receive tax rebate* RM400.

Jumlah rebat cukai/*Total tax rebate*
= RM400 + RM150
= RM550

(*c*) Cukai dasar/*Base tax* = RM150

Cukai atas baki/*Tax on the next balance*
= (RM34 400 – RM20 000) × 3%
= RM432

Cukai pendapatan/*Income tax*
= RM150 + RM432 – RM550
= RM32

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 B 2 C 3 D 4 B 5 C 6 C

Kertas 2/*Paper 2*

1 (*a*) Cukai pintu/*Property assessment* = 24 000 × 0.12
= RM2 880

(*b*) Selepas 15 hari, waran tahanan dalam Borang F akan dikeluarkan dan harta mudah alih Puan Diana akan disita.
After 15 *days*, *a detention warrant in Form F will be issued and portable property could be seized*.

2 (*a*) 2 000 cc:

Cukai jalan/*Road tax*
= 280 + (2 000 – 1 800)(0.50)
= RM380

1 750 cc:
Cukai jalan/*Road tax*
= 200 + (1 750 – 1 600)(0.40)
= RM260

Jumlah cukai jalan/*Total amount of road tax*
= RM380 + RM360
= RM640

(*b*) Kenderaan Puan Mariam perlu dihantar ke Puspakom untuk diperiksa sebelum beliau boleh mengaktifkan kembali cukai jalan beliau.
Puan Mariam's car needs to be sent to Puspakom to be checked before she can renew her road tax.

3 Pendapatan bercukai/*Chargeable income*
= RM120 000 – RM9 000 – RM7 000 – RM3 000 – RM1 500 – RM1 200
= RM92 300

(*a*) Rebat/*Rebate* = RM2 000

(*b*) Pendapatan bercukai/*Chargeable income* = RM92 300
Cukai dasar/*Base tax* = RM4 600
Cukai atas baki/*Tax on the next balance* = (92 300 – 70 000) × 21%
= RM4 683
Cukai pendapatan/*Income tax* = RM4 600 + RM4 683 – RM2 000
= RM7 283

(*c*) PCB setahun/*per year* = 500 × 12 = RM6 000
PCB < Cukai pendapatan/*Income tax*

PCB Encik Marzuki tidak mencukupi. Beliau perlu membuat penambahan bayaran kepada LHDN sebanyak RM1 283.
Encik Marzuki's PCB *is not enough. He needs to make an additional payment to the IRB as much as* RM1 283.

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 1/*Paper 1*

1 D 2 C 3 D 4 B 5 D

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 (*a*) Salah, kerana Puan Ilham tidak perlu menolak rebat cukai.
Wrong, *because Puan Ilham does not need to subtract tax rebate*.

(*b*) Pendapatan bercukai / *Chargeable income*
= RM69 200 – RM18 500 – RM470
= RM50 230

Cukai pendapatan / *Income tax*
$= \text{RM1 800} - (\text{RM50 230} - \text{RM50 000}) \times \left(\frac{13}{100}\right) - 1\ 260$
= RM569.90

2 Gaji / *Salary* = RM56 000
Derma / *Donation* = RM200
Pendapatan bercukai / *Chargeable income*
= 56 000 – 200 – 9 000 – 1 800 – 3 000
= RM42 000

Bahagian B/*Section* B

3 (*a*) Pendapatan bercukai Encik Farqan / *Encik Farqan's chargeable income*
= RM77 600 – RM12 600 – RM9 000 – RM3 360 – RM2 500
= RM50 140

(*b*) Cukai pendapatan / *Income tax*
$= \text{RM1 800} + \left[(\text{RM50 140} - \text{RM50 000}) \times \frac{13}{100}\right] - \text{RM840}$
= RM1 800 + RM18.20 – RM840
= RM978.20

(*c*) (i) Potongan cukai bulanan (PCB) pada tahun tersebut
Monthly tax deduction (PCB) *in that year*
= RM120 × 12
= RM1 440

Tidak perlu, RM1 440 melebihi RM978.20.
No need, RM1 440 *exceeds* RM978.20.

(ii) LHDN perlu memulangkan lebihan kepada Encik Farqan.
IRB *should refund the excess deduction to Encik Farqan.*

BAB 5

SK 5.1

A

1 Kongruen/*Congruent*
2 Tidak kongruen/*Not congruent*
3 Kongruen/*Congruent*

B

1

Sudut/*Angle*	$\angle BAC = \angle NMP$
Sudut/*Angle*	$\angle ACB = \angle SPR$
Sudut/*Angle*	$\angle CBA = \angle MPN$

2

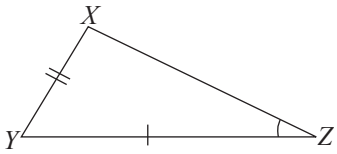
Sisi/*Side*	$FD = CA$
Sudut/*Angle*	$\angle FDE = \angle CAB$
Sisi/*Side*	$DE = AB$

3

Sisi/*Side*	$AB = UT$
Sisi/*Side*	$BC = TS$
Sudut/*Angle*	$\angle BCA = \angle TSU$

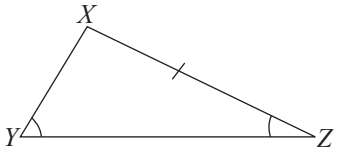
C

1



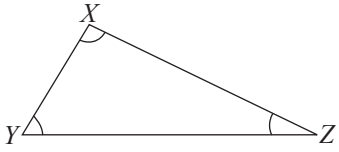
Sisi-Sisi-Sudut/*Side-Side-Angle* (SSA)

2



Sudut-Sudut-Sisi/*Angle-Angle-Side* (AAS)

3



Sudut-Sudut-Sudut/*Angle-Angle-Angle* (AAA)

D

1 (*a*) $DC = \sqrt{FC^2 + DF^2}$
$= \sqrt{(8 \div 2)^2 + (6 - 3)^2}$
$= \sqrt{4^2 + 3^2}$
$= 5$ cm

(*b*) $\angle DCB = \angle DEA = 135°$

(*c*) Perimeter = 8 cm + 3 cm + 5 cm + 5 cm + 3 cm
= 24 cm

2 (*a*) $\angle MPO = 360° - 90° - 71.6° - 135°$
$= 63.4°$

(*b*) $PN = \sqrt{PO^2 + ON^2}$
$= \sqrt{2^2 + 4^2}$
$= 4.47$ cm

SK 5.2

A

1 $\angle ACB = \angle PMN$

$\angle NPM = 180° - 36° - 88°$
$= 56°$

$\angle NPM = \angle BAC$

$\angle ABC = 180° - 36° - 56°$
$= 88°$

$\angle ABC = \angle PNM$

∴ Pasangan objek geometri adalah serupa./*The pair of the geometric object are similar.*

2 $\angle SUV = \angle CBA$
$\angle UVT = \angle BAD$
$\angle ADC = \angle VTS$
$\angle BCD = \angle UST$

$\frac{ST}{CD} = \frac{SU}{CB} = \frac{UV}{BA} = \frac{VT}{AD} = 2$

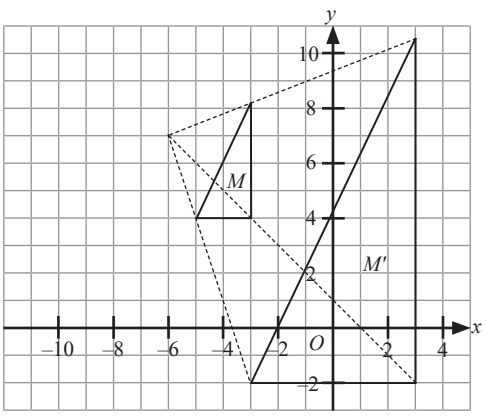
∴ Pasangan objek geometri adalah serupa./*The pair of the geometric object are similar.*

3 $\angle BCD = \angle EHG$
$\angle CDA = \angle HGF$
$\angle DAB = \angle GFE$
$\angle ABC = \angle FEH$
$\frac{BC}{EH} \neq \frac{CD}{HG}$

∴ Pasangan objek geometri adalah tidak serupa./*The pair of the geometric object are not similar.*

B

1

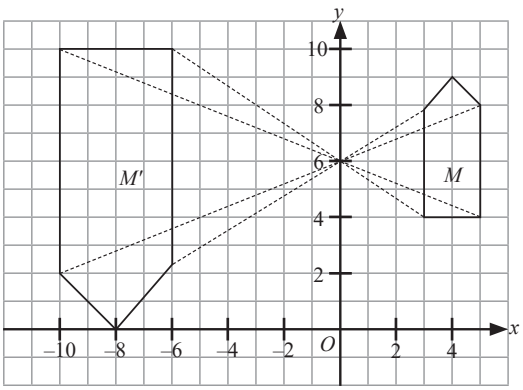


Faktor skala/*Scale factor*, $k = \frac{6}{2}$
$= 3$

Pusat pembesaran/*Centre of enlargement* = (−6, 7)

∴ *M'* ialah imej bagi *M* di bawah suatu pembesaran pada pusat (−6, 7) dengan faktor skala 3.
M' is the image of M under an enlargement at centre (−6, 7) *with a scale factor of* 3.

2



Faktor skala/*Scale factor*, $k = -\frac{4}{2}$

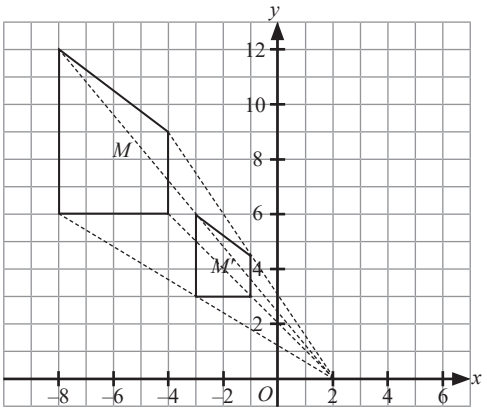
$= -2$

Pusat pembesaran/*Centre of enlargement* = (0, 6)

∴ M' ialah imej bagi M di bawah suatu pembesaran pada pusat (0, 6) dengan faktor skala −3.

M' is the image of M under an enlargement at centre (0, 6) *with a scale factor of* −3.

3



Faktor skala/*Scale factor*, $k = \frac{2}{4}$

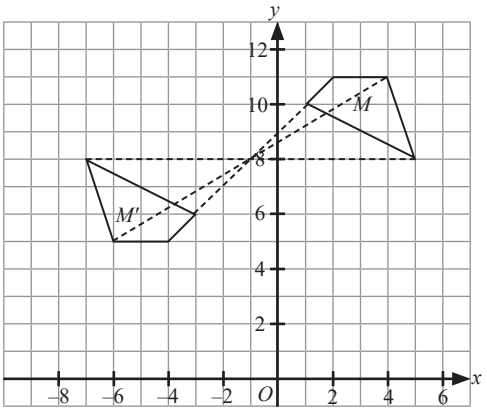
$= \frac{1}{2}$

Pusat pembesaran/*Centre of enlargement* = (2, 0)

∴ M' ialah imej bagi M di bawah suatu pembesaran pada pusat (2, 0) dengan faktor skala $\frac{1}{2}$.

M' is the image of M under an enlargement at centre (2, 0) *with a scale factor of* $\frac{1}{2}$.

4



Faktor skala/*Scale factor*, $k = -\frac{2}{2}$

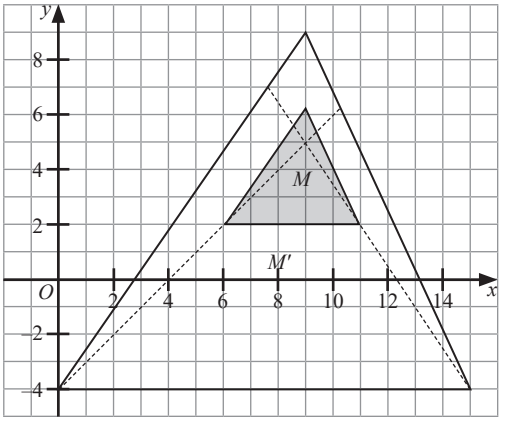
$= -1$

Pusat pembesaran/*Centre of enlargement* = (−1, 8)

∴ M' ialah imej bagi M di bawah suatu pembesaran pada pusat (−1, 8) dengan faktor skala −1.

M' is the image of M under an enlargement at centre (−1, 8) *with a scale factor of* −1.

5



Faktor skala/*Scale factor*, $k = \frac{15}{5}$

$= 3$

Pusat pembesaran/*Centre of enlargement* = (9, 5)

∴ M' ialah imej bagi M di bawah suatu pembesaran pada pusat (9, 5) dengan faktor skala 3.

M' is the image of M under an enlargement at centre (9, 5) *with a scale factor of* 3.

6 Faktor skala/*Scale factor*, $k = -\frac{3}{6}$

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

Pusat pembesaran/*Centre of enlargement* = (11, 2)

$\therefore$ M' ialah imej bagi M di bawah suatu pembesaran pada pusat (11, 2) dengan faktor skala $-\frac{1}{2}$.

M' is the image of M under an enlargement at centre (11, 2) *with a scale factor of* $-\frac{1}{2}$.

C

1 Objek/*Object*: *A*
Imej/*Image*: *B*

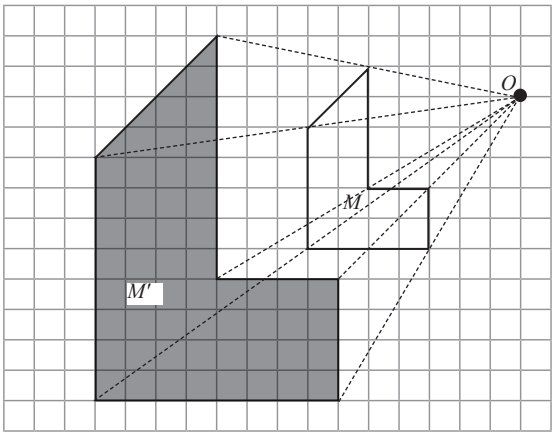
2 Objek/*Object*: *A*
Imej/*Image*: *B*

3 Objek/*Object*: *B*
Imej/*Image*: *A*

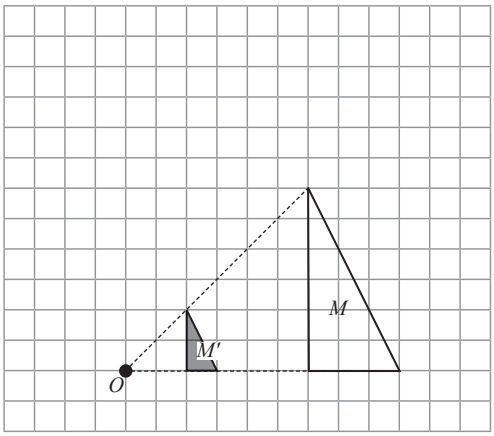
4 Objek/*Object*: *B*
Imej/*Image*: *A*

D

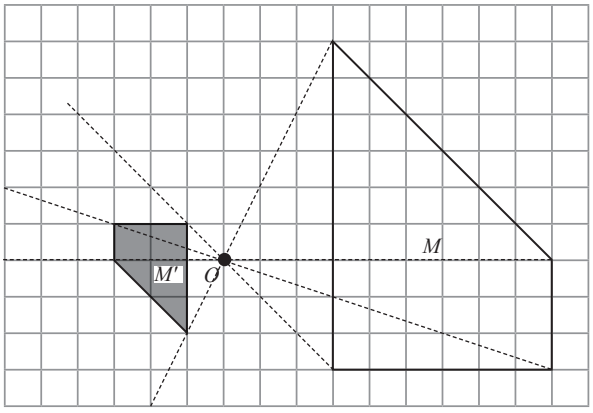
1



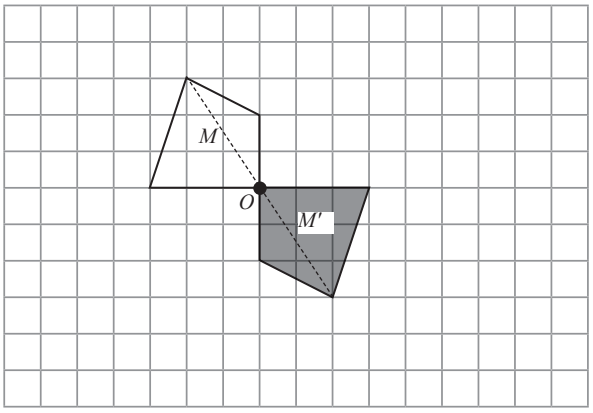
2



3

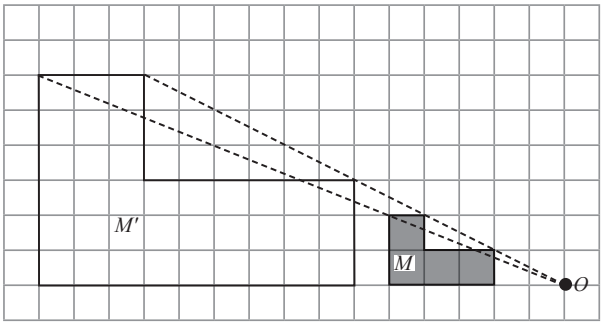


4

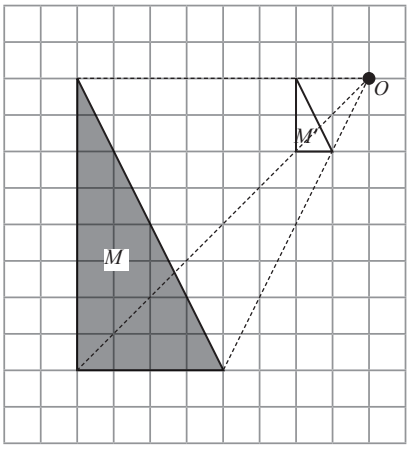


E

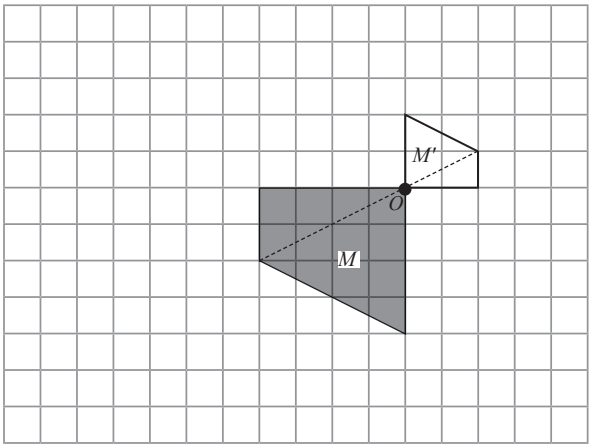
1



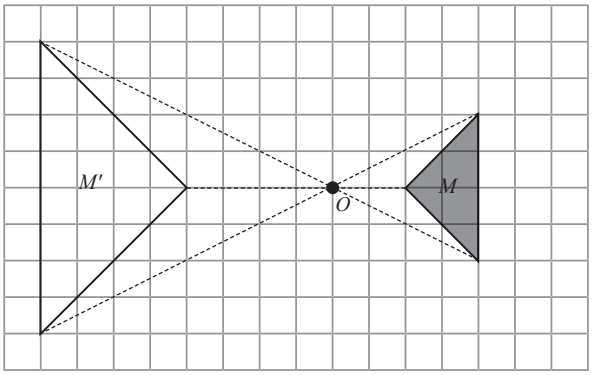
2



3



4



F

	Luas objek *Area of an object*	**Faktor skala, *k*** *Scale factor, k*	**Luas imej** *Area of an image*
1			$3^2 \times 18 = 162\ m^2$
2			$\left(\frac{1}{2}\right)^2 \times 20 = 5\ m^2$
3			$4^2 \times 25 = 400\ m^2$
4			$\left(\frac{1}{4}\right)^2 \times 32 = 2\ m^2$
5	$84 \div 2^2 = 21\ m^2$		
6		$\sqrt{243 \div 27} = 3$	
7		$\sqrt{250 \div 10} = 5$	
8	$392 \div 7^2 = 8\ m^2$		

G

1 (*a*) $k = \frac{4}{8}$

$= \frac{1}{2}$

(*b*) Luas *ABCDE*/*Area of ABCDE* $= 84 \div \left(\frac{1}{2}\right)^2$

$= 336\ m^2$

$\therefore$ Luas kawasan berlorek/*Area of the shaded region* $= 336\ m^2 + 64\ m^2$

$= 272\ m^2$

2 (*a*) Panjang *FE*/*Length of FE* $= \frac{1}{2} \times 180$

$= 120 \text{ m}^2 \times 100$

$= 12\,000 \text{ cm}^2$

(*b*) $k = \frac{180}{120}$

$= \frac{3}{2}$

Luas *ABCD*/*Area of ABCD* $= \left(\frac{3}{2}\right)^2 \times 1\,200$

$= 2\,700 \text{ m}^2$

∴ Luas kawasan tidak berlorek/*Area of the unshaded region* $= 2\,700 \text{ m}^2 - 1\,200 \text{ m}^2$

$= 1\,500 \text{ m}^2$

SK 5.3

A

1 $P(6, -3) \xrightarrow{\mathbf{N}} P'(2, -1) \xrightarrow{\mathbf{N}} P''(-2, 1)$

∴ Koordinat imej *P* ialah (–2, 1)./*Coordinate of image P is* (–2, 1).

2 $P(-3, 2) \xrightarrow{\mathbf{K}} P'(-4, -2) \xrightarrow{\mathbf{M}} P''(6, -2)$

∴ Koordinat imej *P* ialah (6, –2)./*Coordinate of image P is* (6 –2).

3 $P(6, 4) \xrightarrow{\mathbf{U}} P'(0, 4) \xrightarrow{\mathbf{T}} P''(1, -3)$

∴ Koordinat imej *P* ialah (1, –3)./*Coordinate of image P is* (1, –3).

4 $P(6, 4) \xrightarrow{\mathbf{T}} P'(3, 1) \xrightarrow{\mathbf{S}} P''(6, 1)$

∴ Koordinat imej *P* ialah (6, 1)./*Coordinate of image P is* (6, 1).

5 $P(-3, 2) \xrightarrow{\mathbf{K}} P'(1, 4) \xrightarrow{\mathbf{U}} P''(1, -2)$

∴ Koordinat imej *P* ialah (1, –2)./*Coordinate of image P is* (1, –2).

B

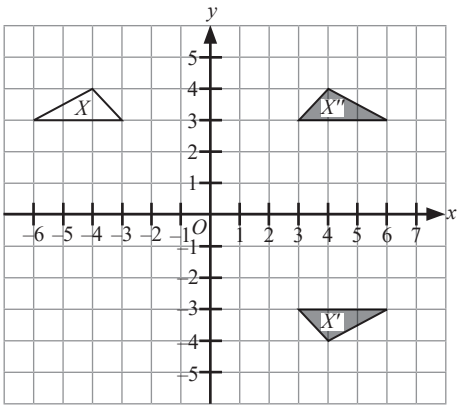
1 (*a*) *R*
(*b*) *Q*
(*c*) *S*
(*d*) *X*
(*e*) *Z*
(*f*) *W*

C

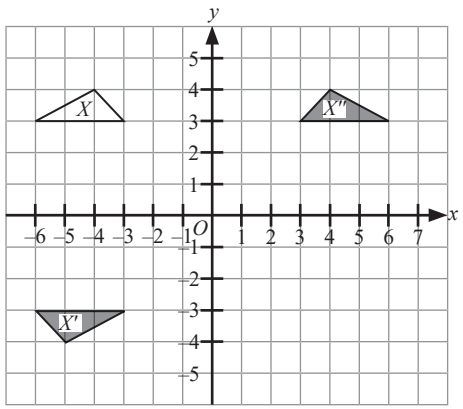
1 (*a*) *A*
(*b*) *H*
(*c*) *G*
(*d*) *E*
(*e*) *C*
(*f*) *B*

D

1 (*a*)

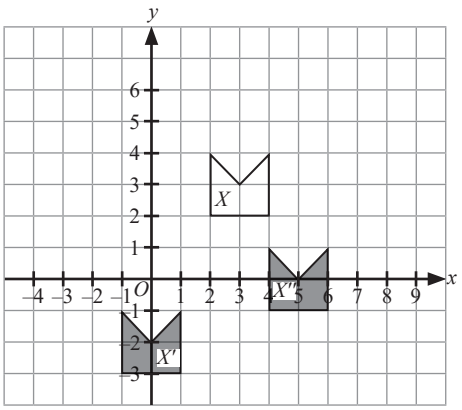


(*b*)

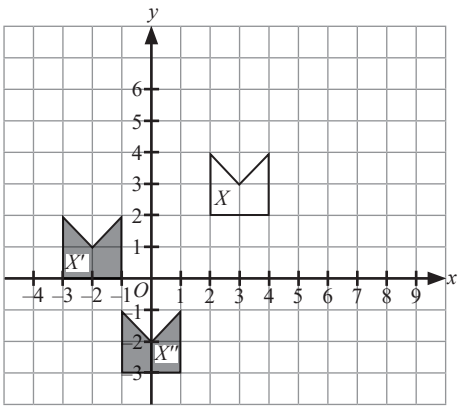


Kesimpulan/*Conclusion*:
Imej gabungan transformasi **AB** tidak sama dengan gabungan transformasi **BA**.
Image for combined transformation of **AB** *not same as combined transformation* **BA**.
Gabungan transformasi **AB** tidak mematuhi sifat kalis tukar tertib.
The combined transformation **AB** *does not satisfy the commutative law*.

2 (*a*)



(*b*)



Kesimpulan/*Conclusion*:
Imej gabungan transformasi **AB** tidak sama dengan gabungan transformasi **BA**.
Image for combined transformation of **AB** *not same as combined transformation* **BA**.
Gabungan transformasi **AB** tidak mematuhi sifat kalis tukar tertib.
The combined transformation **AB** *does not satisfy the commutative law*.

E

1 **B**: Pantulan pada garis $x = 4$./*Reflection on line* $x = 4$.
A: Pembesaran pada pusat (8, 7) dengan faktor skala 3./*Enlargement at centre* (8, 7) *with scale factor* 3.

2 **B**: Translasi/*Translation* $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$
A: Pembesaran pada pusat (8, 7) dengan faktor skala 2./*Enlargement at centre* (8, 7) *with scale factor* 2.

3 **B**: Pembesaran pada pusat (–4, 3) dengan faktor skala 2./*Enlargement at centre* (–4, 3) *with scale factor* 2.
A: Putaran 90° ikut arah jam pada pusat (2, 0)./*Rotation of* 90° *clockwise at centre* (2, 0).

4 **B**: Translasi/*Translation* $\begin{pmatrix} 7 \\ 6 \end{pmatrix}$
A: Pantulan pada paksi-*y*./*Reflection on the y-axis*.

F

1 (*a*) **T**: Putaran 90° lawan arah jam pada pusat (–2, 0)./*Rotation of* 90° *anticlockwise at centre* (–2, 0).
S: Pembesaran pada pusat *E* dengan faktor skala 3./*Enlargement at centre E with scale factor* 3.

(*b*) Luas *GEH*/*Area of GEH* $= 3^2 \times 12.5$
$= 112.5 \text{ m}^2$

$\therefore$ Luas kawasan berlorek/*Area of the shaded region* $= 112.5 \text{ m}^2 - 12.5 \text{ m}^2$
$= 100 \text{ m}^2$

2 (*a*) **U**: Pembesaran pada pusat (11, 5) dengan faktor skala $\frac{1}{2}$./*Enlargement at centre* (11, 5) *with scale factor* $\frac{1}{2}$.
M: Pantulan pada garis $x = 7$./*Reflection on line* $x = 7$.

(*b*) Luas *TSPL*/*Area of TSPL* $= \left(\frac{1}{2}\right)^2 \times 50$
$= 12.5 \text{ m}^2$

$\therefore$ Luas kawasan berlorek/*Area of the shaded region* $= 12.5 \text{ m}^2$

SK 5.4

A

1 Teselasi/*Tessellation*
2 Bukan teselasi/*Not a tessellation*
3 Teselasi/*Tessellation*

B Jawapan mengikut kreativiti murid./*Answers according to students' creativity.*

C

1 Pantulan pada garis *XY*./*Reflection on line XY.*
2 Putaran 180° ikut arah jam pada pusat *O*./*Rotation of* 180° *clockwise at centre O.*
3 Teselasi./*Tessellation.*
4 Putaran 90° ikut arah jam pada pusat *X*./*Rotation of* 90° *clockwise at centre X.*

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 C 2 C 3 C 4 C 5 A 6 B

Kertas 2/*Paper 2*

1 Penjelmaan **N**: Putaran 90° lawan arah jam pada pusat (6, 2).
Transformation **N**: *Rotation of* 90° *anticlockwise at centre* (6, 2).

Penjelmaan **M**: Pantulan pada $x = 0$.
Transformation **M**: *Reflection on* $x = 0$.

2 (*a*) Penjelmaan **T**: Putaran 90° lawan arah jam pada pusat (9, 0).
Transformation **T**: *Rotation of* 90° *anticlockwise at centre* (9, 0).

Penjelmaan **S**: Pembesaran pada pusat *I* dengan faktor skala 3.
Transformation **S**: *Enlargement at centre I with scale factor* 3.

(*b*) Luas *IJKL*/*Area of IJKL* $= 3^2 \times 12$
$= 108 \text{ m}^2$

$\therefore$ Luas kawasan berlorek/*Area of the shaded region* $= 108 \text{ m}^2 - 12 \text{ m}^2$
$= 96 \text{ m}^2$

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 1/*Paper 1*

1 D 2 A 3 D 4 C 5 D 6 D

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 (*a*) Ya / *Yes*
$AB = BC$

(*b*) Pembesaran pada pusat (3, 2) dengan faktor skala $-\frac{1}{2}$.
Enlargement at center (3, 2) *with a scale factor of* $-\frac{1}{2}$.

2 (*a*) (i) $M' = (3, 0)$

(ii) Putaran lawan arah jam pada pusat (–4, 2).
Anticlockwise rotation at centre (–4, 2).

atau / *or*

Putaran ikut arah jam pada pusat (1, –7).
Clockwise rotation at centre (1, –7).

(*b*) Translasi / *Translation* $\begin{pmatrix} 11 \\ 11 \end{pmatrix}$

atau / *or*

Pantulan pada garis $y = -x$.
Reflection on line $y = -x$.

3 $\frac{1}{2} \times$ tapak $\times$ tinggi = luas segi tiga

$\frac{1}{2} \times$ *base* $\times$ *height* = *area of triangle*

$$\frac{1}{2}(x)(2 + x) = 7.5$$
$$x^2 + 2x - 15 = 0$$
$$(x - 3)(x + 5) = 0$$

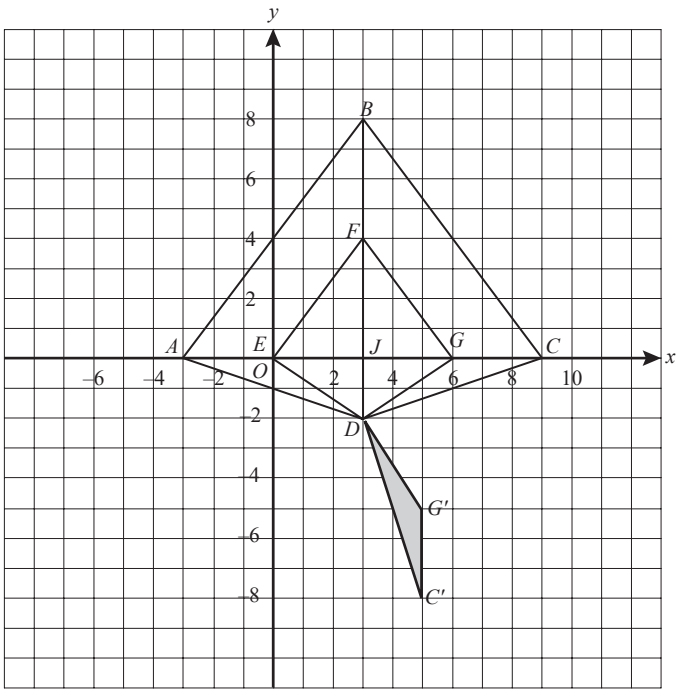
$x = 3, x = -5$
$x > 0, x = 3$

$y = 2(2 + x)$
$= 2(2 + 3)$
$= 10$ cm

Bahagian B/*Section* B

4 (*a*) *DEF* dan *DGF*, *DAB* dan *DCB*, *EFJ* dan *GFJ*.
DEF and DGF, DAB and DCB, EFJ and GFJ.
(Terima mana-mana jawapan yang munasabah)
(*Accept any reasonable answer*)

(*b*)



(*c*) (i) **Q**: Pantulan pada garis $x = 3$.
Reflection on line $x = 3$.

(ii) $k = \frac{6}{3}$
$= 2$

P: Pembesaran pada titik J dengan faktor skala, $k = 2$.
Enlargement at point J with the scale factor, $k = 2$.

5 (*a*) (i) Pembesaran pada pusat $(2, -4)$ dengan faktor skala $-\frac{1}{2}$.
Enlargement at the centre of $(2, -4)$ *with the scale factor of* $-\frac{1}{2}$.

(ii) Putaran 180° pada asalan.
Rotation of 180° *at the origin.*

(*b*) Luas imej = $k^2 \times$ Luas objek
Area of image = $k^2 \times$ *Area of object*

$MNQSTU = \left(-\frac{1}{2}\right)^2 \times 125 \text{ cm}^2$
$= 31.25 \text{ cm}^2$

BAB 6

SK 6.1

A

1 $\alpha = 180° - 161°$
$= 19°$
∴ Sukuan/*Quadrant* II

2 $\alpha = 231° - 180°$
$= 51°$
∴ Sukuan/*Quadrant* III

3 $\alpha = 360° - 284°$
$= 76°$
∴ Sukuan/*Quadrant* IV

4 $\alpha = 360° - 325.4°$
$= 34.6°$
∴ Sukuan/*Quadrant* IV

5 $\alpha = 180° - 118.2°$
$= 61.8°$
∴ Sukuan/*Quadrant* II

6 $\alpha = 215.2° - 180°$
$= 35.2°$
∴ Sukuan/*Quadrant* III

7 $\alpha = 360° - 330°44'$
$= 29°16'$
∴ Sukuan/*Quadrant* IV

8 $\alpha = 190°51' - 180°$
$= 10°51'$
∴ Sukuan/*Quadrant* III

B

1 $\sin 149° = \sin (180° - \theta)$
$= \sin (180° - 149°)$
$= \sin 31°$

2 $\tan 192° = \tan (\theta - 180°)$
$= \tan (192° - 180°)$
$= \tan 12°$

3 $\text{kos/cos } 300° = \text{kos/cos } (360° - \theta)$
$= \text{kos/cos } (360° - 300°)$
$= \text{kos/cos } 60°$

4 $\sin 210°30' = -\sin (\theta - 180°)$
$= -\sin (210°30' - 180°)$
$= -\sin 30°30'$

5 $-\tan 102.8° = -\tan (180° - \theta)$
$= -\tan (180° - 102.8°)$
$= -\tan 77.2°$

6 $-\text{kos/cos } 257.2° = -\text{kos/cos } (\theta - 180°)$
$= -\text{kos/cos } (257.2° - 180°)$
$= -\text{kos/cos } 77.2°$

C

1 (*a*) $\sin \theta = 0.942$
(*b*) $\text{kos/cos } \theta = 0.412$
(*c*) $\tan \theta = \frac{0.942}{0.412}$
$= 2.2864$

2 (*a*) $\sin \theta = 0.5$
(*b*) $\text{kos/cos } \theta = -0.927$
(*c*) $\tan \theta = \frac{0.5}{-0.927}$
$= -0.5394$

3 (*a*) $\sin \theta = 0.903$
(*b*) $\text{kos/cos } \theta = -0.512$
(*c*) $\tan \theta = \frac{0.903}{-0.512}$
$= -1.7637$

4 (*a*) $\sin \theta = -0.788$
(*b*) $\text{kos/cos } \theta = -0.822$
(*c*) $\tan \theta = \frac{-0.788}{-0.822}$
$= 0.9586$

5 (*a*) $\sin \theta = -0.622$
(*b*) $\text{kos/cos } \theta = 0.724$
(*c*) $\tan \theta = \frac{-0.622}{0.724}$
$= -0.8591$

D

1 $\sin 153° = +\sin (180° - 153°)$
$= +\sin 27°$
$= 0.4540$

2 $\sin 198° = -\sin (198° - 180°)$
$= -\sin 18°$
$= -0.3090$

3 $\tan 197° = +\tan (197° - 180°)$
$= +\tan 17°$
$= 0.3057$

4 $\tan 124° = -\tan (180° - 124°)$
$= -\tan 56°$
$= -1.4826$

5 $\text{kos/cos } 120° = -\text{kos/cos } (180° - 120°)$
$= -\text{kos/cos } 60°$
$= -0.5$

6 $\text{kos/cos } 310° = +\text{kos/cos } (360° - 310°)$
$= +\text{kos/cos } 50°$
$= 0.6428$

7 $\tan 210°30' = +\tan (210°30' - 180°)$
$= +\tan 30°30'$
$= 0.5890$

8 $\sin 190°26' = -\sin (190°26' - 180°)$
$= -\sin 10°26'$
$= -0.1811$

9 $\text{kos/cos } 108°45' = -\text{kos/cos } (180° - 108°45')$
$= -\text{kos/cos } 71°15'$
$= -0.3214$

E

1 $\sin 210° = -\sin (210° - 180°)$
$= -\sin 30°$
$= -\frac{1}{2}$

$\text{kos/cos } 210° = -\text{kos/cos } (210° - 180°)$
$= -\text{kos/cos } 30°$
$= -\frac{\sqrt{3}}{2}$

$\tan 210° = +\tan (210° - 180°)$
$= +\tan 30°$
$= \frac{1}{\sqrt{3}}$

2 $\sin 300° = -\sin (360° - 300°)$
$= -\sin 60°$
$= -\frac{\sqrt{3}}{2}$

$\text{kos/cos } 300° = +\text{kos/cos } (360° - 300°)$
$= +\text{kos/cos } 60°$
$= \frac{1}{2}$

$\tan 300° = -\tan (360° - 300°)$
$= -\tan 60°$
$= -\sqrt{3}$

3 $\sin 120° = +\sin (180° - 120°)$
$= +\sin 60°$
$= \frac{\sqrt{3}}{2}$

kos/cos 120° = –kos/cos (180° – 120°)
= –kos/cos 60°
$= -\frac{1}{2}$

tan 120° = –tan (180° – 120°)
= –tan 60°
$= -\sqrt{3}$

F

1 Sudut rujukan sepadan/*Corresponding reference angle*
= $\sin^{-1}$ 0.3907
= 23°

Sukuan/*Quadrant* I: $\theta = 23°$

Sukuan/*Quadrant* II: $\theta = 180° - 23°$
$= 157°$

$\therefore \theta = 23°$ atau/*or* 157°

2 Sudut rujukan sepadan/*Corresponding reference angle*
= $\tan^{-1}$ 0.57741763

Sukuan/*Quadrant* I: $\theta = 10°$

Sukuan/*Quadrant* III: $\theta = 180° + 10°$
$= 190°$

$\therefore \theta = 10°$ atau/*or* 190°

3 Sudut rujukan sepadan/*Corresponding reference angle*
= $\text{kos}^{-1}/\cos^{-1}$ 0.7660
= 40°

Sukuan/*Quadrant* I: $\theta = 40°$

Sukuan/*Quadrant* IV: $\theta = 360° - 40°$
$= 320°$

$\therefore \theta = 40°$ atau/*or* 320°

4 Sudut rujukan sepadan/*Corresponding reference angle*
= $\text{kos}^{-1}/\cos^{-1}$ 0.8660
= 30°

Sukuan/*Quadrant* II: $\theta = 180° - 30°$
$= 150°$

Sukuan/*Quadrant* III: $\theta = 180° + 30°$
$= 210°$

$\therefore \theta = 150°$ atau/*or* 210°

5 Sudut rujukan sepadan/*Corresponding reference angle*
= $\sin^{-1}$ 0.6428
= 40°

Sukuan/*Quadrant* III: $\theta = 180° + 40°$
$= 220°$

Sukuan/*Quadrant* IV: $\theta = 360° - 40°$
$= 320°$

$\therefore \theta = 220°$ atau/*or* 320°

6 Sudut rujukan sepadan/*Corresponding reference angle*
= $\tan^{-1}$ 0.5774
= 30°

Sukuan/*Quadrant* II: $\theta = 180° - 30°$
$= 150°$

Sukuan/*Quadrant* IV: $\theta = 360° - 30°$
$= 330°$

$\therefore \theta = 150°$ atau/*or* $330°$

G

1 (*a*) $\angle BEC = \sin^{-1}\left(\frac{5}{13}\right)$
$= 22.62°$

$\angle DEC = 180° - 22.62°$
$= 157.38°$

(*b*) Panjang *BD*/*Length of BD* = 12 cm + 12 cm
= 24 cm

Panjang *AB*/*Length of AB* $= \sqrt{25^2 - 24^2}$
= 7 cm

Panjang *AC*/*Length of AC* = 5 cm + 7 cm
= 12 cm

SK 6.2

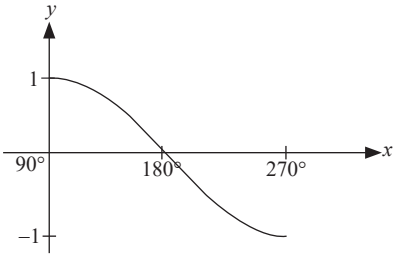
A

1 Graf tangen/*Tangent graph*
2 Graf sinus/*Sinus graph*
3 Graf kosinus/*Cosinus graph*
4 Graf sinus/*Sinus graph*
5 Graf tangen/*Tangent graph*
6 Graf kosinus/*Cosinus graph*

B

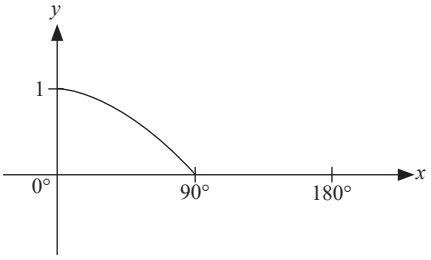
1

x	90°	180°	270°
y	1	0	−1



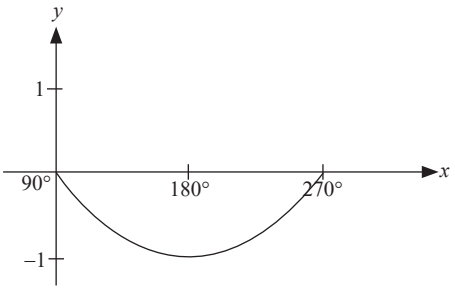
2

x	0°	90°
y	1	0



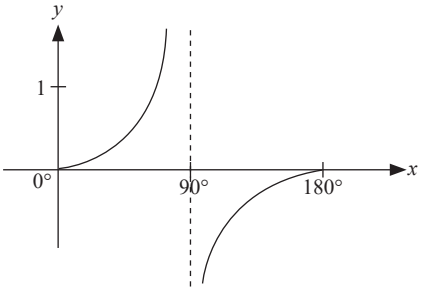
3

x	90°	180°	270°
y	0	−1	0



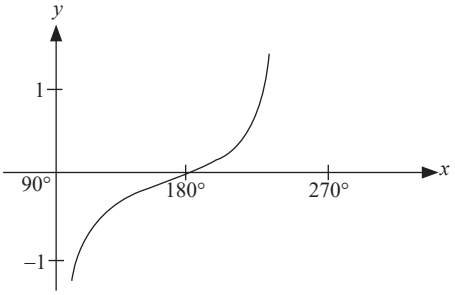
4

x	0°	90°
y	0	∞



5

x	90°	180°	270°
y	∞	0	∞



C

1 Amplitud/*Amplitude*, $a = \frac{1}{2}$

Tempoh/*Period* $= \frac{360°}{2}$

$= 180°$

2 Amplitud/*Amplitude*, $a = 1$

Tempoh/*Period* $= \frac{360°}{2}$

$= 180°$

3 Amplitud/*Amplitude*, $a = 3$

Tempoh/*Period* $= \frac{360°}{1}$

$= 360°$

4 Amplitud/*Amplitude*, $a = 1$

Tempoh/*Period* $= \frac{180°}{2}$

$= 90°$

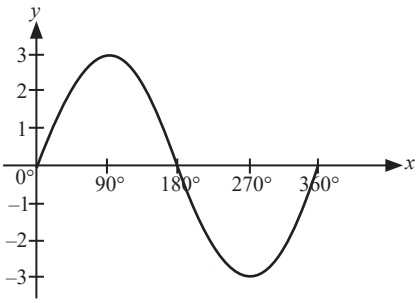
5 Amplitud/*Amplitude*, $a = 3$

Tempoh/*Period* $= \frac{180°}{4}$

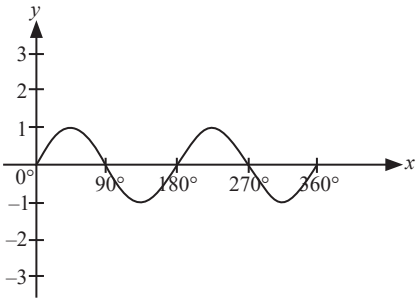
$= 45°$

D

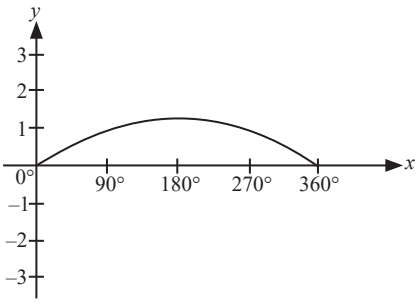
1



2



3



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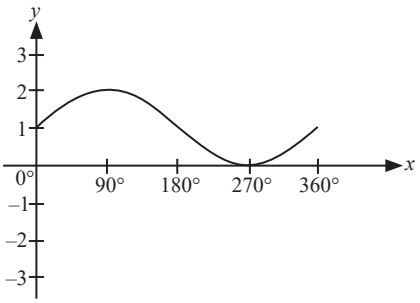
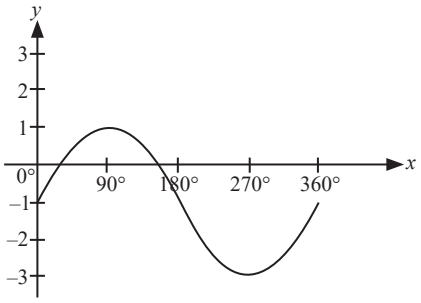
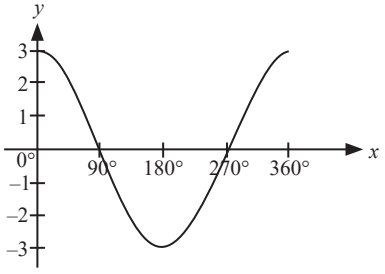


5

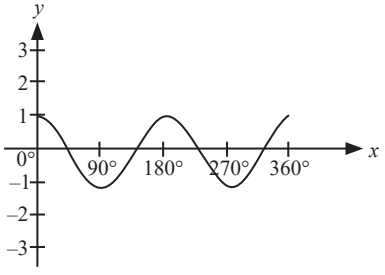


E

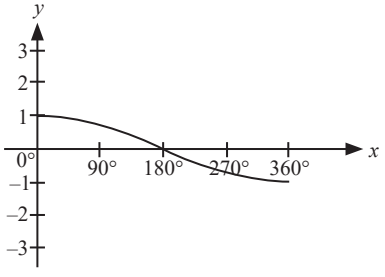
1



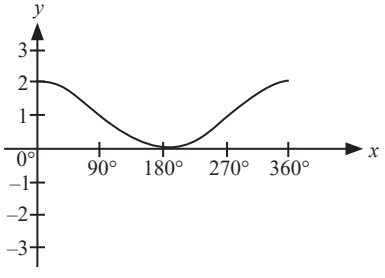
2



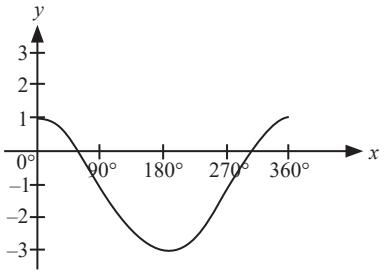
3



4

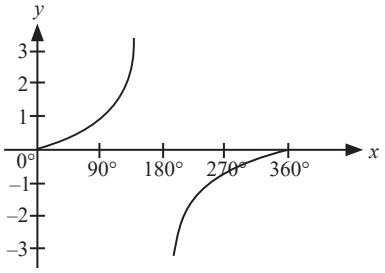


5

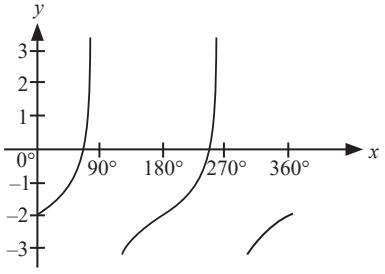


F

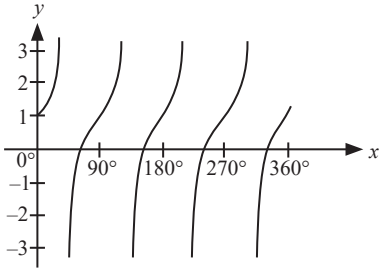
1



2



3



G

1 (*a*) Amplitud/*Amplitude* = 3 m

Tempoh/*Period* = 12 s

(*b*) $a = 3$

$b = 30$

$c = 1$

$\therefore y = 3 \sin 30 + 1$

(*c*) 1 meter

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 C 2 D 3 A 4 B 5 A

Kertas 2/*Paper 2*

1 (*a*) Sudut rujukan sepadan/*Corresponding reference angle* $= \sin^{-1} 0.6428$
$= 40°$

Sukuan/*Quadrant* III: $\theta = 180° + 40°$
$= 220°$

,

Sukuan/*Quadrant* IV: $\theta = 360° - 40°$
$= 320°$

$\therefore \theta = 220°$ atau/*or* $320°$

(*b*) Sudut rujukan sepadan/*Corresponding reference angle* $= \text{kos}^{-1}/\cos^{-1} 0.1736$
$= 80°$

Sukuan/*Quadrant* I: $\theta = 80°$

,

Sukuan/*Quadrant* IV: $\theta = 360° - 80°$
$= 280°$

$\therefore \theta = 80°$ atau/*or* $280°$

2 (*a*) $\tan 28° = \dfrac{\text{Panjang } DC/\textit{Length of } DC}{15}$

Panjang DC/*Length of* $DC = 7.98$ cm

Panjang ED/*Length of* $ED = \sqrt{39^2 - 15^2}$
$= 36$ cm

$\therefore$ Panjang EC/*Length of* $EC = 7.98$ cm $+ 36$ cm
$= 43.98$ cm

(*b*) $\angle EDA = \text{kos}^{-1}/\cos^{-1} \dfrac{36}{39}$
$= 22.62°$

$\angle CDA = 180° - 22.62°$
$= 157.38°$

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

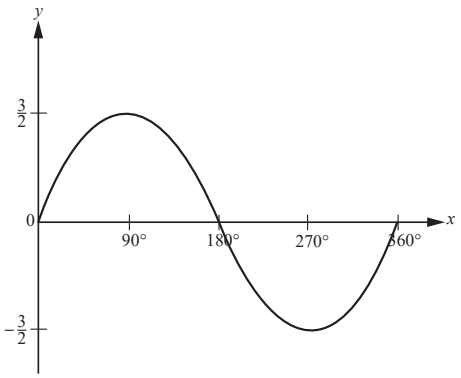
Kertas 1/*Paper 1*

1 C **2** A **3** A **4** C

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 (*a*)



(*b*) (i) $PR = \sqrt{30^2 + 15^2}$
$= 33.54$ cm

(ii) kos / cos $y° = \dfrac{30}{33.54}$ (Sukuan / *Quadrant* II)

kos / cos $y° = -0.89$

Bahagian C/*Section* C

2 $l = \frac{u^2}{g}(2 \sin \theta \text{ kos } \theta) / \frac{u^2}{g}(2 \sin \theta \cos \theta)$

$l = \frac{20^2}{10}(2 \sin 30° \text{ kos } 30°) / \frac{20^2}{10}(2 \sin 30° \cos 30°)$

$l = 40\left(2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2}\right)$

$l = 20\sqrt{3}$ m

$l = \frac{20^2}{10}(2 \sin 45° \text{ kos } 45°) / \frac{20^2}{10}(2 \sin 45° \cos 45°)$

$l = 40\left(2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}\right)$

$l = 40$ m

$\therefore$ Sudut pelancaran terbaik ialah 45°.
The best launching angle is 45°.

BAB 7

SK 7.1

A

1 Saiz selang kelas/*Size of class interval* $= \frac{92 - 15}{8}$

$= 9.63 \approx 10$

Selang kelas/*Class interval*:
15 – 24, 25 – 34, 35 – 44, 45 – 54, 55 – 64, 65 – 74, 75 – 84, 85 – 94

2 Saiz selang kelas/*Size of class interval* $= \frac{10 - 1}{5}$

$= 1.8 \approx 2$

Selang kelas/*Class interval*:
1 – 2, 3 – 4, 5 – 6, 7 – 8, 9 – 10

B

1

Titik tengah *Midpoint*	Had bawah *Lower limit*	Had atas *Upper limit*	Sempadan bawah *Lower boundary*	Sempadan atas *Upper boundary*
2.5	1	4	0.5	4.5
6.5	5	8	4.5	8.5
10.5	9	12	8.5	12.5
14.5	13	16	12.5	16.5
18.5	17	20	16.5	20.5

Saiz selang kelas/*Size of class interval*: 4.5 – 0.5 = 4

2

Markah *Marks*	Kekerapan *Frequency*	Titik tengah *Midpoint*	Had bawah *Lower limit*	Had atas *Upper limit*	Sempadan bawah *Lower boundary*	Sempadan atas *Upper boundary*
50 – 56	10	53	50	56	49.5	56.5
57 – 63	12	60	57	63	56.5	63.5
64 – 70	8	67	64	70	63.5	70.5
71 – 77	15	74	71	77	70.5	77.5
78 – 84	8	81	78	84	77.5	84.5
85 – 91	7	88	85	91	84.5	91.5

Saiz selang kelas/*Size of class interval*: 56.5 – 49.5 = 7

3

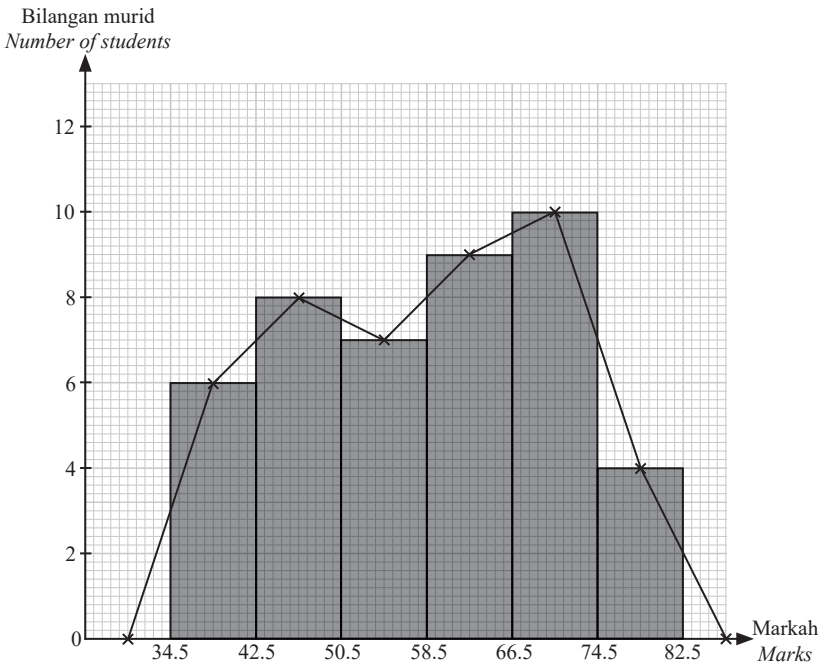
Markah *Marks*	Kekerapan *Frequency*	Titik tengah *Midpoint*	Had bawah *Lower limit*	Had atas *Upper limit*	Sempadan bawah *Lower boundary*	Sempadan atas *Upper boundary*
55 – 59	3	57	55	59	54.5	59.5
60 – 64	4	62	60	64	59.5	64.5
65 – 69	9	67	65	69	64.5	69.5
70 – 74	8	72	70	74	69.5	74.5
75 – 79	6	77	75	79	74.5	79.5

Saiz selang kelas/*Size of class interval*: 59.5 – 54.5 = 5

C

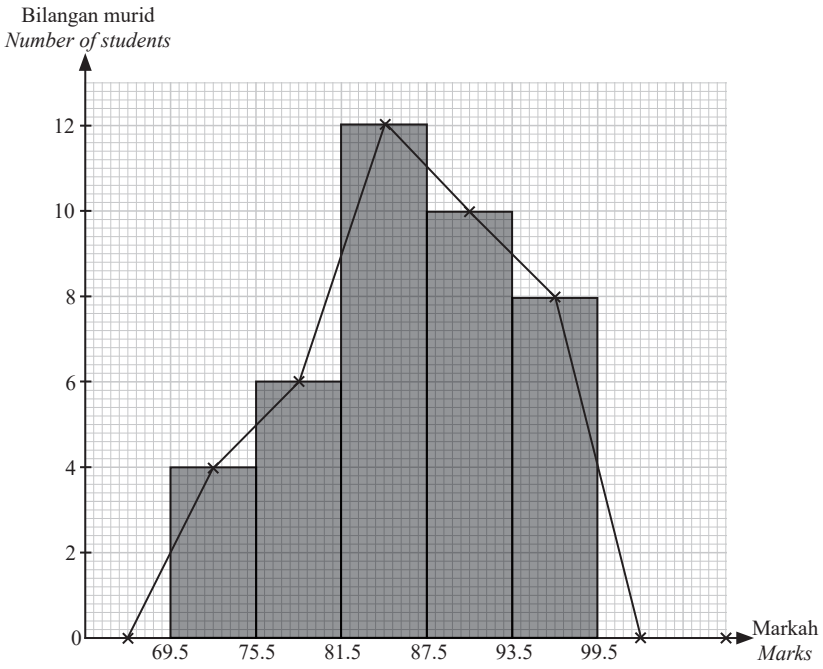
1

Titik tengah/*Midpoint*	**Sempadan bawah/*Lower boundary***	**Sempadan atas/*Upper boundary***
38.5	34.5	42.5
46.5	42.5	50.5
54.5	50.5	58.5
62.5	58.5	66.5
70.5	66.5	74.5
78.5	74.5	82.5



2

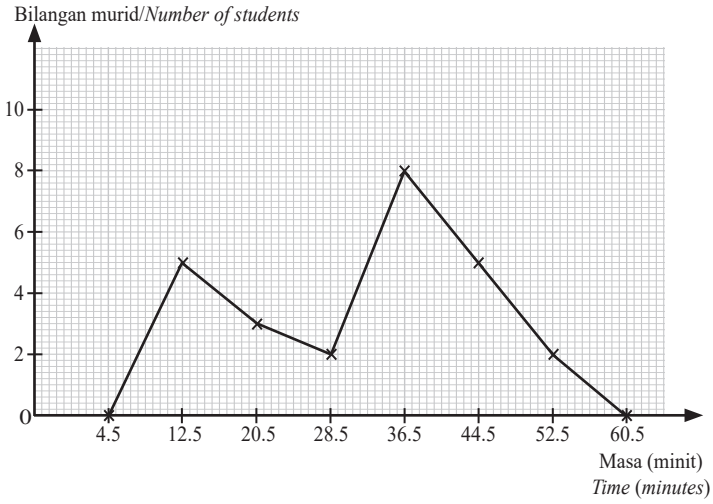
Titik tengah/*Midpoint*	**Sempadan bawah/*Lower boundary***	**Sempadan atas/*Upper boundary***
72.5	69.5	75.5
78.5	75.5	81.5
84.5	81.5	87.5
90.5	87.5	93.5
96.5	93.5	99.5



D

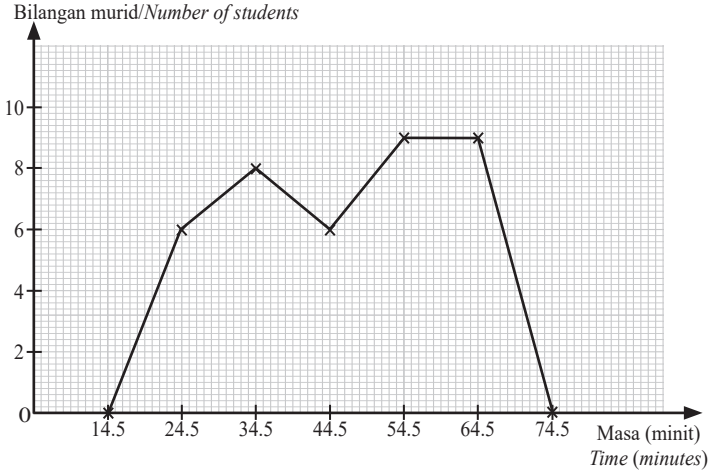
1

Masa (minit) *Time (minutes)*	Kekerapan *Frequency*	Titik tengah *Midpoint*
1 – 8	0	4.5
		12.5
		20.5
		28.5
		36.5
		44.5
		52.5
57 – 64	0	60.5



2

Masa (minit) *Time (minutes)*	Kekerapan *Frequency*	Titik tengah *Midpoint*
10 – 19	0	14.5
		24.5
		34.5
		44.5
		54.5
		64.5
70 – 79	0	74.5



E

1 (*a*) Bentuk taburan histogram 5 Anggerik ialah bentuk seragam manakala bentuk taburan histogram 5 Mawar ialah bentuk loceng.
The histogram for 5 Anggerik shows a uniform-shaped distribution and for 5 Mawar shows a bell-shaped distribution.

(*b*) Serakan markah 5 Anggerik dan 5 Mawar adalah hampir sama walaupun mempunyai bentuk taburan yang berbeza.
The distribution of 5 Anggerik and 5 Mawar approximately the same even though their distribution shapes are different.

(*c*) 5 Mawar menunjukkan keputusan yang lebih baik kerana kebanyakan markahnya adalah tinggi berbanding 5 Anggerik.
5 Mawar shows more excellent result because most of the marks is higher compared to 5 Anggerik.

2 (*a*) Bentuk taburan kawasan *A* ialah pencong ke kanan manakala bentuk taburan kawasan *B* ialah pencong ke kiri.
The distribution of area A shows skewed to right and distribution of area B shows skewed to left.

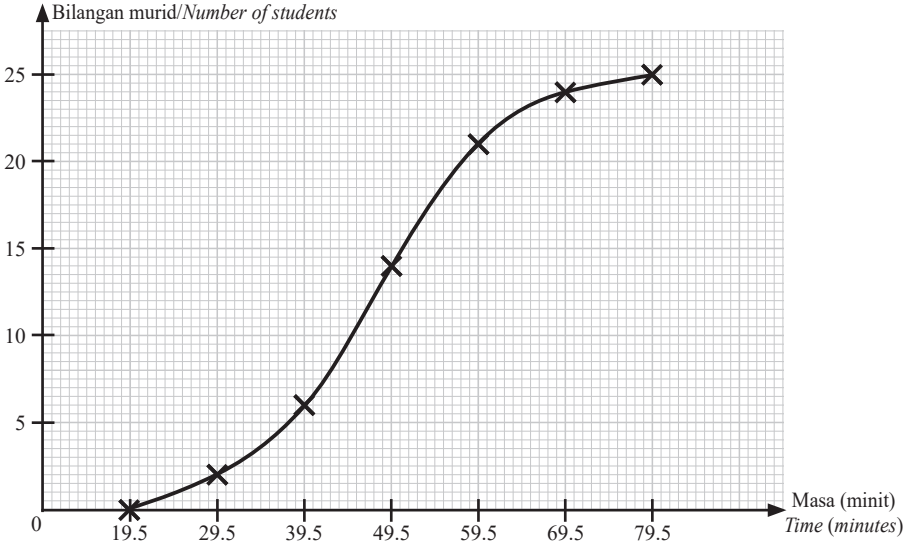
(*b*) Serakan harga jualan rumah di kawasan *A* dan kawasan *B* adalah hampir sama walaupun mempunyai bentuk taburan berbeza.
The distribution of the selling prices in area A and area B are approximately the same even though their distribution shapes are different.

(*c*) Kawasan *A* mewakili kawasan luar bandar kerana kebanyakan harga rumahnya adalah rendah manakala kawasan *B* mewakili kawasan bandar kerana kebanyakan harga rumahnya adalah tinggi.
Area A represent a rural area because most of the selling prices are lower whereas area B represent an urban area because most of the selling prices are higher.

F

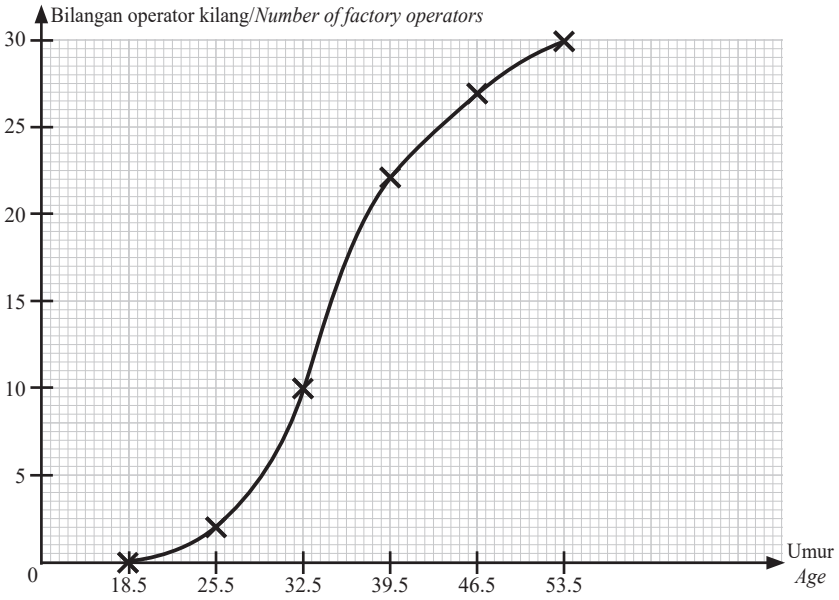
1

Sempadan atas/*Upper boundary*	**Kekerapan longgokan/*Cumulative frequency***
29.5	2
39.5	6
49.5	14
59.5	21
69.5	24
79.5	25



2

Sempadan atas/*Upper boundary*	Kekerapan longgokan/*Cumulative frequency*
25.5	2
32.5	10
39.5	22
46.5	27
53.5	30

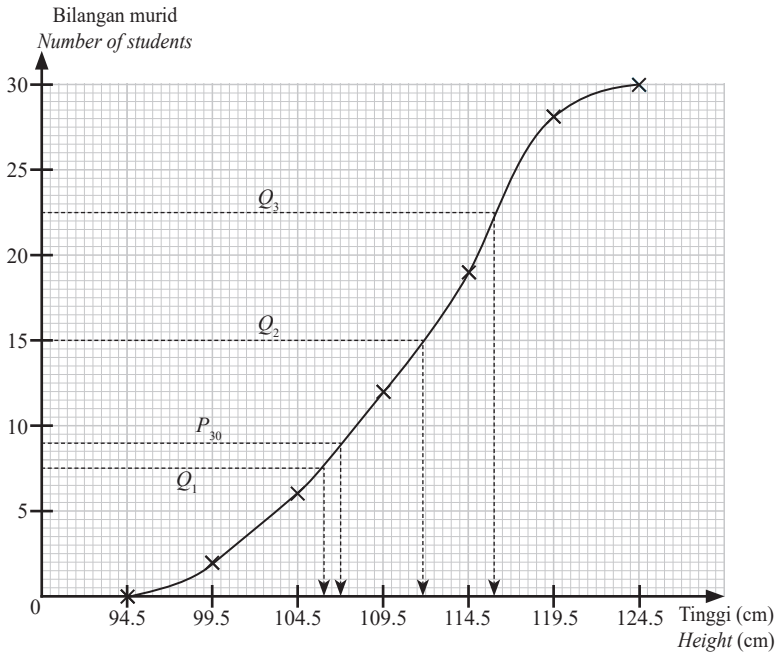


G

1

Sempadan atas/*Upper boundary*	Kekerapan longgokan/*Cumulative frequency*
18.5	2
22.5	6
26.5	12
30.5	19
34.5	28
38.5	30

(*a*)



(*b*) (i) Kuartil pertama/1st *quartile*, $Q_1 = \frac{1}{4} \times 30$

$= 7.5$

Daripada graf/*From the graph*, $Q_1 = 106$

(ii) Median, $Q_2 = \frac{1}{4} \times 30$

$= 15$

Daripada graf/*From the graph*, $Q_2 = 111.75$

(iii) Kuartil ketiga/3rd *quartile*, $Q_3 = \frac{3}{4} \times 30$

$= 22.5$

Daripada graf/*From the graph*, $Q_3 = 116.25$

(iv) Persentil ke-30/30th *percentile*, $P_{30} = \frac{30}{100} \times 30$

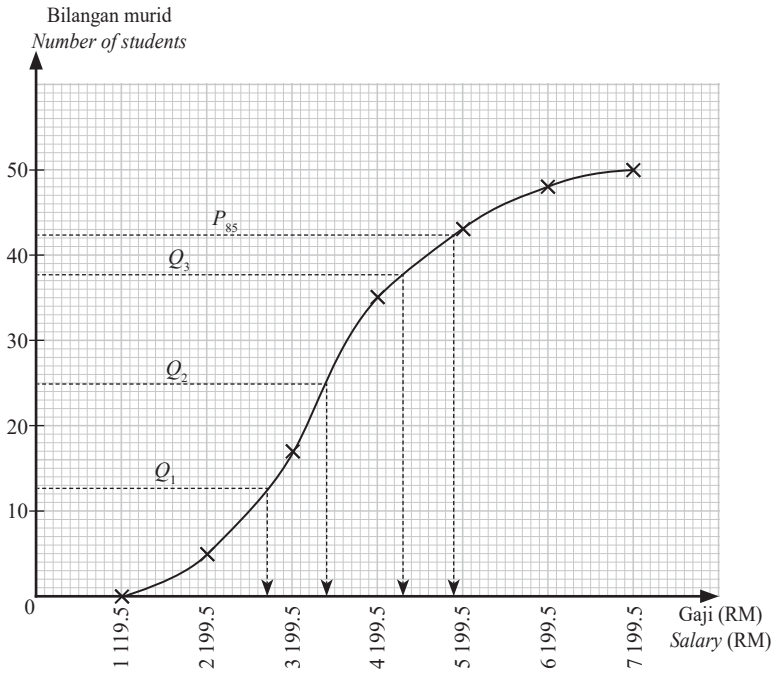
$= 9$

Daripada graf/*From the graph*, $P_{30} = 107$

2

Sempadan atas/*Upper boundary*	**Kekerapan longgokan/*Cumulative frequency***
2 199.5	5
3 199.5	17
4 199.5	35
5 199.5	43
6 199.5	48
7 199.5	50

(*a*)



(*b*) (i) Kuartil pertama/1st *quartile*, $Q_1 = \frac{1}{4} \times 50 = 12.5$

Daripada graf/*From the graph*, $Q_1 = 2\ 899.5$

(ii) Median, $Q_2 = \frac{1}{2} \times 50 = 25$

Daripada graf/*From the graph*, $Q_2 = 3\ 599.5$

(iii) Kuartil ketiga/3rd *quartile*, $Q_3 = \frac{3}{4} \times 50 = 37.5$

Daripada graf/*From the graph*, $Q_3 = 4\ 449.5$

(iv) Persentil ke-85/85th *percentile*, $P_{85} = \frac{85}{100} \times 50 = 42.5$

Daripada graf/*From the graph*, $P_{85} = 5\ 099.5$

SK 7.2

A

1

Titik tengah ***Midpoint***
20.5
30.5
40.5
50.5
60.5
70.5

Julat/*Range* = 70.5 – 20.5
= 50

Kedudukan/*Position of* $Q_1 = \frac{1}{4} \times 100$
$= 25$

$\therefore Q_1 = 38.5$

Kedudukan/*Position of* $Q_3 = \frac{3}{4} \times 100$
$= 75$

$\therefore Q_3 = 48.5$

$\therefore$ Julat antara kuartil/*Interquartile range* = 48.5 – 38.5
= 10

2

Titik tengah *Midpoint*
84.5
94.5
104.5
114.5
124.5
134.5

Julat/*Range* = 134.5 − 84.5
= 50

Kedudukan/*Position of* $Q_1 = \frac{1}{4} \times 50$
$= 12.5$

$\therefore Q_1 = 99$

Kedudukan/*Position of* $Q_3 = \frac{3}{4} \times 100$
$= 37.5$

$\therefore Q_3 = 117$

$\therefore$ Julat antara kuartil/*Interquartile range* = 117 − 99
= 18

B

1

Kekerapan, f *Frequency*, f	Titik tengah, x *Midpoint*, x	fx	x^2	fx^2
	0.65	3.90	0.4225	2.535
	1.05	1.05	1.1025	9.9225
	1.45	1.45	2.1025	35.7425
	1.85	1.85	3.4225	68.45
	2.25	2.25	5.0625	50.625
	2.65	2.65	7.0225	56.18
$\sum f = 70$		$\sum fx = 118.70$		$\sum fx^2 = 223.455$

Min/*Mean*, $\bar{x} = \frac{\Sigma fx}{\Sigma f}$
$= \frac{118.70}{70}$
$= 1.6957$

Varians/*Variance*, $\sigma^2 = \frac{\Sigma fx^2}{\Sigma f} - \bar{x}$
$= \frac{223.455}{70} - 1.6957^2$
$= 0.31677$
$= 0.32$

Sisihan piawai/*Standard deviation*, $\sigma^2 = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}}$
$= \sqrt{0.31677}$
$= 0.56$

2

Kekerapan, f *Frequency*, f	Titik tengah, x *Midpoint*, x	fx	x^2	fx^2
	2.5	5	6.25	12.5
	6.5	32.5	42.25	211.25
	10.5	73.5	110.25	771.75
	14.5	174	210.25	2 523
	18.5	185	342.25	3 422.5
	22.5	90	506.25	2 025
$\sum f = 40$		$\sum fx = 560$		$\sum fx^2 = 8\ 966$

Min/*Mean*, $\bar{x} = \frac{\Sigma fx}{\Sigma f}$

$= \frac{560}{40}$

$= 14$

Varians/*Variance*, $\sigma^2 = \frac{\Sigma fx^2}{\Sigma f} - \bar{x}$

$= \frac{8\,966}{40} - 14^2$

$= 28.15$

Sisihan piawai/*Standard deviation*, $\sigma^2 = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}}$

$= \sqrt{28.15}$

$= 5.3057$

C

1 Nilai minimum/*Minimum value* = 4.5
Nilai maksimum/*Maximum value* = 40.5
Kedudukan/*Position of* $Q_1 = \frac{1}{4} \times 30$

$= 7.5$

$\therefore Q_1 = 20.1$

Kedudukan/*Position of* $Q_2 = \frac{1}{2} \times 30$

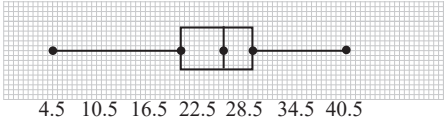
$= 15$

$\therefore Q_2 = 25.5$

Kedudukan/*Position of* $Q_3 = \frac{3}{4} \times 30$

$= 22.5$

$\therefore Q_3 = 29.1$



$\therefore$ Bentuk taburan = Pencong ke kiri
Distribution shape = Skewed to the left

2 Nilai minimum/*Minimum value* = 59.5
Nilai maksimum/*Maximum value* = 99.5
Kedudukan/*Position of* $Q_1 = \frac{1}{4} \times 30$

$= 7.5$

$\therefore Q_1 = 73.1$

Kedudukan/*Position of* $Q_2 = \frac{1}{2} \times 30$

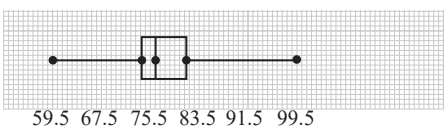
$= 15$

$\therefore Q_2 = 76.3$

Kedudukan/*Position of* $Q_3 = \frac{3}{4} \times 30$

$= 22.5$

$\therefore Q_3 = 81.5$



$\therefore$ Bentuk taburan = Pencong ke kanan
Distribution shape = Skewed to the right

D

1

Skor *Score*	Titik tengah, x *Midpoint*, x	x^2	Zarif			Marina		
			f	fx	fx^2	f	fx	fx^2
3 – 4	3.5	12.25	1	3.5	12.25	2	7	24.5
5 – 6	5.5	30.25	2	11	60.5	1	5.5	30.25
7 – 8	7.5	56.25	3	22.5	168.75	3	22.5	168.75
9 – 10	9.5	90.25	1	9.5	90.25	2	19	180.5
Jumlah/*Total*			8	48	334	8	54	404

Peserta/*Participant A*: $\bar{x} = \frac{\Sigma fx}{\Sigma f}$ $\quad \sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2}$

$= \frac{48}{8}$ $\quad = \sqrt{\frac{334}{8} - 6^2}$

$= 6$ $\quad = 2.398$

Peserta/*Participant B*: $\bar{x} = \frac{\Sigma fx}{\Sigma f}$ $\quad \sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2}$

$= \frac{54}{8}$ $\quad = \sqrt{\frac{404}{8} - 6.75^2}$

$= 6.75$ $\quad = 2.222$

$\therefore$ Skor peserta *B* lebih baik kerana min skor peserta *B* lebih besar berbanding peserta *A*. Skor peserta *B* juga lebih konsisten kerana sisihan piawai peserta *B* lebih kecil berbanding peserta *A*. Oleh itu, peserta *B* layak diiktiraf sebagai juara bagi pertandingan memanah tersebut.

Participant B's score is better because the score of participant B is greater than participant A. Participant B's score is also more consistent because the standard deviation of participant B is smaller than participant A. Therefore, participant B deserve to be recognized as the champion of the archery competition.

E

1 (*a*)

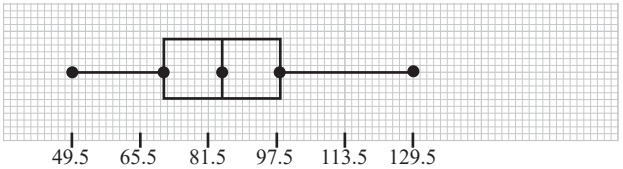
Panjang kayu (cm) *Length of wood* (cm)	Titik tengah, x *Midpoint*, x	x^2	Kekerapan, f *Frequency*, f	fx	fx^2
50 – 65	57.5	3 306.25	8	460	26 450
66 – 81	73.5	5 402.25	15	1 102.5	81 033.75
82 – 97	89.5	8 010.25	14	1 253	112 143.5
98 – 113	105.5	11 130.25	10	1 055	111 302.5
114 – 129	121.5	14 762.25	3	364.5	44 286.75
Jumlah/*Total*			50	4 235	375 216.5

(*b*) Julat/*Range* = 121.5 – 57.5 = 64

Min/*Mean* = $\frac{4\,235}{50}$ = 84.7

Sisihan piawai/*Standard deviation* = $\sqrt{\frac{375\,216.5}{50} - 84.7^2}$ = 18.1725

(*c*)



PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

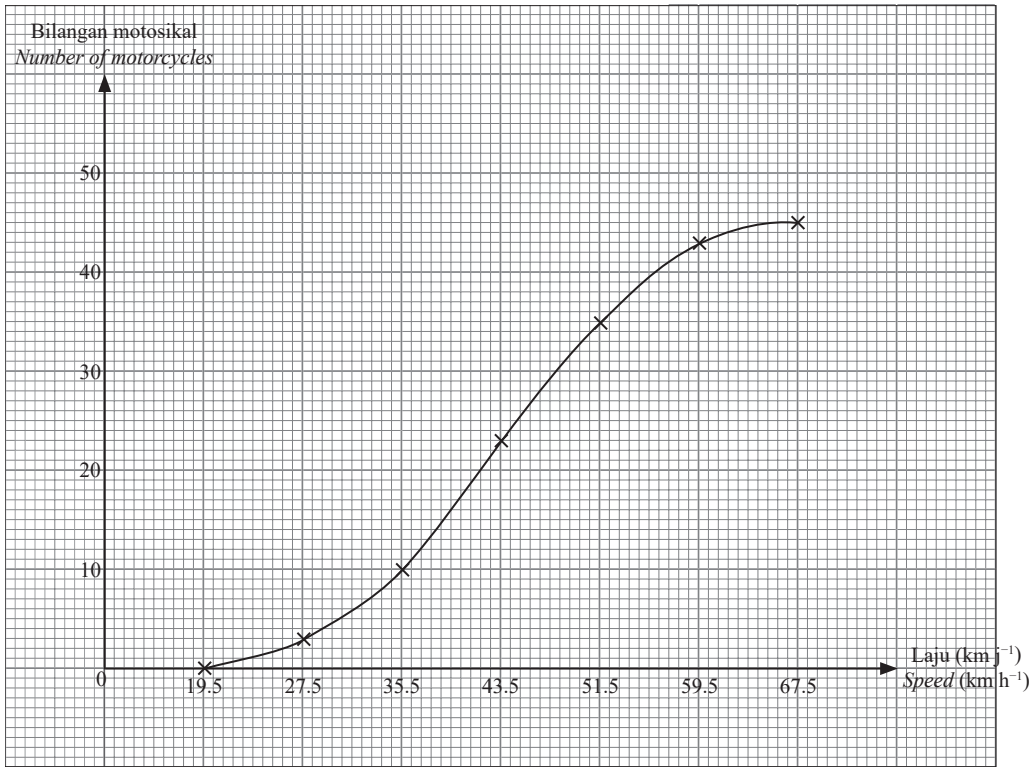
1 B **2** B **3** A **4** D

Kertas 2/*Paper 2*

1 (*a*)

Kekerapan *Frequency*	**Kekerapan loggokan** *Cumulative frequency*	**Sempadan atas** *Upper boundary*
3	3	27.5
7	10	35.5
13	23	43.5
12	35	51.5
8	43	59.5
2	45	67.5

(*b*)



2 (*a*)

Titik tengah, *x* *Midpoint, x*	x^2	**Baja *X*/*Fertilizer X***			**Baja *Y*/*Fertilizer Y***		
		f	fx	fx^2	f	fx	fx^2
14.5	210.25	2	29	420.5	3	43.5	630.75
24.5	600.25	3	73.5	1 800.75	2	49	1 200.5
34.5	1 190.25	4	138	4 761	6	207	7 141.5
44.5	1 980.25	5	222.5	9 901.25	2	89	3 960.5
54.5	2 970.25	1	54.5	2 970.25	2	109	5 940.5
Jumlah/*Total*		15	517.5	19 853.75	15	497.5	18 873.75

(*b*) Baja/*Fertilizer X*: $\bar{x} = \frac{\Sigma fx}{\Sigma f}$

$= \frac{517.5}{15}$

$= 34.5$

$\sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2}$

$= \sqrt{\frac{19\,853.75}{15} - 34.5^2}$

$= 11.547$

Baja/*Fertilizer Y*: $\bar{x} = \frac{\Sigma fx}{\Sigma f}$

$= \frac{497.5}{15}$

$= 33.17$

$\sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2}$

$= \sqrt{\frac{18\,873.75}{15} - 33.17^2}$

$= 12.57$

∴ Baja *X* menghasilkan cili lebih banyak berbanding baja *Y* kerana min baja *X* lebih besar berbanding baja *Y*. Penghasilan cili dengan baja *X* juga lebih konsisten kerana sisihan piawai baja lebih kecil berbanding baja *Y*.
Fertilizer X produce more chillies compared to fertilizer Y because the mean of fertilizer X is bigger than fertilizer Y. The production of chillies using fertilizer X also more consistent because the standard deviation is smaller than fertilizer Y.

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 1/*Paper 1*

1 A **2** B **3** C **4** D

Kertas 2/*Paper 2*

Bahagian A/*Section* A

1 (*a*) $\frac{(42 \times 3) + (47 \times 6) + (52 \times m) + (57 \times 16) + (62 \times 10) + (67 \times 4)}{3 + 6 + m + 16 + 10 + 4} = 55.6$

$\frac{2\,208 + 52m}{39 + m} = 55.6$

$2\,208 + 52m = 2\,168.4 + 55.6m$

$2\,208 - 2\,168.4 = 55.6m - 52m$

$39.6 = 3.6m$

$m = 11$

(*b*) $\sigma^2 = \frac{(3 \times 42^2) + (6 \times 47^2) + (11 \times 52^2) + (16 \times 57^2) + (10 \times 62^2) + (4 \times 67^2)}{3 + 6 + 11 + 16 + 10 + 4} - 55.62$

$= \frac{156\,670}{50} - 55.6^2$

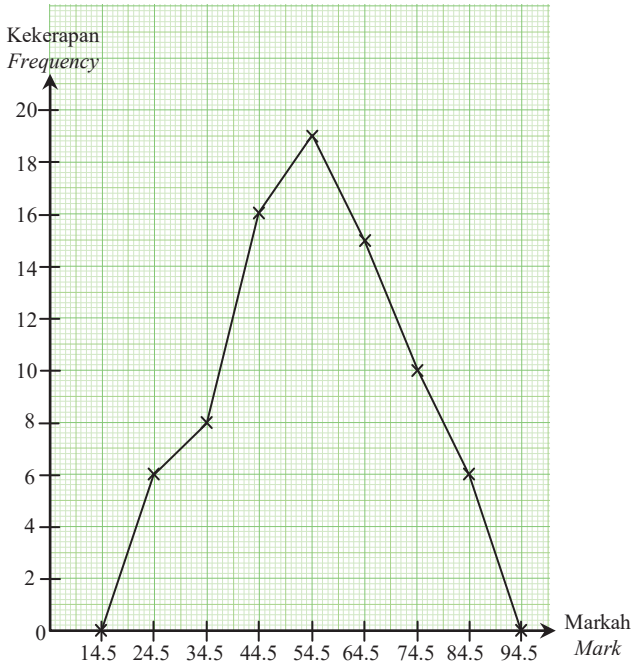
$= 42.04$

Bahagian B/*Section* B

2 (*a*) (i)

Kekerapan *Frequency*
0
6
8
16
19
15
10
6
0

(ii)



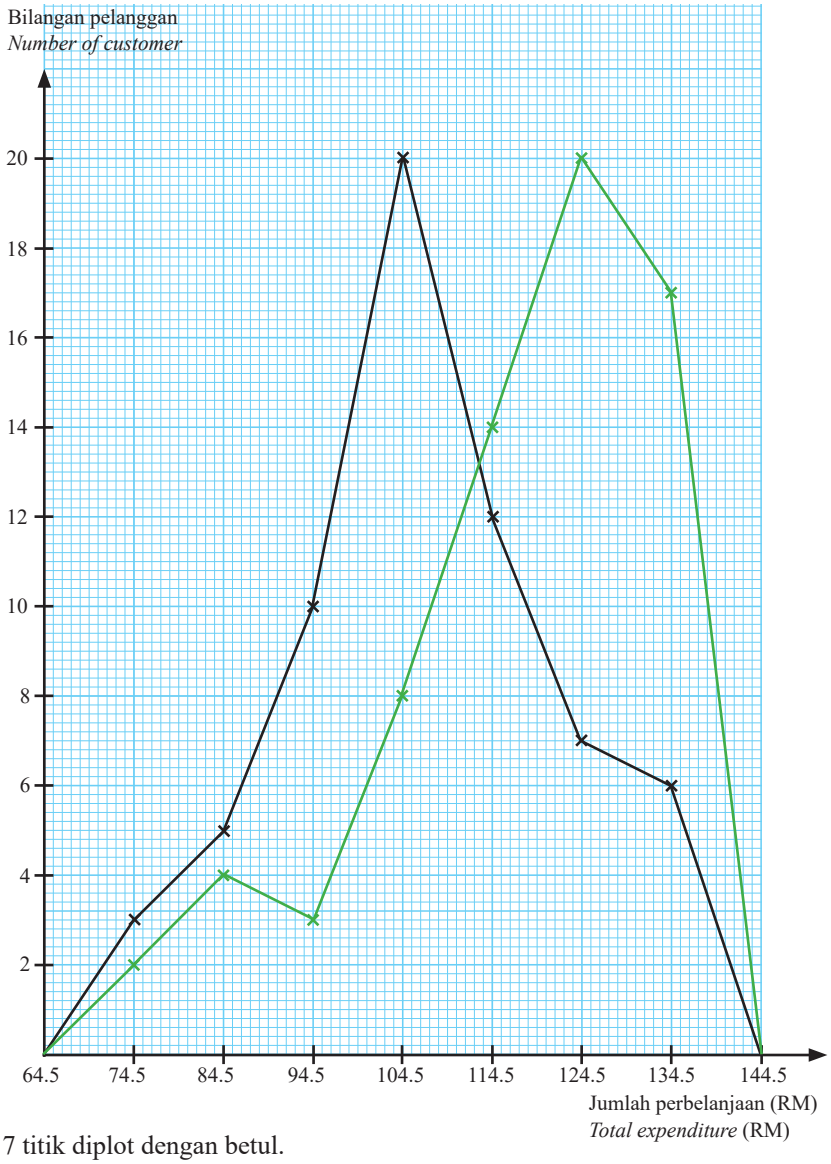
3 (*a*) (i) Saiz selang kelas / *Class interval*: 10

Julat / *Range*: $\left[\left(\frac{130+139}{2}\right)-\left(\frac{70+79}{2}\right)\right]=60$

(ii) $x = 68 - 2 - 4 - 3 - 8 - 14 - 20$

$= 17$

(*b*) Bilangan pelanggan
Number of customer



– 7 titik diplot dengan betul.
7 *points are plotted correctly.*
– 9 titik yang betul dilalui oleh poligon kekerapan.
The correct 9 *points are passed through by the frequency polygon.*

(*c*) (i) – Bentuk loceng
Bell-shaped
– Pencong ke kiri
Left-skewed

(ii) Hari kedua. Pelanggan membelanjakan lebih banyak wang.
Second day. Customers spent more money.

4 (*b*) (i) $x = \sqrt{\dfrac{6(24.5)^2 + 8(34.5)^2 + 16(44.5)^2 + 19(54.5)^2 + 15(64.5)^2 + 10(74.5)^2 + 6(84.5)^2}{80} - 54.75^2}$

$= 16.65$

(ii) Prestasi murid pada tahun 2021 lebih konsisten.
The students performance in 2021 *is more consistent.*

Bahagian C/*Section* C

5 (*a*)

Titik tengah *Midpoint*
3.5
5.5
7.5
9.5
11.5
13.5

(*b*) (i) Min / *Mean*

$$= \frac{(11 \times 1.5) + (12 \times 3.5) + (19 \times 5.5) + (18 \times 7.5) + (20 \times 9.5) + (12 \times 11.5) + (8 \times 13.5)}{100}$$

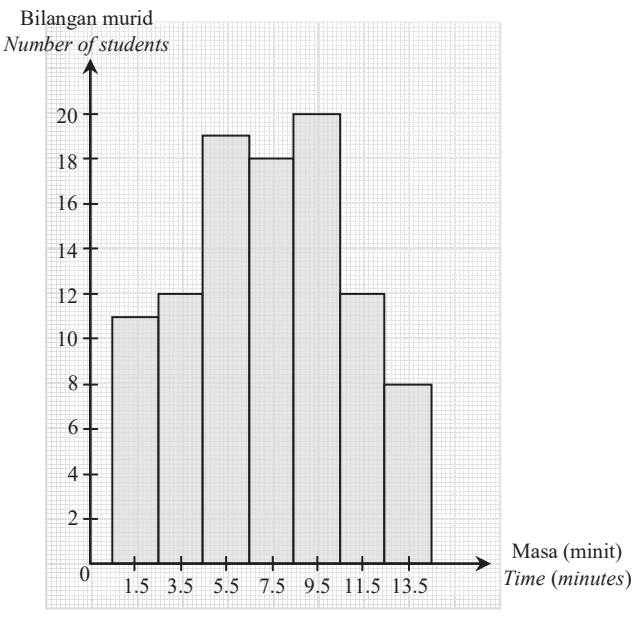
$= 7.34$

(ii) $\sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2}$

$$= \sqrt{\frac{(11 \times 1.5^2) + (12 \times 3.5^2) + (19 \times 5.5^2) + (18 \times 7.5^2) + (20 \times 9.5^2) + (12 \times 11.5^2) + (8 \times 13.5^2)}{100} - 7.34^2}$$

$= 3.49$

(*c*)



6 $\bar{x} = \frac{5(17) + 3(22) + 6(27) + 2(32)}{5 + 3 + 6 + 2}$

$= 23.56$

$\sigma = \sqrt{\frac{5(17)^2 + 3(22)^2 + 6(27)^2 + 2(32)^2}{5 + 3 + 6 + 2} - 23.56^2}$

$= 5.23$

SK 6.1

A

1 **Masalah/*Problem*:**
- Menentukan tempoh penyimpanan yang diperlukan supaya jumlah prinsipal dan faedah mencapai RM8 000.
  Determine the period of saving needed so that the amount of principal and interest reaches RM8 000.

Andaian/*Assumption*:
- Kadar faedah tidak berubah dalam jangka masa pengiraan faedah./*Interest rate is fixed in the calculated period.*
- Harga barang kemas yang ingin dibeli tidak berubah apabila jumlah wang yang diperlukan mencukupi.
  The price of jewellery is not changing when required money is sufficient.

Pemboleh ubah/*Variables*:
- I = faedah/*interest*
- P = prinsipal atau simpanan/*principal or savings*
- r = kadar faedah/*interest rate*
- t = tahun/*year*
- T = jumlah simpanan/*total savings*

2 **Masalah/*Problem*:**
- Menentukan bilangan tangki oksigen diperlukan penyelam untuk menyelam sedalam 30 meter.
  Determine the numbers of oxygen need by divers to dive 30 *meters below sea level.*

Andaian/*Assumption*:
- Kadar penggunaan tangki oksigen adalah sama./*The rate of oxygen tank usage is same.*
- Setiap tangki oksigen mampu bertahan selama 60 minit di dalam air.
  Each oxygen tank can last for 60 *minutes in the water.*

Pemboleh ubah/*Variables*:
- n = bilangan tangki oksigen/*number of oxygen tank*
- t = tempoh masa berada di dalam air/*duration in the water*
- m = kedalaman penyelam di bawah paras laut/*diver's depth below the sea level*

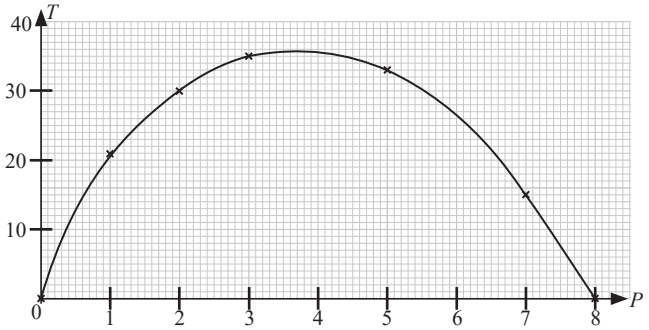
B

1

Mengenal pasti dan mendefinisikan masalah ***Identifying and defining problem***	• Mengenal pasti satu fungsi linear bagi pola peningkatan populasi panda. *Identify a linear function for the inclination of panda's population.* • Menentukan tahun populasi panda mencapai 10 000 ekor. *Determine the year when the population of panda will reach* 10 000.
Membuat andaian dan mengenal pasti pemboleh ubah ***Making assumption(s) and identifying variables***	Andaian/*Assumption*: • Andaikan pola peningkatan populasi panda setiap tahun adalah sama. *Assume the inclination trend of panda population each year is same.* Pemboleh ubah/*Variables*: p = populasi panda/*panda population* x = bilangan panda bertambah per tahun *number of panda increase per year* t = tahun/*year*
Mengaplikasikan matematik untuk menyelesaikan masalah ***Applying mathematical modeling to solve the problem***	Anggaran bilangan panda bertambah setiap tahun: *Estimated number of panda increase per year*: $x = \frac{1\,800 - 150}{31} = 53$ Model linear dalam bentuk am ialah $y = mx + c$. *The general form of linear model is* $y = mx + c$. Meningkat sebanyak 53 per tahun diwakili oleh kecerunan, m *Increase by* 53 *per year represent by gradient,* m

	Apabila/*When* $t = 0$, $P(0) = 150$ $\therefore P(t) = 53t + 150$ Gantikan $P(t) = 10\,000$ ke dalam persamaan./*Substitute* $P(t) = 10\,000$ *into the equation*. $10\,000 = 53t + 150$ $53t = 9\,850$ $t = 185$ Maka, pada tahun ke-185 selepas tahun 1990, dijangkakan populasi panda akan mencapai 10 000 ekor iaitu pada tahun 2175. *Hence*, 185 *years after* 1990, *it is expected that the panda population will reach* 10 000 *which is in* 2175.
Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan ***Applying mathematical modeling to solve the problem***	Model fungsi linear, $P(t) = 53t + 150$ yang diperoleh hanya boleh digunakan sekiranya situasi mengikut andaian yang dibuat di awal proses pemodelan matematik. *The linear function model*, $P(t) = 53t + 150$ *obtained only can be used if the situation is following the assumption obtained at the beginning of the mathematical modeling process*.
Memurnikan model matematik ***Refining the mathematical modeling***	Dalam masalah ini, kita tidak dapat memurnikan model memandangkan maklumat yang diberi adalah terhad. *In this problem*, *we cannot refine the model since the information given is limited*.
Melaporkan dapatan ***Report the findings***	Laporan penuh dibuat berdasarkan struktur rangka kerja pemodelan di atas. *Full report is made based on the framework structure of the modeling above.*

2

Mengenal pasti dan mendefinisikan masalah ***Identifying and defining problem***	• Mengenal pasti ketinggian sebenar, T, dalam m, bagi palang paling tinggi. *Determine the actual height* T, *in* m, *for the highest bar*.
Membuat andaian dan mengenal pasti pemboleh ubah ***Making assumption(s) and identifying variables***	Andaian/*Assumption*: • Andaikan ketinggian palang jambatan berbentuk hiperbola adalah paling tinggi di bahagian tengah. *Assume that the highest bar for a bridge with the hyperbola shape is in the middle.* Pemboleh ubah/*Variables*: p = jarak palang dari A/*distance of the bar from A* T = tinggi palang/*height of the bar*
Mengaplikasikan matematik untuk menyelesaikan masalah ***Applying mathematical modeling to solve the problem***	Bagi mengenal pasti fungsi, bina graf berdasarkan jadual: *To determine the function*, *construct the graph based on the table*:  Berdasarkan graf yang dibina, bentuk graf ialah parabola yang mewakili fungsi kuadratik. *Based on the graph*, *the shape of graph is parabola that represents the quadratic function.*

	Model kuadratik dalam bentuk am ialah $T = aP^2 + bP + c$. Gantikan mana-mana tiga koordinat ke dalam persamaan am untuk menentukan nilai a dan b. *The general form of quadratic model is $T = aP^2 + bP + c$. Replace any three coordinates on the general form to determine the value of a and b.* $(0, 0)$ $0 = a(0)^2 + b(0) + c$ $a = c$ $(8, 0)$ $0 = a(8)^2 + b(8) + c$ $a = 64a + 8b + c$ $(1, 21)$ $21 = a(1)^2 + b(1) + c$ $21 = a + b + c$ Oleh sebab $c = 0$, sistem bagi dua persamaan linear dalam dua pemboleh ubah: *Since $c = 0$, system of two linear equations in two variables is*: $21 = a + b$ ..... ① $0 = 64a + 8b$ ..... ② Daripada/*From* ②, $b = -8a$ ..... ③ Gantikan ③ ke dalam ① *Substitute* ③ *into* ① $21 = a + b$ $21 = a + (-8a)$ $21 = -7a$ $a = -3$ Gantikan $a = -3$ ke dalam ③ *Substitute $a = -3$ into* ③ $b = -8a$ $b = -8(-3)$ $b = 24$ Fungsi kuadratik yang mungkin ialah *is* *The possible quadratic function is* Bagi mengenal pasti ketinggian palang tertinggi, kenal pasti titik maksimum dengan menggunakan persamaan paksi simetri. *To determine the highest bar, determine the maximum point by using the symmetry equation.* $x = \frac{-b}{2a}$ $P = \frac{-24}{2(-3)}$ $P = 4$ Apabila $P = 4$, $T = -3(4)^2 + 24(4) = 48$ *When $P = 4$, $T = -3(4)^2 + 24(4) = 48$* Skala yang digunakan ialah 1 : 100. Oleh itu, *The scale used is* 1 : 100. *Therefore*, Panjang sebenar/*Actual length* $= 48 \times 100$ $= 4\,800$ cm $= 48$ m
Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan ***Applying mathematical modeling to solve the problem***	Dalam model ini, kita membuat andaian ketinggian palang paling tinggi ialah di bahagian tengah. Hal ini mungkin tidak benar bagi sesetengah jambatan lain. Model baharu diperlukan sekiranya andaian berbeza. Ketepatan jawapan akan bertambah baik jika memperoleh lebih banyak data. *In this model, we assume that the highest bar is in the middle of the bridge. This might be differ for some bridge. New model will be needed for different assumption. The answer will be more accurate if more data is collected.*
Memurnikan model matematik ***Refining the mathematical modeling***	Dalam masalah ini, kita tidak dapat memurnikan model memandangkan maklumat yang diberi adalah terhad. *In this problem, we cannot refine the model since the information given is limited.*
Melaporkan dapatan ***Report the findings***	Laporan penuh dibuat berdasarkan struktur rangka kerja pemodelan di atas. *Full report is made based on the framework structure of the modeling above.*

3

<table>
<tr><td>Mengenal pasti dan mendefinisikan masalah
Identifying and defining problem</td><td>• Mengenal pasti satu fungsi eksponen bagi peningkatan kes jangkitan COVID-19 di negara A.
Identify an exponential function that shows the increasing in COVID-19 cases in country A.
• Menentukan jumlah kes jangkitan COVID-19 pada hari ke-10.
Determine the number of COVID-19 cases on the 10th day.</td></tr>
<tr><td>Membuat andaian dan mengenal pasti pemboleh ubah
Making assumption(s) and identifying variables</td><td>Andaian/Assumption:
• Andaikan kadar peningkatan kes COVID-19 adalah konsisten sebanyak 50% sehari.
Assume that the growth rate for COVID-19 cases is consistent at 50% per day.

Pemboleh ubah/Variables:
P_0 = populasi awal/initial population
r = kadar peningkatan/growth rate
d = masa dalam hari/time in day</td></tr>
<tr><td>Mengaplikasikan matematik untuk menyelesaikan masalah
Applying mathematical modeling to solve the problem</td><td>
<table>
<tr><th>Hari, d
Day, d</th><th>Bilangan kes baharu
Number of new cases</th><th>Kes sedia ada + kes baru
Existing cases + new cases</th><th>Jumlah kes
Total cases</th></tr>
<tr><td>1</td><td>100×0.5</td><td>$100 + (100 \times 0.5)$
$= 100(1 + 0.5)$</td><td>$100 \times (1.5)^1$</td></tr>
<tr><td>2</td><td>$100 \times (0.5)^1 \times 0.5$</td><td>$[100 \times (1.5)^1] + [100 \times (1.5)^1 \times 0.5]$
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</table>
Model matematik/Mathematical model, $y(d) = P_0 \times (1 + r)^d$

Jumlah kes jangkitan COVID-19 pada hari ke-10/Total cases of COVID-19 on 10th day:
$y(10) = 100 \times (1 + 0.5)^{10}$
$\therefore y(10) = 5\ 766$</td></tr>
<tr><td>Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan
Applying mathematical modeling to solve the problem</td><td>Dalam model ini, kita membuat andaian kadar peningkatan kes COVID-19 adalah konsisten sebanyak 50% sehari. Model baharu diperlukan sekiranya kadar peningkatan berubah.
In this model, we assume that the growth rate of COVID-19 cases is uniform at 50% per day. New model is needed if the increment rate is changed.</td></tr>
<tr><td>Memurnikan model matematik
Refining the mathematical modeling</td><td>Dalam masalah ini, kita tidak dapat memurnikan model memandangkan maklumat yang diberi adalah terhad.
In this problem, we cannot refine the model since the information given is limited.</td></tr>
<tr><td>Melaporkan dapatan
Report the findings</td><td>Laporan penuh dibuat berdasarkan struktur rangka kerja pemodelan di atas.
Full report is made based on the framework structure of the modeling above.</td></tr>
</table>

4

<table>
<tr><td>Mengenal pasti dan mendefinisikan masalah
Identifying and defining problem</td><td>• Mengenal pasti satu fungsi eksponen bagi peningkatan kes jangkitan SARS-Cov di negara A.
Identify an exponential function that shows the increasing in SARS-Cov cases in country A.
• Menentukan jumlah kes jangkitan SARS-Cov pada hari ke-12.
Determine the number of SARS-Cov cases on the 12th day.</td></tr>
</table>

<table>
<tr><td>Membuat andaian dan mengenal pasti pemboleh ubah
Making assumption(s) and identifying variables</td><td>Andaian/Assumption:
• Andaikan kadar peningkatan kes SARS-Cov adalah konsisten sebanyak 10% sehari.
Assume that the growth rate of SARS-Cov cases is consistent at 10% per day.

Pemboleh ubah/Variables:
P_0 = populasi awal/initial population
r = kadar peningkatan/growth rate
d = masa dalam hari/time in day</td></tr>
<tr><td>Mengaplikasikan matematik untuk menyelesaikan masalah
Applying mathematical modeling to solve the problem</td><td>
<table>
<tr><th>Hari, Day, d</th><th>Bilangan kes baharu
Number of new cases</th><th>Kes sedia ada + kes baru
Existing cases + new cases</th><th>Jumlah kes
Total cases</th></tr>
<tr><td>1</td><td>$1\,000 \times 0.1$</td><td>$1\,000 + (1\,000 \times 0.1)$
$= 1\,000(1 + 0.1)$</td><td>$100 \times (1.1)^1$</td></tr>
<tr><td>2</td><td>$1\,000 \times (1.1)^1 \times 0.1$</td><td>$[1\,000 \times (1.1)^1] + [1\,000 \times (1.1)^1 \times 0.1]$
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</table>
Model matematik/Mathematical model, $y(d) = P_0 \times (1 + r)^d$

Jumlah kes jangkitan SARS-Cov pada hari ke-12:
Total cases of SARS-Cov on 12th day:
$y(12) = 1\,000 \times (1 + 0.1)^{12}$
$\therefore y(12) = 3\,138$</td></tr>
<tr><td>Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan
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PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 C **2** C **3** C **4** C **5** B

Kertas 2/*Paper 2*

1 (*a*) P_0 = populasi awal/*initial population*
$= 200$
r = kadar peningkatan/*growth rate*
t = masa dalam tahun/*time in year*

Model matematik/*Mathematical model*, $y(t) = rt + P_0$

$r = \frac{2\,000 - 200}{23} = 78$

Populasi pada tahun 2026/*Population on year* 2026*:*
$y(26) = 78(26) + 200$
$y(26) = 2\ 228$

(*b*) $y(t) = 78t + 200$
$5\ 000 = 78t + 200$
$78t = 4\ 800$
$t = 61.54$
$t = 62$
∴ Tahun ke-62 selepas tahun 2000, iaitu pada tahun 2062.
62^{th} *year after* 2000, *which is on year* 2062.

2 (*a*) Titik maksimum/*Maximum point* = (*t*, *h*)

$$t = \frac{-b}{2a}$$
$$= \frac{-10}{2(-2)}$$
$$= 2.5$$

Apabila/*When* $x = 2.5$,
$h = -2(2.5)^2 + 10(2.5) - 8$
$h = 4.5$ m

∴ Ketinggian maksimum balingan batu = 4.5 m
The maximum height of the thrown stone

(*b*) Apabila batu jatuh ke permukaan air, $h = 0$.
When the stone fall on the suface of water, $h = 0$.
$h = -2(t)^2 + 10(t) - 8$
$0 = -2(t)^2 + 10(t) - 8$
$t = -8$ s, 4 s

∴ Masa apabila batu jatuh ke permukaan air adalah pada saat ke-4.
Time taken for the stone fall on the surface of water is at 4 *seconds*.

3

Mengenal pasti dan mendefinisikan masalah ***Identifying and defining problem***	• Mengenal pasti satu fungsi bagi pembiakan mikroorganisma. *Identify a function that modeling the reproduction of the microorganism.* • Menentukan jumlah mikroorganisma pada hari ke-9. *Determine the total number of microorganism on the* 9^{th} *day*.
Membuat andaian dan mengenal pasti pemboleh ubah ***Making assumption(s) and identifying variables***	• Andaikan kadar peningkatan pembiakan mikroorganisma adalah 2 kali daripada hari yang sebelumnya. *Assume that the growth rate of the reproduction of microorganisms is twice from the previous day.* Pemboleh ubah/*Variables*: P_0 = populasi awal/*initial population* , r = kadar peningkatan/*growth rate* d = masa dalam hari/*time in day*
Mengaplikasikan matematik untuk menyelesaikan masalah ***Applying mathematical modeling to solve the problem***	

Hari, *d* *Day*, *d*	Bilangan kes baharu *Number of new cases*	Kes sedia ada + kes baru *Existing cases + new cases*	Jumlah kes *Total cases*
1	30×2	$30 + (30 \times 2)$ $= 30(1 + 2)$	$30 \times (3)^1$
2	$30 \times (3)^1 \times 2$	$[30 \times (3)^1] + [30 \times (3)^1 \times 2]$ $= 30(3)(1 + 2)$	$30 \times (3)^2$
3	$30 \times (3)^2 \times 2$	$[30 \times (3)^2] + [30 \times (3)^2 \times 2]$ $= 30(3)^2(1 + 2)$	$30 \times (3)^3$
4	$30 \times (3)^3 \times 2$	$[30 \times (3)^3] + [30 \times (3)^3 \times 2]$ $= 30(3)^3(1 + 2)$	$30 \times (3)^4$

	Model matematik/*Mathematical model*, $y(d) = P_0 \times (1 + r)^d$ Jumlah mikroorganisma pada hari ke-9/*Total number of microorganisma on 9th day*: $y(9) = 30 \times (1 + 2)^9$ $\therefore y(9) = 590\ 490$
Menentusahkan dan mentafsir penyelesaian dalam konteks masalah berkenaan ***Applying mathematical modeling to solve the problem***	$y(d) = P_0 \times (1 + r)^d$ Dalam model ini, kita membuat andaian bahawa kadar pembiakan mikroorganisma adalah 2 kali daripada hari sebelumnya. Sekiranya pola berubah, model ini tidak boleh digunakan. *In this model, we assume that the growth rate of microorganism reproduction is twice from the previous day. If the growth rate changed, this model cannot be used.*
Memurnikan model matematik ***Refining the mathematical modeling***	Dalam masalah ini, kita tidak dapat memurnikan model memandangkan maklumat yang diberi adalah terhad. *In this problem, we cannot refine the model since the information given is limited.*
Melaporkan dapatan ***Report the findings***	Laporan penuh dibuat berdasarkan struktur rangka kerja pemodelan di atas. *Full report is made based on the framework structure of the modeling above.*

SOALAN SEBENAR SPM/*SPM PAST YEAR QUESTIONS*

Kertas 2/*Paper 2*

Bahagian B/*Section* B

1 (*a*) (i) 1

(ii) $3 - 1 = 2$

(*b*) (i) $b = \frac{360}{4}$

$= 90$

$y = a \sin bx + c$

$y = (1) \sin (90)x + 2$

$y = \sin 90x + 2$

(ii) $y = \sin 90\left(\frac{150}{60}\right) + 2$

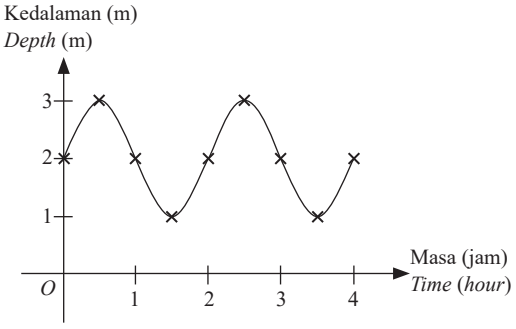
$y = 1.29$

(*c*) (i)

x	0	0.5	1	1.5	2	2.5	3	3.5	4
y	2	3	2	1	2	3	2	1	2

$b = \frac{360}{2} = 180$

$y = \sin 180x + 2$



Graf dilengkapkan dengan 2 titik minimum, 2 titik maksimum dan lengkung sinus yang betul.
The graph is completed with 2 minimum points, 2 maximum points and 2 sine curves correctly.

(ii) Rajah 8 menunjukkan bilangan melepaskan air dalam masa 4 jam ialah satu kali manakala rajah di (*c*)(i) menunjukkan bilangan melepaskan air dalam masa 4 jam ialah dua kali.
Diagram 8 shows the number of water releases in 4 hours is one time whereas diagram in (c)(i) shows the number of water releases in 4 hours is two times.

KERTAS MODEL SPM
SPM MODEL PAPER

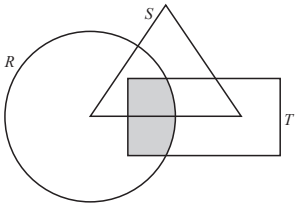
Kertas 1/*Paper 1*

1	B	**2**	B	**3**	C	**4**	D	**5**	B
6	D	**7**	A	**8**	A	**9**	B	**10**	C
11	A	**12**	A	**13**	B	**14**	C	**15**	A
16	B	**17**	B	**18**	C	**19**	D	**20**	D
21	A	**22**	B	**23**	A	**24**	B	**25**	A
26	C	**27**	B	**28**	A	**29**	B	**30**	C
31	C	**32**	D	**33**	B	**34**	C	**35**	B
36	A	**37**	C	**38**	D	**39**	A	**40**	A

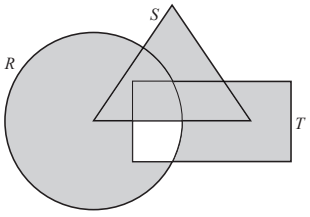
Kertas 2/*Paper 2*

Bahagian A
Section A

1 (*a*)



(*b*)



2 $\frac{1}{2}(x-1)[(2x-2)+(x+1)] = 28$

$3x^2 - 4x - 55 = 0$

$(x-5)(3x+11) = 0$

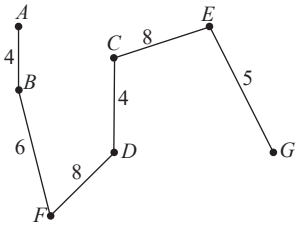
$x = 5, x = \frac{-11}{3}$

$\therefore x = 5$

3 (*a*) $n(E) = 10$

$d = 20$

(*b*)



4 $x + y = 30$

$8x + 15y = 228$

$$\begin{bmatrix} 1 & 1 \\ 8 & 15 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 30 \\ 228 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{1(15) - 8(1)} \begin{bmatrix} 15 & -1 \\ -8 & 1 \end{bmatrix}\begin{bmatrix} 30 \\ 338 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{7} \begin{bmatrix} 112 \\ 98 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 16 \\ 14 \end{bmatrix}$$

∴ Zetty membeli 16 helai baju tidur dan 14 helai baju kemeja.
Zetty bought 16 *pyjamas and* 14 *shirts.*

5 (*a*) $\sin \theta = 0.8$

$\theta = 53°$

(*b*) $p = 0.6$

(*c*) $\tan \theta = \frac{4}{3}$

6 (*a*) *X*: $1222_3 = (3^0 \times 2) + (3^1 \times 2) + (3^2 \times 2) + (3^3 \times 1) = 53$

Y: $141_8 = (8^0 \times 1) + (8^1 \times 4) + (8^2 \times 1) = 97$

Z: $123_8 = (8^0 \times 3) + (8^1 \times 2) + (8^2 \times 1) = 83$

(*b*) Jumlah harga/*Total price* = RM97 + RM83

= RM180

5	180	
5	36	− 0
5	7	− 1
5	1	− 2
	0	− 1

∴ 1210_5

7 (*a*) (i) Palsu/*False*

(ii) Benar/*True*

(*b*) $3p \neq 8$

(*c*) Sudut pedalaman nonagon/*Interior angle of nonagon*

$= (9 - 2) \times 180°$

$= 1\ 260°$

8 $m \propto \frac{n^3}{\sqrt{p}}$

$32 = \frac{k(4)^3}{\sqrt{16}}$

$k = 2$

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

$\sqrt{x} = 2$

$x = 4$

$y = \frac{2(6)^3}{\sqrt{36}}$

$y = 72$

9 (*a*) Kadar perubahan laju/*Rate of change of speed*

$= \frac{20 \text{ m s}^{-1}}{20 \text{ s}}$

$= 1 \text{ m s}^{-2}$

(*b*) Laju purata/*Average speed*

$= \frac{\left(\frac{1}{2} \times 20 \times 20\right) + (20 + 40) + \left[\frac{1}{2} \times (20 + 100) \times 20\right]}{80 \text{ s}}$

$= \frac{200 \text{ m} + 800 \text{ m} + 1\,200 \text{ m}}{80 \text{ s}}$

$= \frac{2\,200 \text{ m}}{80 \text{ s}}$

$= 27.5 \text{ m s}^{-1}$

10 Kos selepas ditolak deduktibel/*Cost after deductible* = RM23 800

Bayaran pampasan/*Amount of compensation*

$= \frac{80}{100} \times$ RM23 800

= RM19 040

Bahagian B

Section B

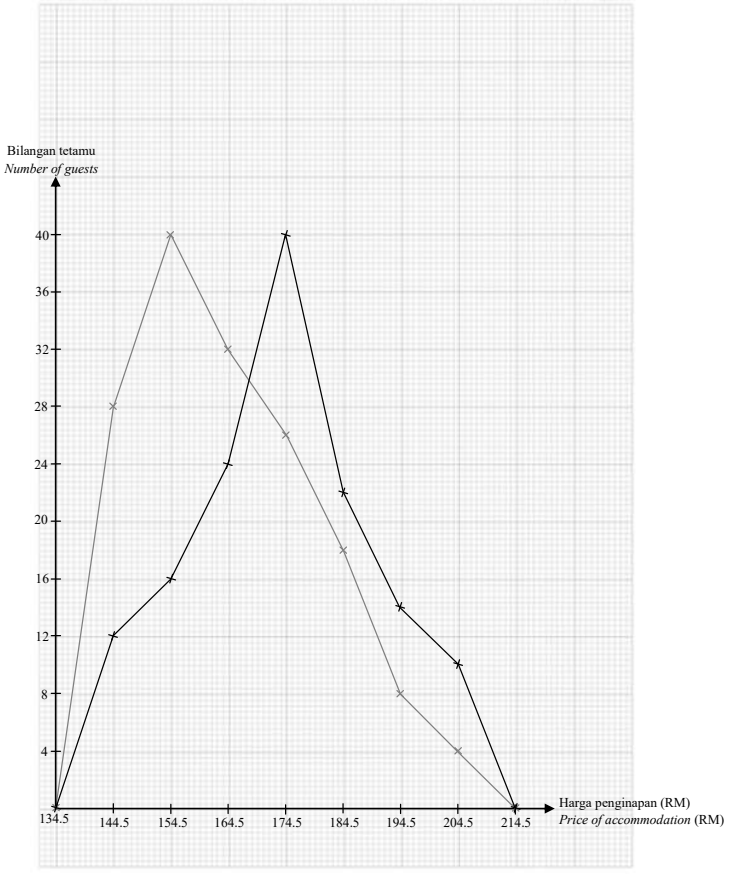
11 (*a*) (i) $m = 138 - 12 - 16 - 24 - 40 - 22 - 120$

$= 14$

(ii) Julat/*Range*: 10

Saiz selang kelas/*Size of class interval*: 60

(*b*)

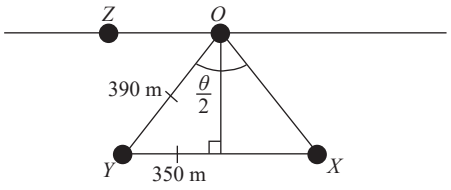


(*c*) (i) Hotel *A*: Pencong ke kanan / *Right-skewed*
Hotel *B*: Bentuk loceng / *Bell-shaped*
(ii) Hotel *A*, lebih ramai tetamu yang menginap bilik yang berharga di bawah RM170.
Hotel A, more guests staying in rooms priced below RM170.

12 (*a*) Aliran tunai positif wujud jika jumlah pendapatan melebihi jumlah perbelanjaan.
Positive cash flow exists if total income exceeds total expenses.

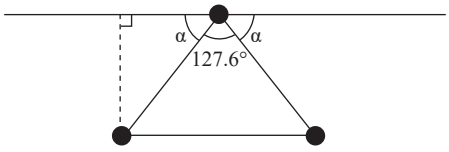
(*b*) (i) RM4 100 + RM400 – RM700 – RM800 – RM250 – RM400 – RM650
= RM1 700
(ii) (*a*) Tidak boleh / *Cannot*
3 × RM1 700 – RM5 400
= –RM300
(*b*) • Meningkatkan pendapatan aktif.
Increasing active income.
• Meningkatkan pendapatan pasif.
Increasing passive income.
• Mengurangkan perbelanjaan bil telefon.
Reducing telephone bill expenses.
• Mengurangkan belanja petrol.
Reducing petrol expenses.
• Mengurangkan perbelanjaan makanan dan minuman.
Reducing food and beverage expenses.
(mana-mana tiga jawapan / *any three answers*)

13 (*a*)



$\theta = 2 \times \sin^{-1}\left(\frac{390}{350}\right)$
$= 127.6°$

(*b*)



$\angle ZOY = \frac{180° - 127.6°}{2}$
$= 26.2°$
Jarak / *Distance* = 390 m × sin 26.2°
= 172.19 m

(*c*) tan $\angle XOZ$ = tan (127.6° + 26.2°)
= –0.49
Sukuan / *Quadrant* II

14 (*a*) (i) Kosinus / *Cosinus*
(ii) 3
(iii) 0.5, 1.5

(*b*) $\tan\theta_1 = \dfrac{-0.51}{-0.87}$

$= 0.59$

$\tan\theta_2 = \dfrac{-0.36}{0.92}$

$= 0.39$

15 (*a*) $\begin{bmatrix} 6 & 7 \\ 4 & 5 \end{bmatrix}^{-1} = \dfrac{1}{(6)(5)-(7)(4)} \begin{bmatrix} 5 & -7 \\ -4 & 6 \end{bmatrix}$

$= \begin{bmatrix} \frac{5}{2} & -\frac{7}{2} \\ -2 & 3 \end{bmatrix}$

(*b*) x = Harga sebiji epal / *Price of an apple*

y = Harga sebiji oren / *Price of an orange*

$6x + 7y = 20$

$4x + 5y = 14$

$\begin{bmatrix} x \\ y \end{bmatrix} = \dfrac{1}{(6)(5)-(7)(4)} \begin{bmatrix} 5 & -7 \\ -4 & 6 \end{bmatrix} \begin{bmatrix} 20 \\ 14 \end{bmatrix}$

16 (*a*) $p = 2q$

$2p + 2q = 1\,200$

$2(2q) + 2q = 1\,200$

$4q + 2q = 1\,200$

$6q = 1\,200$

$q = 200$

$p = 2(200)$

$p = 400$

(*b*) $\sqrt{170^2 - 80^2} = 150$

$\frac{1}{2} \times 150 \times 80 = 6\,000$

(*c*) (i) $280 - 275 = 5$

(ii) $\dfrac{274 + 275 + 277 + 278 + 280 + 283}{6} = 277.83$

(*d*) Jumlah jarak perjalanan / *Total travel distance*

$= \frac{1}{2}(100 + 80)(40) + 90(80) + \frac{1}{2}(30)(80)$

$= 12\,000$

17 (*a*) (i) Isi padu separuh silinder membulat / *Volume of circular half-cylinder*

$= \frac{1}{2} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 8$

$= 154 \text{ cm}^3$

Isi padu kuboid / *Volume of cuboid*

$= 714 \text{ cm}^3 - 154 \text{ cm}^3$

$= 560 \text{ cm}^3$

(ii) $JC = 560 \text{ cm}^3 \div 8 \text{ cm} \div 7 \text{ cm}$

$= 10 \text{ cm}$

(*b*) Min / *Mean* $= \frac{3 \times 13 + 4 \times 18 + 2 \times 23 + 1 \times 28}{3 + 4 + 5 + 1}$

$= 18.5$

Sisihan piawai / *Standard deviation* $= \sqrt{\frac{3 \times 13^2 + 4 \times 18^2 + 2 \times 23^2 + 1 \times 28^2}{3 + 4 + 5 + 1} - 18.5^2}$

$= 4.72$

(*c*) $\frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$

(*d*) $\frac{5}{100} \times 20 + \frac{5}{100} \times 30 = \text{RM}2.50$