Yakin

Jawapan

Yakin Classroom

MATEMATIK

UNIT 1

SK 1.1

A **1** $3x^2 - x - 10$ ialah ungkapan kuadratik.
$3x^2 - x - 10$ is a quadratic expression.

2 $x^2 - 4^2$ ialah ungkapan kuadratik.
$x^2 - 4^2$ is a quadratic expression.

3 $x^3 + 8$ bukan ungkapan kuadratik kerana kuasa tertinggi pemboleh ubah ialah 3.
$x^3 + 8$ is not a quadratic expression because the highest power of the unknown is 3.

4 $x^2 + y^2$ bukan ungkapan kuadratik kerana terdapat dua pemboleh ubah dalam ungkapan iaitu x dan y.
$x^2 + y^2$ is not a quadratic expression because there is two unknown in the expression that is x and y.

5 $(x - 5)(x + 6)$ ialah ungkapan kuadratik.
$(x - 5)(x + 6)$ is a quadratic expression.

6 $9x - 1$ bukan ungkapan kuadratik kerana ungkapan ini ialah satu ungkapan linear.
$9x - 1$ is not a quadratic expression because it is a linear expression.

7 $9x^2$ ialah ungkapan kuadratik.
$9x^2$ is a quadratic expression.

8 $\frac{1}{3}x^2 + \sqrt{x}$ bukan ungkapan kuadratik kerana terdapat kuasa yang bukan nombor bulat.
$\frac{1}{3}x^2 + \sqrt{x}$ is not a quadratic expression because the power is not a whole number.

9 $2x^2 + \frac{7}{x} - 8$ bukan ungkapan kuadratik kerana terdapat kuasa yang bukan nombor bulat.
$2x^2 + \frac{7}{x} - 8$ is not a quadratic expression because the power is not a whole number.

B **1** $a = 2, b = 5, c = -63$

2 $a = -1, b = -2, c = 15$

3 $a = 1, b = -3, c = 0$

4 $a = \frac{1}{2}, b = 4, c = 0$

5 $a = \frac{-1}{6}, b = 0, c = 5$

6 $a = 1, b = -4, c = -12$

C **1**

2

3

4

D **1** Titik minimum = (4, –1)
Point of minimum = (4, –1)

2 Titik maksimum = (–2, 9)
Point of maximum = (–2, 9)

3 Titik maksimum = (5, 4)
Point of maximum = (5, 4)

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4 Titik minimum = (–10, 0)
Point of minimum = (–10, 0)

E **1** $f(x) = x^2 - 2x + c$
$6 = (0)^2 - 2(0) + c$
$c = 6$

2 $f(x) = -2x^2 + 4x - c$
$-8 = -2(3)^2 + 4(3) - c$
$-8 = -6 - c$
$c = -6 + 8$
$c = 2$

3 $f(x) = c - x^2$
$5 = c - 0^2$
$c = 5$

4 $f(x) = 3x^2 - x + c$
$-7 = 3(0)^2 - (0) + c$
$c = -7$

F **1** $(10 + m)(m) = 1\ 800$
$10m + m^2 = 1\ 800$
$m^2 + 10m - 1\ 800 = 0$

2 (*a*) $A = (2x - 4)(x + 4) - x^2$
$= 2x^2 + 8x - 4x - 16 - x^2$
$= x^2 + 4x - 16$

(*b*) $x^2 + 4x - 16 = 80$
$x^2 + 4x - 16 - 80 = 0$
$x^2 + 4x - 96 = 0$

G **1** (*a*) $c = 25$

(*b*) $(x + 5)^2$
$= x^2 + 10x + 25$
$\therefore b = 10$

2 (*a*) $-x^2 + 5x + 14 = 0$
$x^2 - 5x - 14 = 0$
$(x + 2)(x - 7) = 0$
$x = -2$ atau/*or* 7
$m = (-2, 0)$

(*b*) $n = (7, 0)$

H **1** $f(x) = 4^2 - 10(4) + 24$
$= 16 - 40 + 24$
$= 0$

2 $f(x) = 3 - 9(-6) - 2(-6)^2$
$= 3 + 54 - 72$
$= -15$

3 $f(x) = [2(2) - 5][1 - 8(2)]$
$= (-1)(-15)$
$= 15$

I **1** Apabila/*When* $x = 1$,
$x^2 - 11x + 24 = (1)^2 - 11(1) + 24$
$= 14$
Apabila/*When* $x = 3$,
$x^2 - 11x + 24 = (3)^2 - 11(3) + 24$
$= 0$

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Apabila/*When* $x = 8$,

$x^2 - 11x + 24 = (8)^2 - 11(8) + 24$

$= 0$

$x = 3$ dan $x = 8$ adalah punca-punca bagi $x^2 - 11x + 24 = 0$

$x = 3$ *and* $x = 8$ *are the roots for* $x^2 - 11x + 24 = 0$

2 Apabila/*When* $x = 5$,

$5x^2 - 33x + 18 = 5(5)^2 - 33(5) + 18$

$= -22$

Apabila/*When* $x = 6$,

$5x^2 - 33x + 18 = 5(6)^2 - 33(6) + 18$

$= 0$

$x = 6$ adalah punca bagi $5x^2 - 33x + 18 = 0$

$x = 6$ *is a root for* $5x^2 - 33x + 18 = 0$

3 Apabila/*When* $x = -2$,

$-x^2 - 3x + 4 = -(2)^2 - 3(2) + 4$

$= -6$

Apabila/*When* $x = -4$,

$-x^2 - 3x + 4 = -(-4)^2 - 3(-4) + 4$

$= 0$

$x = -4$ adalah punca bagi $-x^2 - 3x + 4 = 0$

$x = -4$ *is a root for* $-x^2 - 3x + 4 = 0$

4 Apabila/*When* $x = -5$,

$-25 + 10x - x^2 = -25 + 10(-5) - (-5)^2$

$= -100$

Apabila/*When* $x = 5$,

$-25 + 10x - x^2 = -25 + 10(5) - (5)^2$

$= 0$

$x = 5$ adalah punca bagi $-25 + 10x - x^2 = 0$

$x = 5$ *is a root for* $-25 + 10x - x^2 = 0$

J 1 $(2x - 3)(2x + 5) = 0$

$x = \frac{3}{2}, x = -\frac{5}{2}$

2 $(x - 3)(x + 2) = 0$

$x = 3, x = -2$

3 $(3x + 7)(3x - 7) = 0$

$x = -\frac{7}{3}, x = \frac{7}{3}$

4 $x = 0, x = 8$

5 $2x^2 - 9x - 5 = 0$

$(x - 5)(2x + 1) = 0$

$x = 5, x = -\frac{1}{2}$

6 $(4x - 5)(3x - 2) = 0$

$x = \frac{5}{4}, x = \frac{2}{3}$

Kaedah alternatif/*Alternative method*

$12x^2 - 23x + 10 = 0$

$$x = \frac{-(-23) \pm \sqrt{(-23)^2 - 4(12)(10)}}{2(12)}$$

$$x = \frac{23 \pm \sqrt{49}}{24}$$

$$x = \frac{23 + \sqrt{49}}{24} \quad , x = \frac{23 - \sqrt{49}}{24}$$

$x = \frac{5}{4}$, $x = \frac{2}{3}$

K 1 $x^2 - 3x + 2 = 0$
$(x - 1)(x - 2) = 0$
$x = 1, x = 2$

2 $z^2 - 3z = 4$
$z^2 - 3z - 4 = 0$
$(z + 1)(z - 4) = 0$
$z = -1, z = 4$

3 $(x - 1) = \pm 4$
$x = 4 + 1$, $x = -4 + 1$
$x = 5$, $x = -3$

4 $2x^2 - 7x - 4 = 5$
$2x^2 - 7x - 9 = 0$
$(2x - 9)(x + 1) = 0$
$x = \frac{9}{2}, x = -1$

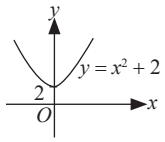
5 $x^2 + 3 = 3 - 2x$
$x^2 + 2x = 0$
$x(x + 2) = 0$
$x = 0$, $x = -2$

6 $4x^2 - 12x + 9 = 1$
$4x^2 - 12x + 8 = 0$
$x^2 - 3x + 2 = 0$
$(x - 1)(x - 2) = 0$
$x = 1$, $x = 2$

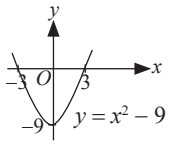
7 $x - x^2 = -12$
$-x^2 + x + 12 = 0$
$x^2 - x - 12 = 0$
$(x + 3)(x - 4) = 0$
$x = -3$, $x = 4$

8 $(3x - 5)^2 - (x - 8)(3x - 5) = 0$
$(3x - 5)[(3x - 5) - (x - 8)] = 0$
$(3x - 5)(2x + 3) = 0$
$x = \frac{5}{3}$, $x = -\frac{3}{2}$

L 1 $a = 1 > 0$
$b = 0$,
paksi simetri ialah paksi-y
axis of symmetry is y-axis
$c = 2$



2 $a = 1 > 0$
$b = 0$,
paksi simetri ialah paksi-y
axis of symmetry is y-axis
$c = -9$



$y = 0$
$x^2 - 9 = 0$
$(x + 3)(x - 3) = 0$
$x = -3, 3$

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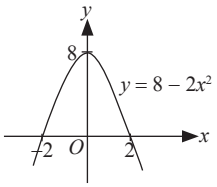
3 $a = -2 < 0$

$b = 0$,

paksi simetri ialah paksi-y

axis of symmetry is y-axis

$c = 8$



$$y = 0$$
$$8 - 2x^2 = 0$$
$$2(4 - x^2) = 0$$
$$2(2 + x)(2 - x) = 0$$
$$x = -2, 2$$

M 1 $x(x - 5) = 234$

$$x^2 - 5x - 234 = 0$$
$$(x - 18)(x + 13) = 0$$
$$x = 18, x = -13$$

Kedua-dua nombor itu ialah 18 dan –13.

The two numbers are 18 *and* –13.

2 $x(x + 21) = 196$

$$x^2 + 21x - 196 = 0$$
$$(x - 7)(x + 28) = 0$$
$$x = 7, x = -28$$

Oleh kerana/*Since* $x > 0$, $x = 7$

Lebar/*Width* = 7 m

Panjang/*Length* = 7 + 21 m = 28 m

3 $\frac{1}{2}[(x + 6) + 6](6) = 60$

$$(x + 12)3 = 60$$
$$3x = 60 - 36$$
$$3x = 24$$
$$x = 8$$

4 $x^2 + px - 54 = 0$

Apabila/*When* $x = 6$,

$$6^2 + p(6) - 54 = 0$$
$$6p = 18$$
$$p = 3$$

5 $2\pi r^2 + 2\pi rh = 276\pi$

$$2r^2 + 2r(2r + 5) = 276$$
$$2r^2 + 4r^2 + 10r = 276$$
$$6r^2 + 10r - 276 = 0$$
$$(r - 6)(3r + 23) = 0$$
$$r = 6, r = -\frac{23}{3}$$

Oleh kerana/*Since* $r > 0$, $r = 6$ cm

Tinggi/*Height* = 2(6) + 5 cm = 17 cm

6 $x(x + 27) = 280$

$$x^2 + 27x - 280 = 0$$
$$(x - 8)(x + 35) = 0$$
$$x = 8, x = -35$$

Oleh kerana umur mesti positif, $x = 8$

Since age must be positive, $x = 8$

Umur Encik Tan sekarang

Current age of Mr Tan

= 8 + 27 + 5

= 40 tahun/*years old*

Umur anaknya sekarang
Current age of son
$= 8 + 5$
$= 13$ tahun/*years old*

7 (*a*) $(x + 2) \times (x + 4 + x + 3) - \frac{1}{2}x(x + 3) = 221$

$$(x + 2)(2x + 7) - \frac{1}{2}x^2 - \frac{3}{2}x = 221$$

$$2x^2 + 11x + 14 - \frac{1}{2}x^2 - \frac{3}{2}x - 221 = 0$$

$$\frac{3}{2}x^2 - \frac{19}{2}x - 207 = 0$$

$$3x^2 + 19x - 414 = 0$$

$$(x - 9)(3x + 46) = 0$$

Oleh kerana/*Since* $x > 0$, $x = 9$ cm

(*b*) $UT = \sqrt{(9)^2 + (9 + 3)^2}$
$= 15$ cm

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 C **2** C

Kertas 2/*Paper 2*

1 (*a*) $V^3 = (n + 5)(n + 1)(17)$
$= (n^2 + 6n + 5)(17)$
$= 17n^2 + 102n + 85$
$\therefore V^3 = 17n^2 + 102n + 85$

(*b*) $17n^2 + 102n + 85 = 357$
$17n^2 + 102n - 272 = 0$
$n = 2$ atau/*or* $n = -8$ (Abaikan/*Ignore*)
Panjang kotak susu $= (n + 5)$ cm
Length of a box of milk
$= (2 + 5)$ cm
$= 7$ cm

(*c*) $\frac{357}{(3 \times 7)} = 17 \text{ cm}^3$

$\therefore$ Amir perlu minum 17 cm^3 susu dalam sehari.
Amir needs to drink 17 cm^3 *of milk in a day.*

2 4 sisi/*sides* $= 4x + 4$
1 sisi/*side* $= \frac{4x + 4}{4} = x + 1$
Luas/*Area* $= (x + 1)(x + 1)$

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SK 2.1

A

Asas Nombor *Base Number*	Digit
Asas 2/*Base* 2	0, 1
Asas 3/*Base* 3	0, 1, 2
Asas 4/*Base* 4	0, 1, 2, 3
Asas 5/*Base* 5	0, 1, 2, 3, 4
Asas 6/*Base* 6	0, 1, 2, 3, 4, 5
Asas 7/*Base* 7	0, 1, 2, 3, 4, 5, 6
Asas 8/*Base* 8	0, 1, 2, 3, 4, 5, 6, 7
Asas 9/*Base* 9	0, 1, 2, 3, 4, 5, 6, 7, 8
Asas 10/*Base* 10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9

B 23412, 122104, 100011

C **1**

Nilai tempat *Place value*	$\underline{1}$	0	0	1	1	1
Nombor *Number*	2^5	2^4	2^3	2^2	2^1	2^0

$2^5 \times 1 = 32$

2

Nilai tempat *Place value*	1	0	$\underline{1}$	1	1	0	1
Nombor *Number*	2^6	2^5	2^4	2^3	2^2	2^1	2^0

$2^4 \times 1 = 16$

3

Nilai tempat *Place value*	3	6	$\underline{5}$	1
Nombor *Number*	8^3	8^2	8^1	8^0

$8^1 \times 5 = 40$

4

Nilai tempat *Place value*	$\underline{3}$	2	4	1
Nombor *Number*	5^3	5^2	5^1	5^0

$5^3 \times 3 = 375$

5

Nilai tempat *Place value*	1	0	$\underline{2}$	1	1	1	0
Nombor *Number*	3^6	3^5	3^4	3^3	3^2	3^1	3^0

$3^4 \times 2 = 162$

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6

Nilai tempat *Place value*	1	3	2	0	1	1	2	3
Nombor *Number*	4^7	4^6	4^5	4^4	4^3	4^2	4^1	4^0

$4^3 \times 1 = 64$

D **1** $x = 2, y = 1$ **2** $x = 6, y = 1$
3 $x = 2, y = 3$

E **1** $(1 \times 2^4) + (1 \times 2^0) = 17$
2 $(1 \times 3^6) + (2 \times 3^5) + (0) + (1 \times 3^3) + (2 \times 3^2) + (1 \times 3^1) + (1 \times 3^0) = 1264$
3 $(1 \times 5^3) + (4 \times 5^2) + (3 \times 5^1) + (0) = 240$
4 $(1 \times 8^6) + (7 \times 8^5) + (0) + (2 \times 8^3) + (4 \times 8^2) + (6 \times 8^1) + (1 \times 8^0) = 492849$

F **1** 1001_2, 10010_2, 100100_2, 101100_2
2 2310_5, 24310_5, 100231_5, 112130_5
3 7147_8, 42617_8, 120673_8, 412346_8
4 11100_2, 3001_4, 3213_5, 2011_6

G **1**

2	2310	
2	1155	–0
2	577	–1
2	288	–1
2	144	–0
2	72	–0
2	36	–0
2	18	–0
2	9	–0
2	4	–1
2	2	–0
2	1	–0
	0	–1

$2310_{10} = 100100000110_2$

2

4	2310	
4	577	–2
4	144	–1
4	36	–0
4	9	–0
4	2	–1
	0	–2

$2310_{10} = 210012_4$

3

5	2310	
5	462	–0
5	92	–2
5	18	–2
5	3	–3
	0	–3

$2310_{10} = 33220_5$

4

8	2310	
8	288	–6
8	36	–0
8	4	–4
	0	–4

$2310_{10} = 4406_8$

H **1** $2013_4 = (2 \times 4^3) + (1 \times 4^1) + (3 \times 4^0)$
$= 135$

8	135	
8	16	–7
8	2	–0
	0	–2

$2013_4 = 207_8$

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2 $10245_6 = (1 \times 6^4) + (2 \times 6^2) + (4 \times 6^1) + (5 \times 6^0)$
$= 1397$

9	1397	
9	155	−2
9	17	−2
9	1	−8
	0	−1

$10245_6 = 1822_9$

3 $30120_5 = (3 \times 5^4) + (1 \times 5^2) + (2 \times 5^1)$
$= 1910$

2	1910	
2	955	−0
2	477	−1
2	238	−1
2	119	−0
2	59	−1
2	29	−1
2	14	−1
2	7	−0
2	3	−1
2	1	−1
	0	−1

$30120_5 = 11101110110_2$

4 $167100_8 = (1 \times 8^5) + (6 \times 8^4) + (7 \times 8^3) + (1 \times 8^2)$
$= 60992$

7	60992	
7	8713	−1
7	1244	−5
7	177	−5
7	25	−2
7	3	−4
	0	−3

$167100_8 = 342551_7$

I 1

Asas 2 *Base 2*	1	1	0	0	1	1	1	0
Nilai digit *Digit value*	2^1	2^0	2^2	2^1	2^0	2^2	2^1	2^0
Asas 8 *Base 8*	$2 + 1 = 3$		$0 + 0 + 1 = 1$			$4 + 2 + 0 = 6$		
	316_8							

2

Asas 2 *Base 2*	1	0	1	1	0	1	0	1
Nilai digit *Digit value*	2^1	2^0	2^2	2^1	2^0	2^2	2^1	2^0
Asas 8 *Base 8*	$2 + 0 = 2$		$4 + 2 + 0 = 6$			$4 + 0 + 1 = 5$		
	265_8							

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3

Asas 8 *Base 8*	3			0			1			2			6			7		
	2 + 1			0			1			2			4 + 2			4 + 2 + 1		
Nilai digit *Digit value*	2^2	2^1	2^0	2^2	2^1	2^0	2^2	2^1	2^0	2^2	2^1	2^0	2^2	2^1	2^0	2^2	2^1	2^0
Asas 2 *Base 2*	0	1	1	0	0	0	0	0	1	0	1	0	1	1	0	1	1	1
	11000001010110111_2																	

J 1 $101001_2 \rightarrow 41_{10}$

$11110_2 \rightarrow 30_{10}$

$41_{10} + 30_{10} = 71_{10}$

2	71	
2	35	–1
2	17	–1
2	8	–1
2	4	–0
2	2	–0
2	1	–0
	0	–1

$\therefore\ 101001_2 + 11110_2 = 1000111_2$

2 $201_5 \rightarrow 51_{10}$

$41_5 \rightarrow 21_{10}$

$51_{10} + 21_{10} = 72_{10}$

5	72	
5	14	–2
5	2	–4
	0	–2

$\therefore\ 201_5 + 41_5 = 242_5$

3 $21210_3 \rightarrow 210_{10}$

$1201_3 \rightarrow 46_{10}$

$210_{10} + 46_{10} = 256_{10}$

3	256	
3	85	–1
3	28	–1
3	9	–1
3	3	–0
3	1	–0
	0	–1

$\therefore\ 21210_3 + 1201_3 = 100111_3$

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4 $3012_4 \rightarrow 198_{10}$

$1201_4 \rightarrow 97_{10}$

$198_{10} + 97_{10} = 295_{10}$

4	295	
4	73	–3
4	18	–1
4	4	–2
4	1	–0
	0	–1

$\therefore\ 3012_4 + 1201_4 = 10213_4$

5 $217_8 \rightarrow 143_{10}$

$162_8 \rightarrow 114_{10}$

$143_{10} + 114_{10} = 257_{10}$

8	257	
8	32	–1
8	4	–0
	0	–4

$\therefore\ 217_8 + 162_8 = 401_8$

6 $157_9 \rightarrow 133_{10}$

$21_9 \rightarrow 19_{10}$

$133_{10} + 19_{10} = 152_{10}$

9	152	
9	16	–8
9	1	–7
	0	–1

$\therefore\ 157_9 + 21_9 = 178_9$

K 1 $111_2 \rightarrow 7_{10}$

$11_2 \rightarrow 3_{10}$

$7_{10} - 3_{10} = 4_{10}$

2	4	
2	2	–0
2	1	–0
	0	–1

$\therefore\ 111_2 - 11_2 = 100_2$

2 $2101_3 \rightarrow 64_{10}$

$1021_3 \rightarrow 34_{10}$

$64_{10} - 34_{10} = 30_{10}$

3	30	
3	20	–0
3	3	–1
3	1	–0
	0	–1

$\therefore\ 2101_3 - 1021_3 = 1010_3$

3 $3121_4 \rightarrow 217_{10}$

$301_4 \rightarrow 49_{10}$

$217_{10} - 49_{10}$

$= 168_{10}$

4	168	
4	42	–0
4	10	–2
4	2	–2
	0	–2

$\therefore 3121_4 - 301_4 = 2220_4$

4 $2310_5 \rightarrow 330_{10}$

$410_5 \rightarrow 105_{10}$

$330_{10} - 105_{10}$

$= 225_{10}$

5	225	
5	45	–0
5	9	–0
5	1	–4
	0	–1

$\therefore 2310_5 - 4105_5 = 1400_5$

5 $676_8 \rightarrow 446_{10}$

$41_8 \rightarrow 33_{10}$

$446_{10} - 33_{10}$

$= 413_{10}$

8	413	
8	51	–5
8	6	–3
	0	–6

$\therefore 676_8 - 41_8 = 635_8$

6 $142_9 \rightarrow 119_{10}$

$10_9 \rightarrow 9_{10}$

$119_{10} - 9_{10}$

$= 110_{10}$

9	110	
9	12	–2
9	1	–3
	0	–1

$\therefore 142_9 - 10_9 = 132_9$

L 1 (*a*) $4011_5 = (4 \times 5^3) + 0 + (1 \times 5^1) + (1 \times 5^0)$

$= 506$

$1141_8 = (1 \times 8^3) + (1 \times 8^2) + (4 \times 8^1) + (1 \times 8^0) = 609$

(*b*) Jumlah penduduk di Kampung Dew

Total number of villagers in Kampung Dew

$= 506 \times 1.4071$

$= 712$

(*c*) Jumlah penduduk dalam ketiga-tiga kampung ini

Total villagers in these three housing areas

$= 506 + 609 + 712$

$= 1827$

5	1827	
5	365	–2
5	73	–0
5	14	–3
5	2	–4
	0	–2

$\therefore 1827_{10} = 24302_5$

2 (*a*) $6.25\pi = \frac{1}{4}(\pi)(r^2)$

$r = 5$ cm

2	5	
2	2	–1
2	1	–0
	0	–1

$\therefore r = 101_2$

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(*b*) $10_2 = (1 \times 2^1) + 0$
$= 2$ cm

Keluasan bulatan kecil $= \pi(2^2)$
Area of small circle
$= 4\pi$ cm^2

Keluasan kawasan lorekan yang tinggal
Area of shaded region remained
$= 6.25\pi - 4\pi$
$= 2.25\pi$ cm^2

3 $\text{RM}135_6 = \text{RM}[(1 \times 6^2) + (3 \times 6^1) + (5 \times 6^0)]$
$= \text{RM}59$

$\text{RM}106_8 = \text{RM}[(1 \times 8^2) + (0) + (6 \times 8^0)]$
$= \text{RM}70$

$59 \times x = 59 - 47.2$
$x = 0.2$
$= 20\%$

$70 \times y = 70 - 47.6$
$y = 0.32$
$= 32\%$

$\therefore$ May mempunyai diskaun yang lebih tinggi.
May has higher discount.

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 D **2** C **3** B **4** D

Kertas 2/*Paper 2*

1 Sofa $M = (5 \times 9^2) + (4 \times 9^1) + (7 \times 9^0) = 448$
Sofa $N = (2 \times 6^3) + (4 \times 6^2) + (4 \times 6^1) + (1 \times 6^0) = 601$
$\therefore$ Sofa *M* lebih murah./*Sofa M is cheaper.*

UNIT 3

SK 3.1

A 1 Pernyataan kerana ayat itu palsu.
It is a statement because it is false.

2 Pernyataan kerana ayat itu benar.
It is a statement because it is true.

3 Bukan pernyataan kerana ayat itu ayat berbentuk soalan.
It is not a statement because it is a question.

4 Pernyataan kerana jika hari ini ialah Hari Jumaat, maka pernyataan ini adalah benar. Jika hari ini bukan hari Jumaat, maka pernyataan ini adalah palsu.
It is a statement because if today is Friday then it is true. If today is not Friday, then it is false.

5 Bukan pernyataan kerana itu adalah ayat berbentuk perintah.
It is not a statement because it is an order.

6 Bukan pernyataan kerana itu adalah ayat seruan.
It is not a statement because it is an exclamation sentence.

B 1 Pernyataan kerana ayat itu benar.
It is a statement because it is true.

2 Bukan pernyataan kerana tidak dapat menentukan kebenaran.
It is not a statement because it is neither true nor false.

3 Pernyataan kerana ayat itu benar.
It is a statement because it is true.

4 Pernyataan kerana ayat itu palsu.
It is a statement because it is false.

5 Bukan pernyataan kerana tidak dapat menentukan kebenaran.
It is not a statement because it is neither true nor false.

6 Bukan pernyataan kerana tidak dapat menentukan kebenaran.
It is not a statement because it is neither true nor false.

C **1** Palsu/*False* **2** Benar/*True*
3 Benar/*True* **4** Palsu/*False*
5 Benar/*True* **6** Palsu/*False*
7 Benar/*True* **8** Palsu/*False*

D **1** Pernyataan benar/*True statement*:
$2 + 7 = 13 - 4$
Pernyataan palsu/*False statement*:
$13 + 2 = 7 - 4$

2 Pernyataan benar/*True statement*:
$-8 < -6$
Pernyataan palsu/*False statement*:
$-6 < -8$

3 Pernyataan benar/*True statement*:
$\sqrt{64} = 8$
Pernyataan palsu/*False statement*:
$\sqrt{8} = 64$

4 Pernyataan benar/*True statement*:
$\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$
Pernyataan palsu/*False statement*:
$\frac{1}{6} - \frac{1}{3} = \frac{1}{2}$

E **1** Bukan semua nombor perdana adalah nombor ganjil.
Not all prime numbers are odd numbers.

2 Bukan semua rombus mempunyai dua paksi simetri.
Not all rhombus has two axis of symmetry.

3 Suatu heptagon tidak mempunyai 6 sisi.
A heptagon does not have 6 *sides*.

F **1** (*a*) 3 dan –5 ialah nombor ganjil.
3 *and* –5 *is an odd number*.
(*b*) 3 atau –5 ialah nombor ganjil.
3 *or* –5 *is an odd number*.

2 (*a*) 2 dan 3 ialah faktor perdana bagi 12.
2 *and* 3 *is a prime factor of* 12.
(*b*) 2 atau 3 ialah faktor perdana bagi 12.
2 *or* 3 *is a prime factor of* 12.

3 (*a*) $-17 + 9 < -5$ dan $16 \div 4 = 2^2$
$-17 + 9 < -5$ *and* $16 \div 4 = 2^2$
(*b*) $-17 + 9 < -5$ atau $16 \div 4 = 2^2$
$-17 + 9 < -5$ *or* $16 \div 4 = 2^2$

G **1** *p*: 36 ialah kuasa dua sempurna.
36 *is a perfect square*.
q: 6 ialah faktor bagi 12.
6 *is a factor of* 12.

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2 p: $\sqrt{25} = 5$
q: $\sqrt[3]{729} = 9$

3 p: Matahari terbit dari Timur.
The sun rises from the East.
q: Matahari terbit dari Barat.
The sun rises from the West.

4 p: -11 ialah integer.
-11 *is an integer.*
q: 3 ialah nombor perdana.
3 *is a prime number.*

H 1 p: -9 lebih kecil daripada -11. (Palsu)
-9 *is smaller than* -11. (*False*)
q: -2 lebih besar daripada -3. (Benar)
-2 *is greater than* -3. (*True*)
p dan q (Palsu)
p *and* q (*False*)

2 p: 21 ialah ganda bagi 7. (Benar)
21 *is a multiple of* 7. (*True*)
q: 21 ialah ganda bagi 10. (Palsu)
21 *is a multiple of* 10. (*False*)
p atau q (Benar)
p *or* q (*True*)

3 p: $5^2 = 25$ (Benar/*True*)
q: $(-5)^2 = 25$ (Benar/*True*)
p dan q (Benar)
p *and* q (*True*)

4 p: $4 > 5$ (Palsu/*False*)
q: $4 - 5 = 9$ (Palsu/*False*)
p dan q (Palsu)
p *and* q (*False*)

5 p: Setiap bulan mempunyai 30 hari. (Palsu)
Every month has 30 *days*. (*False*)
q: Setiap tahun mempunyai 365 hari. (Palsu)
Every year has 365 *days*. (*False*)
p dan q (Palsu)
p *and* q (*False*)

6 p: $x = -1$ ialah punca bagi $(x + 1)(x + 2) = 0$. (Benar)
$x = -1$ *is a root of* $(x + 1)(x + 2) = 0$. (*True*)
q: 2 ialah punca $(x + 1)(x + 2) = 0$. (Palsu)
2 *is a root of* $(x + 1)(x + 2)$. (*False*)
p atau q (Benar)
p *or* q (*True*)

I 1 Implikasi : Jika hari ini hujan, maka Ali akan lewat ke sekolah.
Implication : *If today is raining, then Ali will be late for school.*

2 Implikasi : Jika $x = 8$, maka $x^3 = 512$.
Implication : *If* $x = 8$, *then* $x^3 = 512$.

3 Implikasi : Jika $P \subset Q$, maka $P \cap Q = P$.
Implication : *f* $P \subset Q$, *then* $P \cap Q = P$.

4 Implikasi : Jika $(x - 4)(x + 2) = 0$, maka $x = -2$ atau/*or* 4.
Implication : *If* $(x - 4)(x + 2) = 0$, *then* $x = -2$ atau/*or* 4.

J 1 Antejadian : x ialah nombor genap.
Antecedent : x *is an even number.*
Akibat : x^2 ialah nombor genap.
Consequent : x^2 *is an even number.*

2 Antejadian/*Antecedent* : $x = 0$.
Akibat : $\frac{1}{x}$ tidak ditakrif.
Consequent : $\frac{1}{x}$ *is undefined.*

3 Antejadian/*Antecedent* : $m < 0$.
Akibat : m ialah nombor negatif.
Consequent : *m is a negative number*.

4 Antejadian/*Antecedent* : $p - 5 = 8$
Akibat/*Consequent* : $p = 13$

K 1 Implikasi : Rombus ialah segi empat tepat jika dan hanya jika ia mempunyai 4 paksi simetri.
Implication : *A rhombus is a square if and only if it has* 4 *axis of symmetry*.

2 Implikasi : $x = y$ jika dan hanya jika $x - y = 0$.
Implication : $x = y$ *if and only if* $x - y = 0$.

3 Implikasi : $\angle OPQ < 90°$ jika dan hanya jika $\angle OPQ$ adalah sudut tirus.
Implication : $\angle OPQ < 90°$ *if and only if* $\angle OPQ$ *is an acute angle*.

4 Implikasi : Poligon mempunyai 3 sisi jika dan hanya jika hasil tambah sudut pedalaman ialah 180°.
Implication : *Polygon consists of* 3 *sides if and only if the sum of the interior angles is* 180°.

L 1 Implikasi 1 : Jika $x - y$ adalah negatif, maka x lebih kecil daripada y.
Implication 1 : *If* $x - y$ *is negative*, *then* x *is smaller than* y.
Implikasi 2 : Jika x lebih kecil daripada y, maka $x - y$ adalah negatif.
Implication 2 : *If* x *is smaller than* y, *then* $x - y$ *is negative*.

2 Implikasi 1 : Jika A ialah set kosong, maka A tidak mempunyai elemen.
Implication 1 : *If A is an empty set*, *then A is does not have any element*.
Implikasi 2 : Jika A tidak mempunyai elemen, maka A ialah set kosong.
Implication 2 : *If A does not have element*, *then A is an empty set*.

3 Implikasi 1 : Jika $x = 9$, maka $x^2 = 81$.
Implication 1 : *If* $x = 9$, *then* $x^2 = 81$.
Implikasi 2 : Jika $x^2 = 81$, maka $x = 9$.
Implication 2 : *If* $x^2 = 81$, *then* $x = 9$.

4 Implikasi 1 : Jika $PQRS$ ialah segi empat selari, maka PQ selari dengan RS.
Implication 1 : *If PQRS is a parallelogram*, *then PQ is parallel to RS*.
Implikasi 2 : Jika PQ selari dengan RS, maka $PQRS$ ialah segi empat selari.
Implication 2 : *If PQ is parallel to RS*, *then PQRS is a parallelogram*.

M 1 Akas : Jika x ialah nombor bulat, maka x ialah integer.
Converse : *If* x *is a whole number*, *then* x *is a integer*.
Songsangan : Jika x bukan integer, maka x bukan nombor bulat.
Inverse : *If* x *is not an integer*, *then* x *is not a whole number*.
Kontrapositif : Jika x bukan nombor bulat maka x bukan integer.
Contrapositive : *If* x *is not a whole number*, *then* x *is not an integer.*

2 Akas : Jika x ialah nombor negatif, maka x lebih kecil daripada 0.
Converse : *If* x *is a negative number*, *then* x *is smaller than* 0.
Songsangan : Jika x tidak lebih kecil daripada 0, maka x bukan nombor negatif.
Inverse : *If* x *is not smaller than* 0, *then* x *is not a negative number*.
Kontrapositif : Jika x bukan nombor negatif, maka x tidak lebih kecil daripada 0.
Contrapositive : *If* x *is not a negative number*, *then* x *is not smaller than* 0.

3 Akas : Jika 7 ialah faktor bagi 49, maka 49 ialah gandaan 7.
Converse : *If* 7 *is a factor of* 49, *then* 49 *is a multiple of* 7.
Songsangan : Jika 7 ialah bukan faktor bagi 49, maka 49 ialah bukan gandaan 7.
Inverse : *If* 7 *is not a factor of* 49, *then* 49 *is not a multiple of* 7.
Kontrapositif : Jika 49 ialah bukan gandaan 7, maka 7 ialah bukan faktor bagi 49.
Contrapositive : *If* 49 *is not a multiple of* 7, *then* 7 *is not a factor of* 49.

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N **1** Palsu. Kerana 9 bukan nombor perdana.
False. Because 9 *is not a prime number*.
2 Benar/*True*
3 Palsu. 5 bukan unsur bagi {2, 4, 6, 8}.
False. 5 *is not an element of* {2, 4, 6, 8}.
4 Palsu. Kerana heptagon mempunyai 14 bilangan pepenjuru.
False. Because heptagon has 14 *number of diagonals*.
5 Benar/*True*

SK 3.2

A **1** Umum/*General* **2** Khusus/*Specific*
3 Umum/*General*

B **1** Hujah deduktif/*Deductive argument*
2 Hujah induktif/*Inductive argument*
3 Hujah induktif/*Inductive argument*

C **1** Sah dan munasabah/*Valid and reasonable*
2 Sah tetapi tidak munasabah kerana premis 1 dan kesimpulan adalah palsu.
Valid but not reasonable because premise 1 *and conclusion are false*.
3 Tidak sah kerana tidak memenuhi bentuk hujah deduktif yang sah. Tidak munasabah kerana kesimpulan adalah palsu.
Not valid because does not follow the form of deductive argument that is valid. Not reasonable because conclusion is false.

D **1** 13 tidak boleh dibahagikan oleh 2.
13 *is not divided by* 2.
2 Semua gandaan 10 ialah gandaan 5.
All multiples of 10 *are multiples of* 5.
3 $\sqrt{121}$ adalah suatu integer.
$\sqrt{121}$ *is an integer*.
4 $AC^2 \neq AB^2 + BC^2$ bagi ΔABC
$AC^2 \neq AB^2 + BC^2$ *for* ΔABC
5 Semua haiwan boleh bergerak.
All animals can move.
6 Jika saya dapat markah lebih daripada 90% dalam ujian Fizik, maka saya mendapat gred A+ untuk Fizik.
If I get marks higher than 90% *in Physics test, then I get grade* A+ *for Physics*
7 17 hanya boleh dibahagi dengan 1 dan 17 sendiri.
17 *is only divded by* 1 *and itself.*
8 Lili adalah seorang pelajar.
Lili is a student.
9 Jika $x - y$ adalah positif, maka $x > y$.
If $x - y$ *is positive, then* $x > y$.

E **1** Hujah ini kuat dan meyakinkan kerana semua premis dan kesimpulan adalah benar.
The argument is strong and convincing because all premises and conclusion are true.
2 Hujah ini lemah dan tidak meyakinkan kerana semua premis adalah benar tetapi kesimpulan adalah palsu.
The argument is weak and not convincing because the premises are true but the conclusion is false.
3 Hujah ini kuat dan meyakinkan kerana semua premis dan kesimpulan adalah benar.
The argument is strong and convincing because all premises and conclusion are true.

F **1** $n^2 + n$, $n = 1, 2, 3, 4, \ldots$
2 $3n + 1$, $n = 0, 1, 2, 3, \ldots$
3 $2n - 1$, $n = 2, 3, 4, 5, \ldots$
4 $2(3^n)$, $n = 3, 4, 5, 6, \ldots$

G **1** $(a)\ 2n + 4$, $n = 1, 2, 3, 4, \ldots$

(*b*)

n	Poligon/*Polygon*
1	Segi tiga sama sisi/*Equilateral triangle*
2	Segi empat sama/*Square*
3	Pentagon
4	Heksagon/*Hexagon*
5	Heptagon
6	Oktagon/*Octagon*

Oktagon/*Octagon*, $n = 6$

$2n + 4 = 2(6) + 4$

$= 16$ cm

2 (*a*) $P = \frac{120}{V}$, $V = 1, 2, 3, 4, \ldots$

(*b*) Apabila/*When* $V = 6$,

$P = \frac{120}{6} = 20$ unit

3 (*a*) $A = 30 + 5n$, $n = 1, 2, 3, 4, \ldots$

(*b*) Apabila/*When* $n = 6$,

$A = 30 + 5(6) = 60$ ketul/*pieces*

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 B

Kertas 2/*Paper 2*

1 (*a*) Pernyataan/*Statement*

(*b*) Jika poligon sekata ialah bukan heksagon, maka bilangan sisi ialah bukan 6.

If the regular polygon is not a hexagon, then the number of sides is not 6.

UNIT 4

SK 4.1

A **1** $P = \{11, 13, 15, 17, 19, 21, 23, 25\}$

$Q = \{10, 12, 14, 16, 18, 20, 22, 24\}$

$R = \{12, 16, 20, 24\}$

2 (*a*) $P \cap Q = \varnothing$ (*b*) $P \cap R = \varnothing$

(*c*) $Q \cap R = \{12, 16, 20, 24\}$

3 (*a*) $n(P \cap Q) = 0$ (*b*) $n(P \cap R) = 0$

(*c*) $n(Q \cap R) = 4$

B **1** $\{11, 12\}$ **2** $\{2, 12\}$

3 $\{12\}$ **4** $\{12\}$

C **1** $\{5\}$ **2** $\{6\}$

3 $\{\ \}$ atau/*or* $\varnothing$ **4** $\{\ \}$ atau/*or* $\varnothing$

D **1** $A \cap B = \{3\}$

$\therefore (A \cap B)' = \{1, 2, 4, 5, 6, 7, 8, 9, 10\}$

2 $A \cap C = \{1, 3\}$

$\therefore (A \cap C)' = \{2, 4, 5, 6, 7, 8, 9, 10\}$

3 $A \cap B \cap C = \{3\}$

$\therefore (A \cap B \cap C)' = \{1, 2, 4, 5, 6, 7, 8, 9, 10\}$

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E **1** $P \cap Q = \{k, l\}$

$\therefore (P \cap Q)' = \{j, m, n, s, t, u, v, w, x, y\}$

2 $Q \cap R = \{s, t, w\}$

$\therefore (Q \cap R)' = \{j, k, l, m, n, u, v, x, y\}$

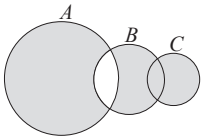
3 $R \cap S = \{v, w\}$

$\therefore (R \cap S)' = \{j, k, l, m, n, s, t, u, x, y\}$

4 $Q \cap R \cap S = \{w\}$

$\therefore (Q \cap R \cap S)' = \{j, k, l, m, n, s, t, u, v, x, y\}$

F **1**



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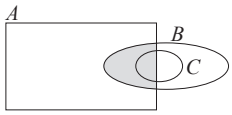

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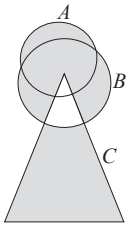

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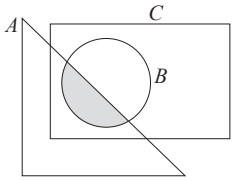

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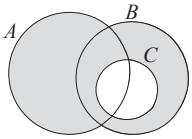

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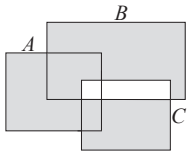


G **1** (*a*) $n(P \cap Q) = 15 - 10$

$= 5$

(*b*) $n(Q) = 5 + 6$

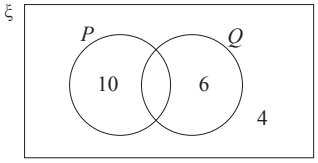
$= 11$

2 Biarkan,/*Let*,

ξ = {Jumlah murid/*Total number of students*}

P = {Bilangan murid memilih permainan video sebagai hobi/*Number of students choose video games as a hobby*}

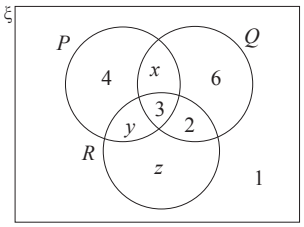
Q = {Bilangan murid memilih bola sepak sebagai hobi/*Number of students choose football as a hobby*}



$n(P \cap Q) = 25 - 10 - 6 - 4$

$= 5$

3



Biarkan,/*Let*,

ξ = {Jumlah guru/*Total number of teachers*}

P = {Bilangan guru yang memiliki gajet jenama Samsung}
{*Number of teachers who own Samsung brand gadgets*}

Q = {Bilangan guru yang memiliki gajet jenama Apple}
{*Number of teachers who own Apple brand gadgets*}

R = {Bilangan guru yang memiliki gajet jenama Lenovo}
{*Number of teachers who own Lenovo brand gadgets*}

(*a*) $x = 16 - 6 - 2 - 3$
$= 5$

(*b*) $y = 14 - 4 - 5 - 3$
$= 2$

(*c*) $z = 11 - 2 - 3 - 2$
$= 4$

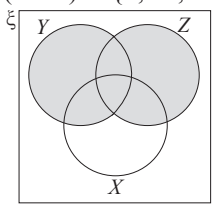
SK 4.2

A **1** $X = \{4, 8, 12, 16, 20\}$

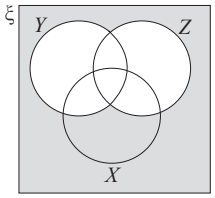
2 (*a*) $Y \cup Z = \{1, 2, 4, 5, 6, 7, 8, 9, 12, 13, 15\}$

(*b*) $(Y \cup Z)' = \{3, 10, 11, 16, 17, 18, 19, 20\}$

3 (*a*)



(*b*)



B **1** {2, 4, 6, 7, 8, 9, 11}

2 {3, 4, 5, 6, 7, 8, 9, 11, 12}

3 {1, 10, 11, 13}

4 {1, 10, 13}

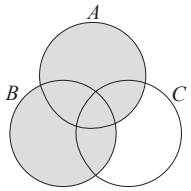
C **1** {10, 11, 13, 15, 17, 18}

2 {10, 11, 14, 15, 17, 18}

3 {10, 12, 15, 16, 18, 19, 20}

4 {12, 14, 16, 19, 20}

D **1**



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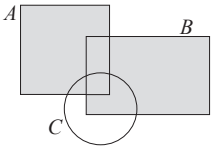

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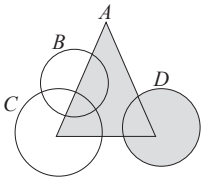

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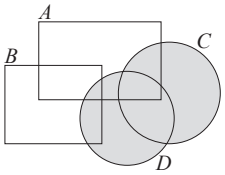

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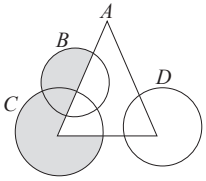

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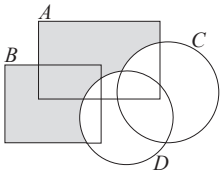

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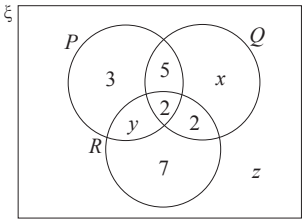
E 1 (*a*) $x = n(P \cap Q) - n(P \cap Q \cap R)$
$= 8 - 3$
$= 5$

(*b*) $n(P \cup Q \cup R) = 5 + 2 + 3 + 5 + 1 + 4 + 3$
$= 23$

2



Biarkan,/*Let*,
ξ = {Jumlah orang awam/*Total number of citizens*}
P = {Bilangan orang awam yang menyukai kopi}
{*Number of citizens who like coffee*}
Q = {Bilangan orang awam yang menyukai teh}
{*Number of citizens who like tea*}
R = {Bilangan orang awam yang menyukai jus buah}
{*Number of citizens who like fruit juice*}

(*a*) $x = 14 - 5 - 2 - 3$
$= 5$

(*b*) $y = 16 - 3 - 2 - 5$
$= 6$

(*c*) $z = 33 - 3 - 5 - 2 - 2 - 5 - 7 - 6$
$= 3$

SK 4.3

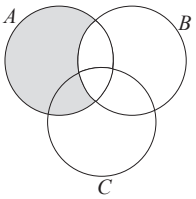
A 1 $\xi = \{21, 22, 23, 24, 25, 26, 27, 28, 29\}$
$A = \{21, 24, 27\}$
$B = \{22, 24, 26, 28\}$
$C = \{24, 28\}$
$B \cap C = \{24, 28\}$
$\therefore (B \cap C) \cup A = \{21, 24, 27, 28\}$

2 $(B \cap C)' = \{21, 22, 23, 25, 26, 27, 29\}$
$\therefore (B \cap C)' \cup A = \{21, 22, 23, 24, 25, 26, 27, 29\}$

3 $A \cap C = \{24\}$
$\therefore (A \cap C) \cup B = \{22, 24, 26, 28\}$

4 $A \cap B = \{24\}$
$\therefore A \cap B \cup C = \{24, 28\}$

B 1



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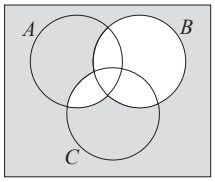

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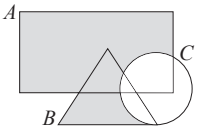

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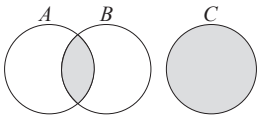

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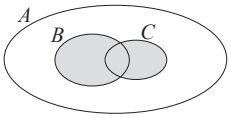

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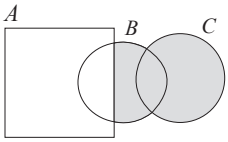


C 1 $7 - x + 5 + 3 = 5 + x$

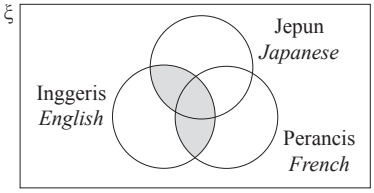
$2x = 10$

$\therefore x = 5$

2 n(Jepun ∪ Perancis) ∩ Inggeris

n(*Japanese* ∪ *French*) ∩ *English*

=



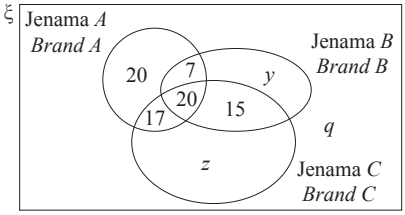
Jumlah bilangan pekerja yang boleh bertutur dalam bahasa Inggeris dan Perancis sahaja

Total number of employees that can speak English and French only

$= 12 - 5 - 3 = 4$

3 Situasi yang dinyatakan boleh dirumuskan seperti yang ditunjukkan di gambar rajah Venn di bawah:

The situation can be summarized as the Venn diagram shown below:



Gunakan/*Let*,

y = {bilangan pelajar yang suka Jenama *B* sahaja}

= {*number of students preferred Brand B only*}

z = {bilangan pelajar yang suka Jenama *C* sahaja}

= {*number of students preferred Brand C only*}

q = {bilangan pelajar yang tidak suka ketiga-tiga jenama}

= {*number of students who do not prefer all of the three brands*}

$y = 65 - 7 - 20 - 15$

$= 23$

$z = 70 - 17 - 20 - 15$

$= 18$

$\therefore q = 150 - 20 - 7 - 23 - 17 - 20 - 15 - 18$

$= 30$

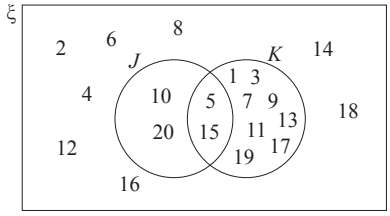
PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 B **2** C **3** B

Kertas 2/*Paper 2*

1



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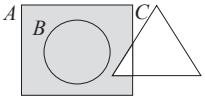
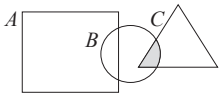
2 (*a*) 

(*b*) 

3 Joe = {2, 3, 5, 7}
Karl = {2, 4, 6, 8}
Liam = {1, 3, 5, 15}

UNIT 5

SK 5.1

A 1 $V = \{A, B, C, D, E, F\}$
$n(V) = 6$
$E = \{(A, B), (A, C), (B, C), (C, D), (C, E), (D, E), (E, F)\}$
$n(E) = 7$
$\sum d(v) = 2(E)$
$= 2(7) = 14$

2 $V = \{P, Q, R, S, T, U, V\}$
$n(V) = 7$
$E = \{(P, Q), (P, R), (Q, R), (Q, T), (R, S), (R, T), (S, T), (S, U), (T, U), (U, V)\}$
$n(E) = 10$
$\sum d(v) = 2(E)$
$= 2(10) = 20$

3 $V = \{1, 2, 3, 4, 5, 6, 7, 8\}$
$n(V) = 8$
$E = \{(1, 2), (1, 3), (1, 7), (1, 8), (2, 3), (3, 4), (3, 5), (3, 8), (4, 5), (5, 6), (5, 7), (5, 8), (6, 7), (7, 8)\}$
$n(E) = 14$
$\sum d(v) = 2(E)$
$= 2(14) = 28$

4 $V = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$
$n(V) = 13$
$E = \{(1, 2), (2, 3), (2, 4), (2, 10), (2, 12), (2, 13), (3, 4), (4, 5), (4, 10), (5, 6), (6, 7), (7, 8), (7, 9), (9, 10), (10, 11), (10, 12), (12, 13)\}$
$n(E) = 18$
$\sum d(v) = 2(E)$
$= 2(18) = 36$

B 1 $V = \{A, B, C, D, E, F\}$
$n(V) = 6$
$E = \{(A, A), (A, B), (A, C), (A, E), (A, F), (B, B), (B, C), (C, D), (D, E), (D, E), (D, F), (E, F)\}$
$n(E) = 13$
$\sum d(v) = 2(E)$
$= 2(13) = 26$

2 $V = \{1, 2, 3, 4, 5, 6, 7, 8\}$
$n(V) = 8$
$E = \{(1, 2), (1, 2), (1, 8), (2, 3), (2, 4), (2, 5), (2, 6), (2, 7), (2, 8), (3, 3), (3, 3), (3, 4), (4, 5), (4, 5), (4, 5), (5, 6), (6, 7), (7, 7), (8, 8)\}$
$n(E) = 19$
$\sum d(v) = 2(E)$
$= 2(19) = 38$

C 1 $\sum d(v) = 1 + 3 + 3 + 2 + 1 + 4$
$= 14$
Boleh melukis suatu graf kerana jumlah bilangan darjah adalah nombor genap.
Can draw a graph because total number of degrees is an even number.

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2 $\sum d(v) = 4 + 4 + 3 + 3 + 2 + 2 + 3$
$= 21$

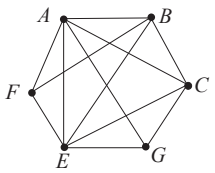
Tidak boleh melukis suatu graf kerana jumlah bilangan darjah bukanlah nombor genap.
Cannot draw a graph because the total number of degrees is not an even number.

D 1 $d(A) = 6$ $d(F) = 4$
$d(B) = 2$ $d(G) = 1$
$d(C) = 3$ $d(H) = 3$
$d(D) = 2$ $d(I) = 3$
$d(E) = 4$ $d(J) = 2$
$\sum d(v) = 30$
$= 2(15)$
$= 2(E)$ (Dibuktikan/*Proven*)

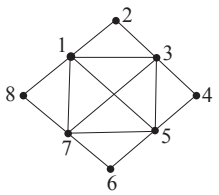
2 $d(P) = 4$
$d(Q) = 6$
$d(R) = 6$
$d(S) = 3$
$d(T) = 3$
$d(U) = 4$
$d(V) = 6$
$\sum d(v) = 32$
$= 2(16)$
$= 2(E)$ (Dibuktikan/*Proven*)

Setiap gelung mempunyai dua darjah, iaitu pusingan mengikut arah jam dan pusingan mengikut lawan arah jam.
A loop has two degrees due to clockwise turning direction and anticlockwise turning direction.

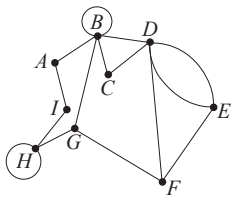
E 1



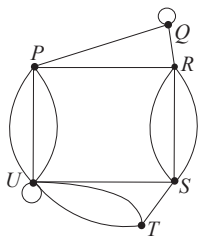
2



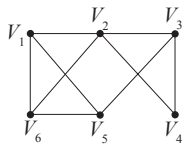
F 1



2

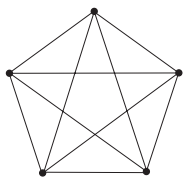


G 1



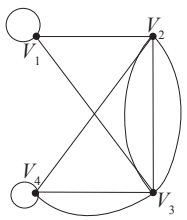
Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

2



Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

H 1



Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

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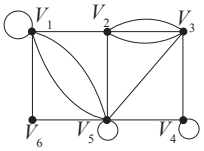
2



Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

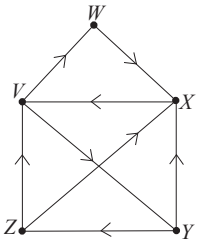
I 1 $V = \{P, Q, R, S, T\}$
$E = \{(S, P), (P, T), (P, S), (T, Q), (Q, Q), (R, Q), (R, T), (S, R)\}$
$d_{in}(P) = 1,\ d_{out}(P) = 2$
$d_{in}(Q) = 3,\ d_{out}(Q) = 1$
$d_{in}(R) = 1,\ d_{out}(R) = 2$
$d_{in}(S) = 1,\ d_{out}(S) = 2$
$d_{in}(T) = 2,\ d_{out}(T) = 1$
$\sum d(v) = 16$

d_{in} = gelung/*loop*, $(T, Q), (R, Q)$
d_{out} = gelung/*loop*

2 $V = \{1, 2, 3, 4, 5, 6\}$
$E = \{(6, 1), (1, 2), (1, 6), (3, 2), (2, 4), (2, 4), (2, 6), (3, 3), (4, 3), (6, 4), (4, 5), (4, 6), (6, 5), (5, 6)\}$
$d_{in}(1) = 1,\ d_{out}(1) = 2$
$d_{in}(2) = 2,\ d_{out}(2) = 3$
$d_{in}(3) = 2,\ d_{out}(3) = 2$
$d_{in}(4) = 3,\ d_{out}(4) = 3$
$d_{in}(5) = 2,\ d_{out}(5) = 1$
$d_{in}(6) = 4,\ d_{out}(6) = 3$
$\sum d(v) = 28$

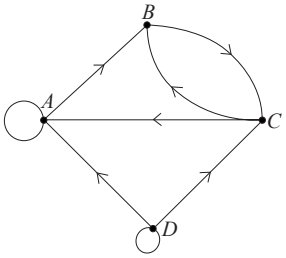
d_{in} = gelung/*loop*, $(4, 3)$
d_{out} = gelung/*loop*, $(3, 2)$

J 1



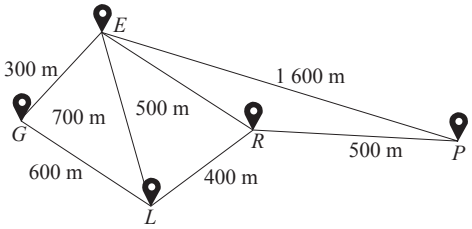
$d(V) = 4$
$d(W) = 2$
$d(X) = 4$
$d(Y) = 3$
$d(Z) = 3$
$\sum d(v) = 16$

2



Yang pertama, lukis gelung pada bucu *A* dan *B*. Kemudian, lukis tepi terarah mengikut bilangan darjah diberikan. (Sebarang jawapan yang memenuhi syarat soalan diterima)
Firtsly, draw the loops at the vertex A and B. Then, draw the directed edges according to the degrees given. (*Any answers that fulfill the requirements are accepted*)

K 1

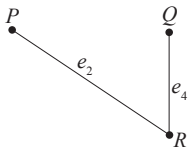


2 Jarak terdekat/*Short distance*
$= E \rightarrow R \rightarrow P$
= 500 m + 500 m
= 1 000 m

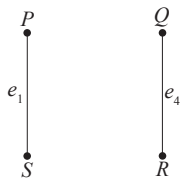
3 Jumlah jarak/*Total distance*
$= P \rightarrow R \rightarrow L \rightarrow G \rightarrow E$
= 500 m + 400 m + 600 m + 300 m
= 1 800 m

L **1** Ya/*Yes* **2** Tidak/*No*
3 Tidak/*No* **4** Ya/*Yes*
5 Tidak/*No* **6** Ya/*Yes*
7 Ya/*Yes* **8** Ya/*Yes*

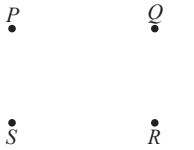
M 1 (*a*)



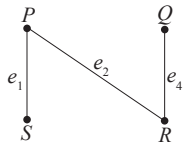
(*b*)



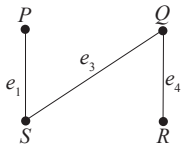
(*c*)



(*d*)

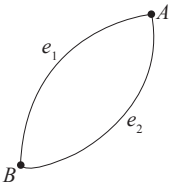


(*e*)



Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

2 (*a*)



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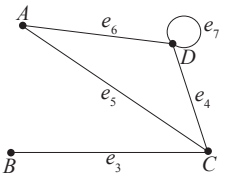
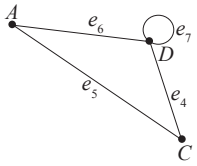
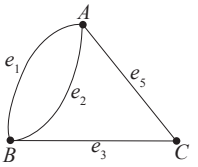


(*c*)

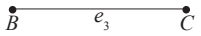


(*d*)

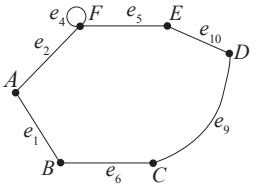


(*e*)

Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.



3 (*a*)



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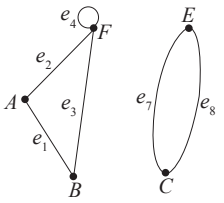

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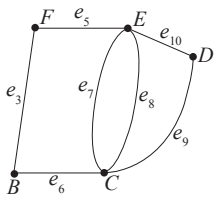
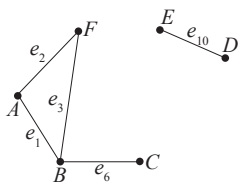
(*c*)



(*d*)



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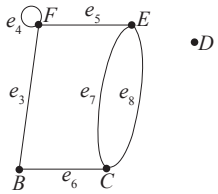


Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

N 1 *A* dan *F* boleh dikaitkan melalui:
A and F can be connected through:
(*a*) $A \rightarrow F$
(*b*) $A \rightarrow B \rightarrow C \rightarrow F$
(*c*) $A \rightarrow B \rightarrow C \rightarrow D \rightarrow F$
(*d*) $A \rightarrow E \rightarrow F$
(*e*) $A \rightarrow E \rightarrow D \rightarrow F$
(*f*) $A \rightarrow E \rightarrow D \rightarrow C \rightarrow F$
∴ Bukan pokok. $n(V) = 6$, $n(E) = 9$. Setiap pasangan bucu boleh dikaitkan dengan pelbagai cara.
∴ *Not a tree.* $n(V) = 6$, $n(E) = 9$. *Each pair of vertex can be connected in various ways.*

2 Pokok. $n(V) = 6$, $n(E) = 5$. Setiap pasangan bucu hanya boleh dikaitkan oleh satu tepi.
A tree. $n(V) = 6$, $n(E) = 5$. *Each pair of vertex only can be connected through one edge.*

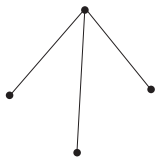
3 Pokok. $n(V) = 6$, $n(E) = 5$. Setiap pasangan bucu hanya boleh dikaitkan oleh satu tepi.
A tree. $n(V) = 6$, $n(E) = 5$. *Each pair of vertex only can be connected through one edge.*

4 Bukan pokok. $n(V) = 6$, $n(E) = 7$. Setiap pasangan bucu boleh dikaitkan dengan pelbagai cara.
Not a tree. $n(V) = 6$, $n(E) = 7$. *Each pair of vertex can be connected in various ways.*

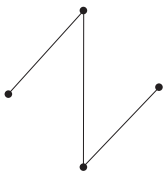
5 Bukan pokok. $n(V) = 6$, $n(E) = 6$. Setiap pasangan bucu boleh dikaitkan dengan pelbagai cara.
Not a tree. $n(V) = 6$, $n(E) = 6$. *Each pair of vertex can be connected in various ways.*

6 Pokok. $n(V) = 6$, $n(E) = 5$. Setiap pasangan bucu hanya boleh dikaitkan oleh satu tepi.
A tree. $n(V) = 6$, $n(E) = 5$. *Each pair of vertex only can be connected through one edge.*

O 1 (*a*)



(*b*)



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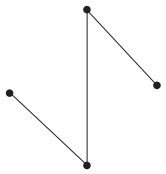
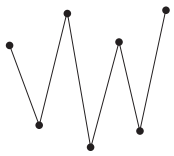
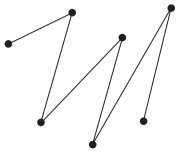


2 (*a*)



(*b*)



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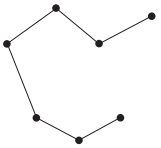
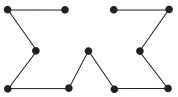
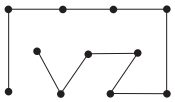
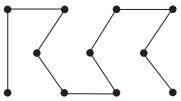
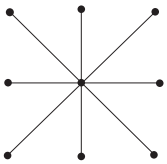
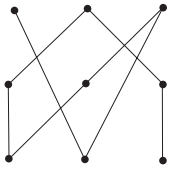
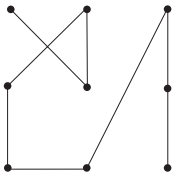


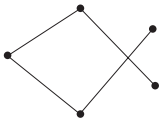
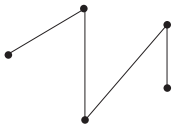
3 (*a*)  (*b*) 

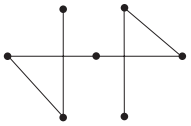
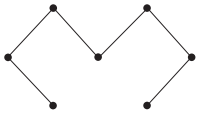
(*c*) 

4 (*a*)  (*b*) 

(*c*) 

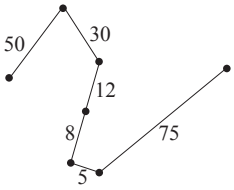
Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

P 1 (*a*)  (*b*) 

2 (*a*)  (*b*) 

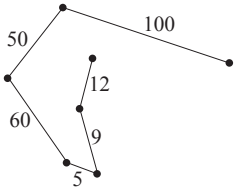
Sebarang jawapan yang memenuhi syarat soalan diterima.
Any answers that fulfill the requirements are accepted.

Q 1



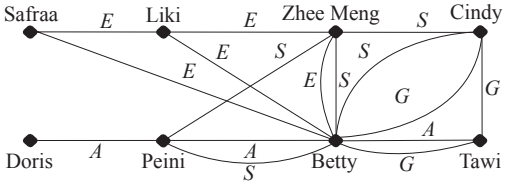
Jumlah nilai
Total value
= 50 + 30 + 12 + 8 + 5 + 75
= 180

2



Jumlah nilai
Total value
= 100 + 50 + 60 + 5 + 9 + 12
= 236

R 1



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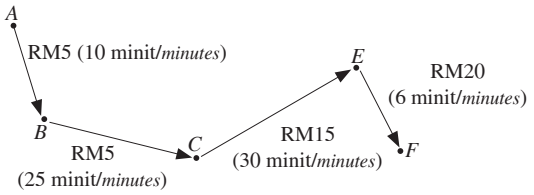
2 Kerana subjek kegemaran merupakan maklumat yang tidak bersilang.
Because the favourite subjects are the information that do not cross to each other.

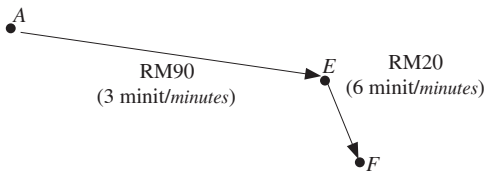
3 Graf/*Graph*

S 1



Jumlah wang digunakan/*Total money spend*
= RM5 + RM5 + RM15 + RM20
= RM45

2



Jumlah masa diambil/*Total time taken*
= 3 minit/*minutes* + 6 minit/*minutes*
= 9 minit/*minutes*

T 1 $\sum d_{in}(B) = \sum d_{out}(B)$
$x = 12$

2 $\sum d_{in}(E) = \sum d_{out}(E)$
$4 = y, y = 4$

3 $\sum d_{in}(A) = \sum d_{out}(A)$
$12 = 4 + 6 + z$
$12 - 10 = z$
$z = 2$

4 $\sum d_{in}(D) = \sum d_{out}(D)$
$y + 6 = w$
Diketahui bahawa/*Known that* $y = 4$
$\therefore 4 + 6 = w$
$w = 10$

U 1 $1 \rightarrow 1 + 3(1) = 4 \rightarrow 4 + 3(3) = 13 \rightarrow 3 + 3(9) = 40$
$\therefore$ Selepas reaksi ketiga, jumlah neutron telah melebihi 38 neutron.
After third fission, the total neutrons will exceed 38 *neutrons.*

2 Jumlah neutron/*Total neutrons*
$= 1 + 3 + 3(3) + 3(9) + 3(27) = 121$

V 1 Menaiki bas Seastar./*Take Seastar bus.*
Baki wang/*Money left* = RM35 – RM33
= RM2

2 Menaiki kereta api./*Take a train.*
Jumlah wang digunakan
Total money spaends
= RM60 + RM60 + RM50 = RM170

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 B **2** B

Kertas 2/*Paper 2*

1 (*a*) $V = \{A, B, C, D, E, F, G\}$
(*b*) $E = \{(A, B), (B, A), (B, C), (C, D), (D, E), (E, F), (E, G), (F, G), (G, G)\}$
(*c*) $d_{in}(A) = 1, d_{out}(A) = 1$ $d_{in}(E) = 1, d_{out}(E) = 2$
$d_{in}(B) = 1, d_{out}(B) = 2$ $d_{in}(F) = 1, d_{out}(F) = 1$

$d_{in}(C) = 1, d_{out}(C) = 1$ $\quad$ $d_{in}(G) = 3, d_{out}(G) = 1$
$d_{in}(D) = 1, d_{out}(D) = 1$
$\sum d(v) = 18$

2 Laluan bot yang dipilih Lina = $A \rightarrow F \rightarrow D$
The boat routes chosen by Lina
Jarak laluan bot/*The distance of the boat routes* = 620 m + 680 m
= 1 300 m
= 1.3 km
Laluan bot dengan jarak paling dekat sesuai untuk perjalanan Lina.
The shortest boat route is suitable for Lina's journey.

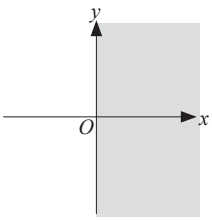
UNIT 6

SK 6.1

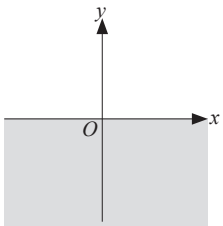
A 1 Katakan x = epal dan y = oren
Let x = apples and y = oranges
$10x + 12y \leq 35$

2 Katakan a = buku latihan matematik dan b = buku latihan sains
Let a = mathematics workbook and b = science workbook
$15a + 17b \geq 460$

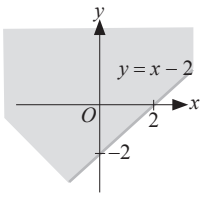
B 1



2



3



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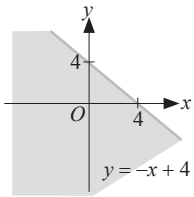

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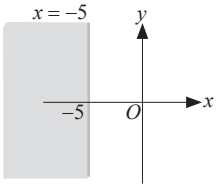

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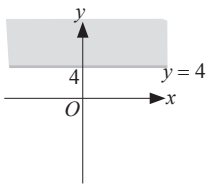
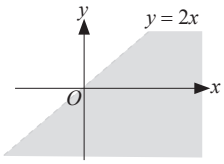


C 1



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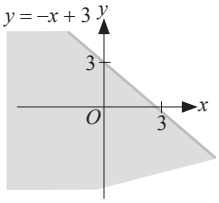

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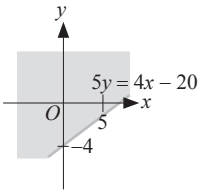

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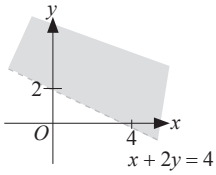

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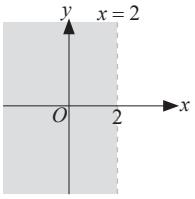
5



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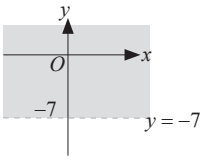


D **1** $y = -\frac{3}{2}x + 6$ **2** $y > -\frac{3}{2}x + 6$

3 $y > -\frac{3}{2}x + 6$ **4** $y < -\frac{3}{2}x + 6$

5 $y = -\frac{3}{2}x + 6$ **6** $y < -\frac{3}{2}x + 6$

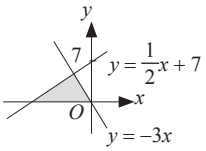
SK 6.2

A **1** (*a*) $x \geq 3y$
(*b*) $x + y \leq 460$
(*c*) $x - y < 250$

2 Katakan x = ikan, y = udang
Let x = fish, y = prawn
(*a*) $x \leq y$
(*b*) $x + y < 120$
(*c*) $y \geq 1.2$

B **1** (*a*) *A* (*b*) *D* (*c*) *C*
2 (*a*) *B* (*b*) *F* (*c*) *C*

C **1**



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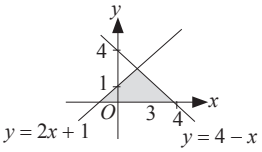

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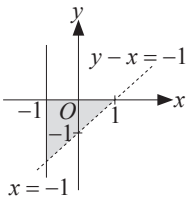

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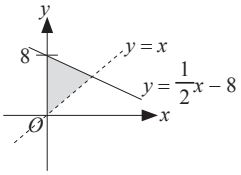
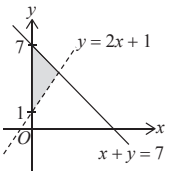


D **1**



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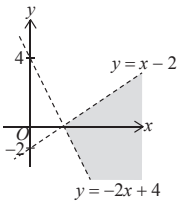

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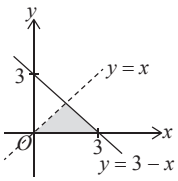

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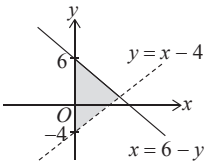

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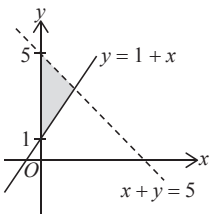

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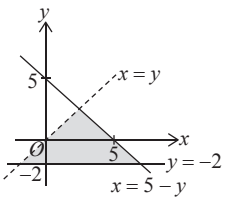


E **1** $y \leq 0$
$x \geq 0$
$y > x - 7$

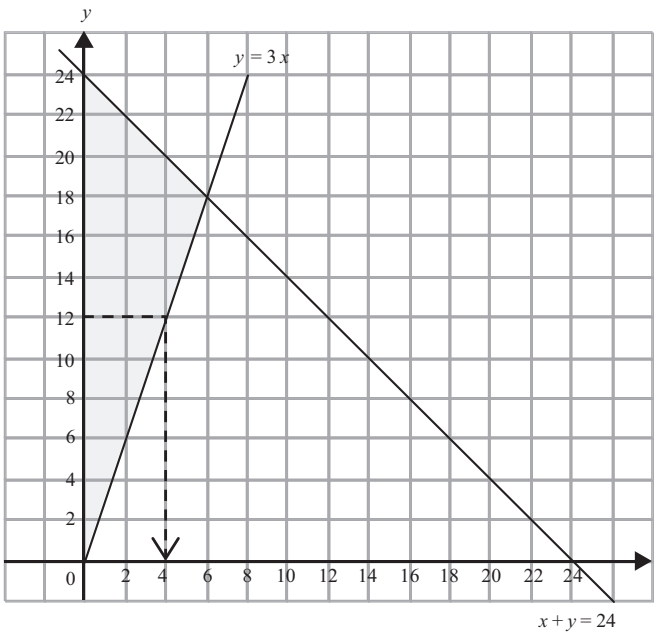
2 $3y \leq -x$
$y \leq x + 3$
$y \geq 0$

3 $y \leq 5 + x$
$y \geq 0$
$x \leq 0$

4 $y \leq 3 - \frac{3}{4}x$
$x < 3$
$y \geq 0$
$x \geq 0$

F **1** (*a*) $y \geq 3x$
$x + y \geq 24$

(*b*)



(*c*) Bilangan kek *A* yang dijual = 4 kek
Number of cake A sold = 4 cakes

PRAKTIS SPM/*SPM PRACTICE*

Kertas 2/*Paper 2*

1 (*a*) $x + y \leq 50\,000$
$y \geq 10\,000$
$x - y < 10\,000$

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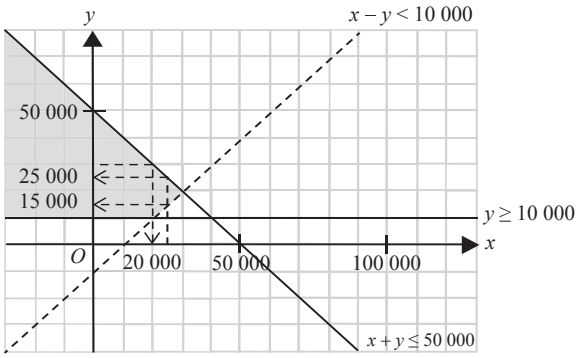
(*b*)

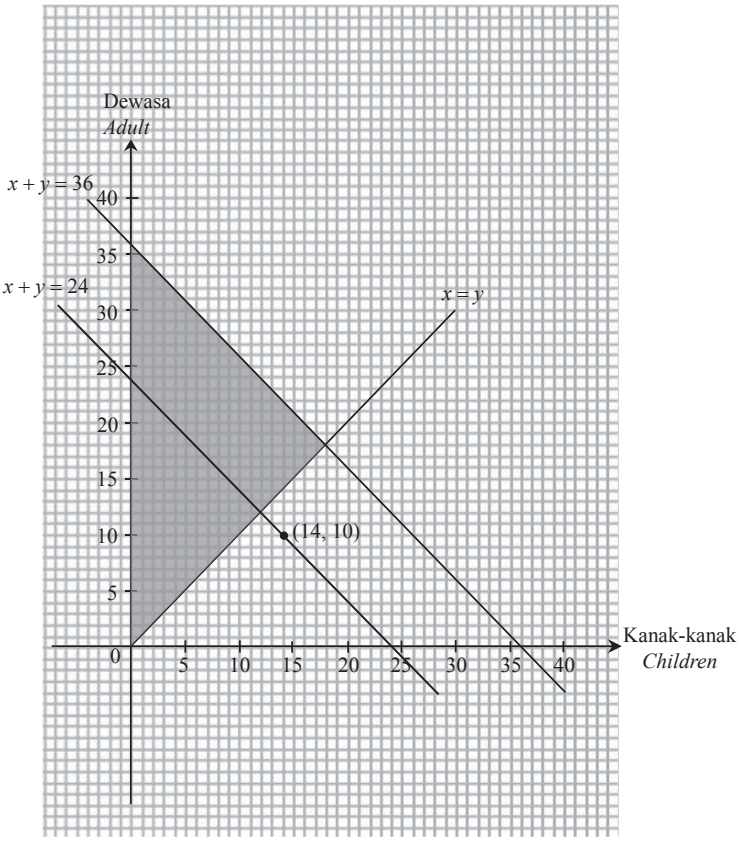


(*c*) Bilangan maksimum produk penjagaan rambut yang dihasilkan/*Maximum number of haircare product produced* = 25 000
Bilangan minimum produk penjagaan rambut yang dihasilkan/*Minimum number of haircare product produced* = 15 000

(*d*) Bilangan produk penjagaan kulit/*Number of skincare products* = 20 000
Keuntungan yang diperoleh/*Total profit earned*
= RM25(30 000) + RM30(20 000)
= RM1 350 000

2 (*a*) $x + y \leq 36$
$x \leq y$

(*b*)

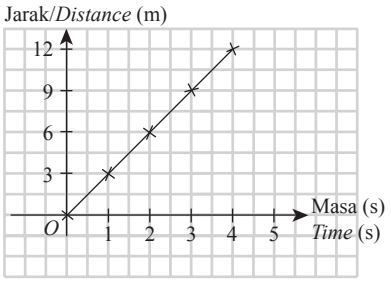


(*c*) Tidak kerana titik (14, 10) terletak di luar kawasan rantau berlorek.
No because point (14, 10) *lies outside the shaded region*.

(*d*) (i) $x + y \leqslant 24$
(ii) Rujuk graf di **2**(*b*)./*Refer graph in* **2**(*b*).

SK 7.1

A 1



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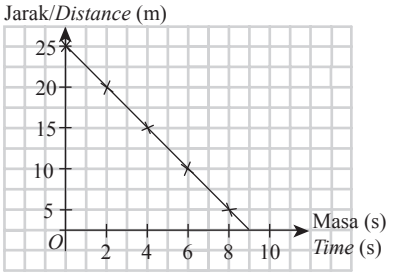

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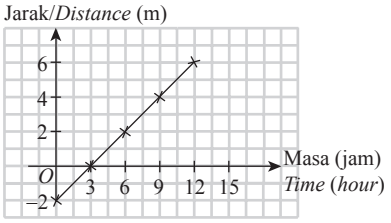

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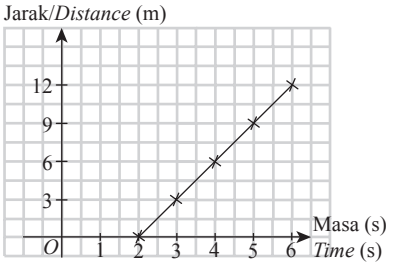

B 1 (*a*) Tempoh keadaan pegun/*Stationary period* = (6 – 3) s
= 3 s

(*b*) Kelajuan/*Speed* $= \dfrac{(0-12)}{(16-6)}$ m s^{-1}
$= -1.2$ m s^{-1}

Objek bergerak balik ke tempat asal dengan kelajuan 1.2 m s^{-1} bagi tempoh 10 saat yang terakhir.
Object moves back to the original place with a speed of 1.2 m s^{-1} *in the last* 10 *seconds*.

2 (*a*) 100 km

(*b*) Purata kelajuan kereta *B*
Average speed of car B

$= \dfrac{(100-0)}{(2-0)} + \dfrac{(400-100)}{(8-4)}$ km j^{-1}/km h^{-1}

$= 125$ km j^{-1}/km h^{-1}

125 km j^{-1}/km h^{-1} $= \dfrac{(400 \text{ km})}{t}$

$t = 3.2$ jam/*hours*

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Kereta *A* bergerak sejauh 400 km dalam tempoh 3.2 jam dengan laju purata 125 km j^{-1}.
Car A moves for a distance of 400 km *in* 3.2 *hours with an average speed of* 125 km h^{-1}.

C 1 (*a*) Kelajuan/*Speed* $= \frac{(24-0)}{(6-0)}$ m s^{-1}

$= 4$ m s^{-1}

(*b*) Kelajuan/*Speed* $= \frac{24}{8}$ m s^{-1}

$= 3$ m s^{-1}

(*c*) Kelajuan purata/*Average speed*

$= \frac{(24+24)}{(14)}$ m s^{-1}

$= 3\frac{3}{7}$ m s^{-1}

2 (*a*) Kelajuan/*Speed* $= \frac{16}{8}$ m s^{-1}

$= 2$ m s^{-1}

(*b*) Kelajuan/*Speed* $= \frac{(16-6)}{2}$ m s^{-1}

$= 5$ m s^{-1}

(*c*) Kelajuan purata/*Average speed*

$= \frac{16+10+8}{16}$ m s^{-1}

$= 2\frac{1}{8}$ m s^{-1}

3 (*a*) Kelajuan/*Speed* $= \frac{210}{4}$ km j^{-1}/km h^{-1}

$= 52.5$ km j^{-1}/km h^{-1}

(*b*) $\frac{210}{4} = \frac{90}{t}$

$t = 1\frac{5}{7}$ jam/*hours*

4 (*a*) (i) $23 - 18 = 5$ minit/*minutes*

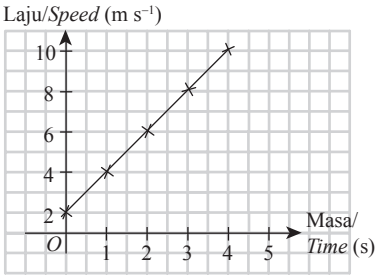
(ii) Laju purata/*Average speed* $= \frac{\text{Jumlah jarak/}\textit{Total distance}}{\text{Jumlah masa/}\textit{Total time}}$

$= \frac{10}{45}$

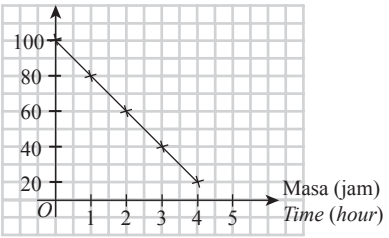
$= 0.22$ km min^{-1}

SK 7.2

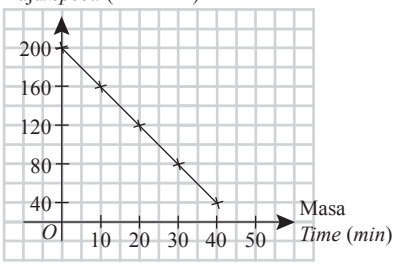
A 1



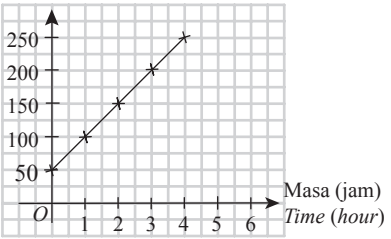
2 Laju (km j^{-1})/*Speed* (km h^{-1})



3 Laju/*Speed* (km min^{-1})



4 Laju (km j^{-1})/*Speed* (km h^{-1})



B 1 Jumlah jarak perjalanan = $\frac{1}{2}(6 + 3)(50)$
Total distance travelled

$= 225$ m

2 Jumlah jarak perjalanan = $\frac{1}{2}(6)(12)$
Total distance travelled

$= 36$ m

3 Jumlah jarak perjalanan
Total distance travelled

$= \frac{1}{2}(6 + 4)(10) + \frac{1}{2}(10 + 12)(8 - 6) + \frac{1}{2}(10 - 8)(12)$

$= 84$ km

4 Jumlah jarak perjalanan
Total distance travelled

$= 8(9) + \frac{1}{2}(9 - 8)(9 + 4) + (10 - 9)(4)$

$= 82.5$ m

5 Jumlah jarak perjalanan
Total distance travelled

$= \frac{1}{2}(4)(10 + 20) + (8 - 4)(10) + \frac{1}{2}(10 - 8)(10)$

$= 110$ m

6 Jumlah jarak perjalanan
Total distance travelled

$= \frac{1}{2}(6)(10 + 12) + (12 - 6)(12) +$

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$\frac{1}{2}(14 - 12)(12)$

$= 150$ m

C 1 Kadar perubahan laju

Rate of change of speed

$= \frac{50 - 0}{2}$ m s^{-2} = 25 m s^{-2}

2 Kadar perubahan laju

Rate of change of speed

$= \frac{0 - 12}{6 - 3}$ m s^{-2} = –4 m s^{-2}

3 Kadar perubahan laju

Rate of change of speed

$= \frac{12 - 10}{8 - 6}$ km j^{-2}/km h^{-2} = 1 km j^{-2}/km h^{-2}

4 Kadar perubahan laju

Rate of change of speed

$= \frac{4 - 9}{9 - 8}$ m s^{-2} = –5 m s^{-2}

D 1 (*a*) Kadar perubahan laju

Rate of change of speed

$= \frac{15 - 25}{2}$ m s^{-2}

= –5 m s^{-2}

Objek mengalami nyahpecutan dengan kadar 5 m s^{-2} dalam tempoh 2 saat pertama.

The object decelerates at a rate of 5 m s^{-2} *for the first* 2 *seconds*.

(*b*) Jumlah jarak = luas di bawah graf

Total distance = area under the graph

$= \left[\frac{1}{2} \times 2 \times (15 + 25)\right] + \left[(6 - 2) \times 15\right]$

$+ \left[\frac{1}{2} \times (8 - 6) \times 15\right]$

= (40 + 60 + 15) m

= 115 m

2 (*a*) Objek bergerak dengan laju seragam 80 km j^{-1} dari jam pertama hingga jam ke-3.

The object moves at a uniform speed of 80 km h^{-1} *from the first hour till the* 3rd *hour*.

(*b*) Jarak yang dilalui semasa nyahpecutan

Distance travelled during deceleration

$= \left[\frac{1}{2} \times (4 - 3) \times 80\right]$

= 40 m

E 1 (*a*) Kadar perubahan laju bagi 4 saat yang pertama

Rate of change of speed for the first 4 *seconds*

$= \frac{20 \text{ m s}^{-1}}{4 \text{ s}}$

= 5 m s^{-2}

(*b*) Kadar perubahan laju bagi 6 saat yang terakhir

Rate of change of speed for the last 6 *seconds*

$= \frac{0 - 20 \text{ m s}^{-1}}{2 \text{ s}} = -3\frac{1}{3}$ m s^{-2}

(*c*) Jumlah jarak perjalanan/*Total distance travelled* $= \frac{1}{2}(4)(20) + \frac{1}{2}(6)(20) = 100$ m

Kelajuan purata/*Average speed* $= \frac{100}{10}$ m s^{-1}

= 10 m s^{-1}

2 (*a*) $3\frac{1}{3} = \frac{x - 10}{6}$

$\therefore x = 30 \text{ m s}^{-1}$

(*b*) Kadar perubahan laju bagi 4 saat yang terakhir

Rate of change of speed for the last 4 *seconds*

$= \frac{0 - 30 \text{ m s}^{-1}}{4 \text{ s}} = -7.5 \text{ m s}^{-2}$

(*c*) Jumlah jarak perjalanan/*Total distance travelled* $= \frac{1}{2}(10 + 30)(6) + \frac{1}{2}(30)(4)$

$= 180 \text{ m}$

Kelajuan purata/*Average speed* $= \frac{180}{10} \text{ m s}^{-1}$

$= 18 \text{ m s}^{-1}$

3 (*a*) Kadar perubahan laju bagi 4 saat yang pertama

Rate of change of speed for the first 4 *seconds*

$= \frac{22 - 8 \text{ m s}^{-1}}{4 \text{ s}}$

$= 3\frac{1}{2} \text{ m s}^{-2}$

(*b*) $146 = \frac{1}{2}(t - 6)(22 + 16) + \frac{1}{2}(16 - t)(16)$

$146 = 19t - 114 + 128 - 8t$

$146 = 14 + 11t$

$\therefore t = 12 \text{ s}$

4 (*a*) Jarak perjalanan dalam 4 saat yang pertama

Distance travelled at the first 4 *seconds*

$= \frac{1}{2}(v + 8)(4)$

$= 2v + 16 \text{ m}$

Jarak perjalanan dari saat ke-4 hingga saat ke-18

Distance travelled from 4th *second to* 18th *second*

$= (18 - 4)(v)$

$= 14v \text{ m}$

$2v + 16 = \frac{1}{5}(14v)$

$0.8v = 16$

$\therefore v = 20$

(*b*) Kelajuan purata/*Average speed*

$= \frac{14(20) + 2(20) + 16}{18} \text{ m s}^{-1}$

$= 18\frac{2}{3} \text{ m s}^{-1}$

5 (*a*) $-2 = \frac{v - 22}{5}$

$\therefore v = 12 \text{ m s}^{-1}$

(*b*) Jumlah jarak perjalanan motosikal

Total distance travelled by motorcycle

$= \frac{1}{2}(14 + 22)(4) + \frac{1}{2}(22 + 12)(9 - 4) +$
$(12 - 9)(12)$

$= 193 \text{ m}$

Jumlah jarak perjalanan kereta

Total distance travelled by car

$= \frac{1}{2}(9)(22) + (12 - 9)(22) = 165 \text{ m}$

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Perbezaan antara jumlah jarak perjalanan
Difference between total distance travelled
= 193 m – 165 m = 28 m

(*c*) Laju purata kereta/*Average speed of car*

$= \frac{165}{12} = 13\frac{3}{4}$ m s^{-1}

PRAKTIS SPM/*SPM PRACTICE*

Kertas 2/*Paper 2*

1 (*a*) (i) Laju kereta *P*/*Speed of car P* $= \left(\frac{250}{t}\right)$

$62.5t = 250$

$t = 4$ jam/*hours*

(ii) Tempoh masa kereta *Q* berhenti di Kuantan
Duration of time car Q stopped at Kuantan
= (4 – 2) jam/*hour* = 2 jam/*hours*

(*b*) Laju kereta *Q*/*Speed of car Q*

$= \left(\frac{135 - 0}{2 - 0}\right) + \left(\frac{250 - 135}{6 - 4}\right)$

= (67.5 + 57.5) km j^{-1}/ km h^{-1}

= 125 km j^{-1}/ km h^{-1}

Beza purata laju kereta *P* dan *Q*
The difference of the average speed of car P and Q

= (125 – 62.5) km j^{-1}/ km h^{-1}

= 62.5 km j^{-1}/ km h^{-1}

UNIT 8

SK 8.1

A 1 Buku paling tebal = 2.5 cm
The thickest book
Buku paling nipis = 0.6 cm
The thinnest book
Beza ketebalan = (2.5 – 0.6) = 1.9 cm
Thickness difference

2 Penduduk Kampung Kelulut yang paling tua
The oldest resident in Kampung Kelulut
= 70 tahun/*years old*
Penduduk Kampung Kelulut yang paling muda
The youngest resident in Kampung Kelulut
= 5 tahun/*years old*
Beza umur/*Ages difference*
= (70 – 5)
= 65 tahun/*years old*

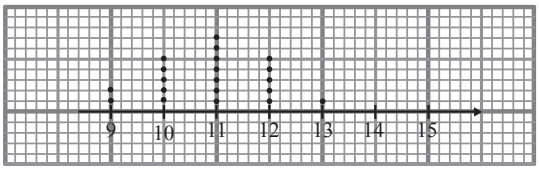
3 Disebabkan $x < y$ dan berdasarkan $0.5 \leq$ isi padu ≤ 3.5
Since $x < y$ and based on $0.5 \leq$ volume ≤ 3.5
Isi padu terkecil $= x = 0.5$
The smallest volume
Isi padu terbesar $= y = 3.5$
The biggest volume

B 1

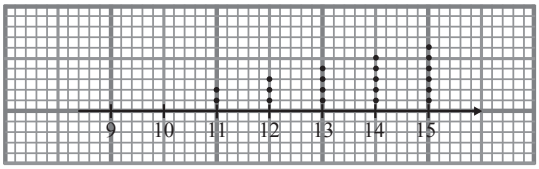
Sekolah *A* *School A*		Sekolah *B* *School B*
8 7 6 5 2 2 2 0	2	5 7
6 5 4 3 1 1 0	3	0 2 6 6
5 4	4	4 5 7 8 9
1	5	0 3 4 4 5 9 9

Kekunci/*Key*: 5 | 9 bermaksud/*means* 5.9 m
Sekolah *B*/*School B*
Lebih ramai atlet daripada Sekolah *B* mencapai keputusan dalam julat (5.1 – 5.9) m.
School B has more athletes achieved the results in the range of (5.1 – 5.9) m.

2



Keputusan Kuiz Kimia bagi Kelas Matahari
Result of Chemistry Quiz for Matahari Class



Keputusan Kuiz Kimia bagi Kelas Bulan
Result of Chemistry Quiz for Bulan Class

Pemenang/*Winner*: Kelas Bulan/*Bulan Class*
Alasan: Kelas Bulan mempunyai murid yang mencapai markah tinggi.
Reason: *Bulan Class has more puplis achieved high mark.*

SK 8.2

A 1 (*a*) 2, 3, 5, 5, 7, 11, 16

Q_1 Median (Q_2) Q_3

Julat = Nilai terbesar – Nilai terkecil
Range = The biggest value – The smallest value
= 16 – 2
= 14

Pertama sekali, tentukan median sebelum mencari Q_1 dan Q_3.
Firstly, determine median before finding Q_1 *and* Q_3.
Median = 5
Kuartil pertama/*First quartile*, $Q_1 = 3$
Kuartil ketiga/*Third quartile*, $Q_3 = 11$
Julat antara kuartil/*Interquatile range*
$= Q_3 - Q_1$
$= 11 - 3 = 8$

(*b*) 103, 228, 333, 334, 397, 398, 459, 566, 721, 790

Q_1 Median (Q_2) Q_3

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Julat/*Range* = Nilai terbesar – Nilai terkecil
The biggest value – The smallest value
= 790 – 103
= 687

Median = $\frac{397 + 398}{2}$ = 397.5

Kuartil pertama/*First quartile*, Q_1 = 333
Kuartil ketiga/*Third quartile*, Q_3 = 566
Julat antara kuartil/*Interquatile range*
= $Q_3 - Q_1$
= 566 – 333 = 233

(*c*) $\underbrace{6.4,\ 6.4}_{}$, $\underbrace{6.6,\ 6.6}_{}$, 6.7, $\underbrace{7.0,\ 7.1}_{}$, $\underbrace{7.1,\ 7.2}_{}$

Q_1 Median (Q_2) Q_3

Julat/*Range* = Nilai terbesar – Nilai terkecil
The biggest value – The smallest value
= 7.2 – 6.4 = 0.8

Median = 6.7

Kuartil pertama/*First quartile*, $Q_1 = \frac{6.4 + 6.6}{2}$
= 6.5

Kuartil ketiga/*Third quartile*, $Q_3 = \frac{7.1 + 7.1}{2}$
= 7.1

Julat antara kuartil/*Interquatile range*
= $Q_3 - Q_1$
= 7.1 – 6.5 = 0.6

2

Kenderaan dimiliki oleh cerapan ke-10 *Vehicles owned by 10th value*
Kenderaan dimiliki oleh cerapan ke-20 *Vehicles owned by 20th value*
Kenderaan dimiliki oleh cerapan ke-30 *Vehicles owned by 30th value*

Bilangan kenderaan *Number of vehicles*	1	2	3	4	5	6
Kekerapan *Frequency*	17	+ 10	+ 7	+ 2	+ 1	+ 2
Kekerapan longgokan *Cumulative frequency*	17	27	34	36	37	39
	Ke-(1 – 17) (1 – 17)th	Ke-(18 – 27) (18 – 27)th	Ke-(28 – 34) (28 – 34)th	Ke-(35 – 36) (35 – 36)th	Ke-37 37th	Ke-(38 – 39) (38 – 39)th

Ke-10 10th Ke-20 20th Ke-30 30th

Julat/*Range* = 6 – 1
= 5 kenderaan/*vehicles*

Median = Cerapan ke-$\left(\frac{2}{4} \times 39\right)$

$\left(\frac{2}{4} \times 39\right)^{th}$ *value*

= Cerapan ke-19.5/19.5th *value*
= Cerapan ke-20/20th *value*

= 2 kenderaan/*vehicles*

Kuartil bawah/*Lower quartile*, Q_1

= Cerapan ke-$\left(\frac{1}{4} \times 39\right)$ / $\left(\frac{1}{4} \times 39\right)^{th}$ *value*

= Cerapan ke-9.75/9.75th *value*

= Cerapan ke-10/10th *value*

= 1 kenderaan/*vehicle*

Kuartil atas/*Upper quartile*, Q_3

= Cerapan ke-$\left(\frac{3}{4} \times 39\right)$ / $\left(\frac{3}{4} \times 39\right)^{th}$ *value*

= Cerapan ke-29.25/29.25th *value*

= Cerapan ke-30/30th *value*

= 3 kenderaan/*vehicles*

Julat antara kuartil/*Interquatile range*

= $Q_3 - Q_1$

= 3 − 1 = 2 kenderaan/*vehicles*

3

Skor cerapan ke-7 *Scores of* 7th *value*

Skor cerapan ke-14 *Scores of* 14th *value*

Skor cerapan ke-21 *Scores of* 21th *value*

Skor/*Scores*	12	14	16	18	20
Kekerapan *Frequency*	5	+ 7	+ 4	+ 9	+ 3
Kekerapan longgokan *Cumulative frequency*	5	12	16	25	28
	Ke-(1 – 5) (1 – 5)th	Ke-(6 – 12) (6 – 12)th	Ke-(13 – 16) (13 – 16)th	Ke-(17 – 25) (17 – 25)th	Ke-(26 – 28) (26 – 28)th
		Ke-7 7th	Ke-14 14th	Ke-21 21th	

Julat/*Range* = 20 − 12 = 8

Median

= Cerapan ke-$\left(\frac{2}{4} \times 28\right)$ / $\left(\frac{2}{4} \times 28\right)^{th}$ *value*

= Cerapan ke-14/14th *value*

= 16

Kuartil bawah/*Lower quartile*, Q_1

= Cerapan ke-$\left(\frac{1}{4} \times 28\right)$ / $\left(\frac{1}{4} \times 28\right)^{th}$ *value*

= Cerapan ke-7/7th *value*

= 14

Kuartil atas/*Upper quartile*, Q_3

= Cerapan ke-$\left(\frac{3}{4} \times 28\right)$ / $\left(\frac{3}{4} \times 28\right)^{th}$ *value*

= Cerapan ke-21/21th *value*

= 18

Julat antara kuartil/*Interquatile range*

= $Q_3 - Q_1$

= 18 − 14 = 4

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B 1 Min/*Mean* $= \dfrac{\sum x}{N}$

$= \dfrac{\frac{1}{3} + \frac{5}{7} + \frac{9}{11} + \frac{4}{7} + \frac{6}{13}}{5}$

$= 0.580$

Varians/*Variance*, σ^2

$= \dfrac{\sum x^2}{N} - \bar{x}^2$

$= \dfrac{\left(\frac{1}{3}\right)^2 + \left(\frac{5}{7}\right)^2 + \left(\frac{9}{11}\right)^2 + \left(\frac{4}{7}\right)^2 + \left(\frac{6}{13}\right)^2}{5} - 0.580^2$

$= \dfrac{1.830}{5} - 0.580^2 = 0.03$

Sisihan piawai/*Standard deviation*, σ

$= \sqrt{\dfrac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{0.03}$

$= 0.17$

2 Min/*Mean* $= \dfrac{\sum x}{N}$

$= \dfrac{9.8 + 10.2 + 3.4 + 7.1 + 5.0 + 4.4 + 2.8 + 3.9 + 6.3 + 8.3}{10}$

$= \dfrac{61.2}{10}$

$= 6.12$

Varians/*Variance*, σ^2

$= \dfrac{\sum x^2}{N} - \bar{x}^2$

$= \dfrac{9.8^2 + 10.2^2 + 3.4^2 + 7.1^2 + 5^2 + 4.4^2 + 2.8^2 + 3.9^2 + 6.3^2 + 8.3^2}{10} - 6.12^2$

$= 6.35$

Sisihan piawai/*Standard deviation*, σ

$= \sqrt{\dfrac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{6.35} = 2.52$

C 1 Min/*Mean*, $\bar{x} = \dfrac{\sum x}{N} = 16$

$\dfrac{10 + 15 + 22 + 24 + 10 + 17 + x + 9}{8} = 16$

$\dfrac{107 + x}{\cancel{8}} \times \cancel{8} = 16 \times 8$ ← Kedua-dua belah didarab dengan 8 *Boths sides are multiplied by* 8

$107 + x = 128$

$x = 128 - 107$

$= 21$

Varians/*Variance*, σ^2

$= \dfrac{\sum x^2}{N} - \bar{x}^2$

$= \dfrac{10^2 + 15^2 + 22^2 + 24^2 + 10^2 + 17^2 + 21^2 + 9^2}{8} - 16^2$

$= 31$

Sisihan piawai/*Standard deviation*, σ

$= \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{\frac{10^2 + 15^2 + 22^2 + 24^2 + 10^2 + 17^2 + 21^2 + 9^2}{8} - 16^2}$

$= 5.57$

2 Min/*Mean*, $x = \frac{\sum fx}{N}$

$= \frac{2(5) + 13(6) + 3(7) + 4(8) + 2(9) + 1(10)}{25}$

$= \frac{169}{25} = 6.76$ minit/*minutes*

Varians/*Variance*, σ^2

$= \frac{\sum x^2}{N} - \bar{x}^2$

$= \frac{2(5)^2 + 13(6)^2 + 3(7)^2 + 4(8)^2 + 2(9)^2 + 1(10)^2}{25} - 6.76^2$

$= 1.6224$ minit/*minutes*

Sisihan piawai/*Standard deviation*, σ

$= \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{1.6224}$

$= 1.2737$ minit/*minutes*

Kaedah alternatif/*Alternative method*:

x	f	fx	x^2	fx^2
5	2	10	25	50
6	13	78	36	468
7	3	21	49	147
8	4	32	64	256
9	2	18	81	162
10	1	10	100	100
	$\Sigma f = 25$	$\Sigma fx = 169$		$\Sigma fx^2 = 1\ 183$

Min/*Mean*, $x = \frac{\sum fx}{\sum f}$

$= \frac{169}{25}$

$= 6.76$ minit/*minutes*

Varians/*Variance*, $\sigma^2 = \frac{\sum fx^2}{\sum f} - x^2$

$= \frac{1\ 183}{25} - 6.76^2$

$= 1.6224$ minit/*minutes*

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D 1 Tertib menaik/*Ascending order*:

33, 35, 41, 50, 69, 72, 86, 88, 200

Q_1 Median Q_3

Julat/*Range* = 200 – 33 = 167

Julat antara kuartil/*Interquartile range*

$= Q_3 - Q_1$

$= \frac{86 + 88}{2} - \frac{35 + 41}{2}$

= 87 – 38

= 49

Julat antara kuartil ialah sukatan serakan yang lebih sesuai kerana wujudnya pencilan (nilai ekstrem iaitu 200).

Interquartile range is more suitable measure of dispersion because outliers (*extreme value which is* 200) *exists*.

2 (*a*)

Jisim ***Mass, x* kg**	f	fx	fx^2
1.0	10	10	10
1.5	37	55.5	83.25
2.0	26	52	104
2.5	15	37.5	93.75
2.7	8	21.6	58.32
5.0	4	20	100
	$\sum f = 100$	$\sum fx = 196.6$	$\sum fx^2 = 449.32$

Jisim durian (kg) ***Mass of durian* (kg)**	1.0	1.5	2.0	2.5	2.7	5.0
Kekerapan ***Frequency***	10	37	26	15	8	4
Kekerapan longgokan ***Cumulative frequency***	10	47	73	88	96	100
	Ke-(1 – 10) $(1 - 10)^{th}$	Ke-(11 – 47) $(11 - 47)^{th}$	Ke-(48 – 73) $(48 - 73)^{th}$	Ke-(74 – 88) $(74 - 88)^{th}$	Ke-(89 – 96) $(89 - 96)^{th}$	Ke-(97 – 100) $(97 - 100)^{th}$

Ke – 25 25th Ke – 75 75th

Julat/*Range* = 5.0 – 1.0 kg

= 4.0 kg

Julat antara kuartil/*Interquartile range*

$= Q_3 - Q_1$

= 2.5 – 1.5 = 1.0 kg

Sisihan piawai/*Standard deviation*,

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \left(\frac{\sum fx}{N}\right)^2}$$

$$= \sqrt{\frac{449.32}{100} - \left(\frac{196.6}{100}\right)^2}$$

$$= \sqrt{0.6280} = 0.7925 \text{ kg}$$

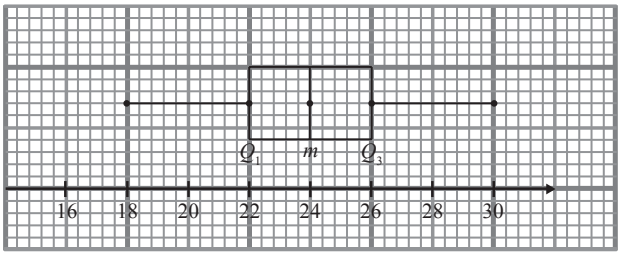
(*b*) Kuartil antara julat kerana wujudnya pencilan, 5.0 kg.
Interquartile range because extreme value, 5.0 kg *exists*.

E 1 18, 20, 21, 21, 22, 23, 23, 24, 24, 24, 25, 25, 26, 26, 26, 27, 28, 30

Q_1 Median Q_3

$$\text{Median} = \frac{24 + 24}{2}$$
$$= 24$$

$Q_1 = 22$
$Q_3 = 26$
Nilai maksimum/*Maximum value* = 30
Nilai minimum/*Minimum value* = 18



F 1

Bilangan kanak-kanak ***Number of children***	1	2	5	6	8
Kekerapan/*Frequency*	2	16	17	12	3
Kekerapan longgokan ***Cumulative frequency***	2	18	35	47	50
	1 – 2	3 – 18	19 – 35	36 – 47	48 – 50

Ke-13 13th Ke-25 25th Ke-38 38th

$$\text{Median} = \text{Ke-}\left(\frac{1}{2} \times 50\right)/\left(\frac{1}{2} \times 50\right)^{th}$$
$$= \text{Ke-}25/25^{th}$$
$$= 5$$

$$Q_1 = \text{Ke-}\left(\frac{1}{4} \times 50\right)/\left(\frac{1}{4} \times 50\right)^{th}$$
$$= \text{Ke-}13/13^{th}$$
$$= 2$$

$$Q_3 = \text{Ke-}\left(\frac{3}{4} \times 50\right)\left(\frac{3}{4} \times 50\right)^{th}$$
$$= \text{Ke-}38/38^{th}$$
$$= 6$$

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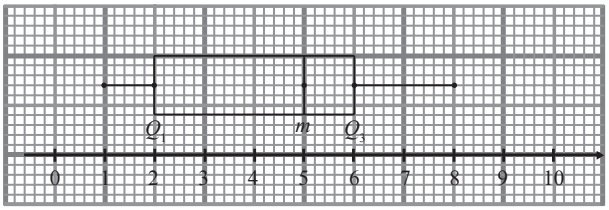
Nilai maksimum /*Maximum value* = 8
Nilai mimimum/*Minimum value* = 1

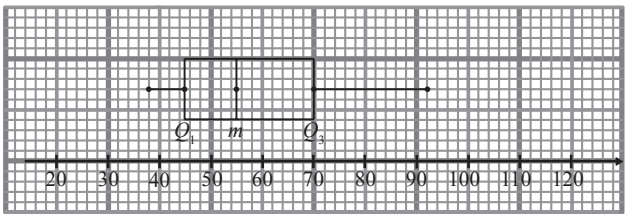


2 Median = Ke-$\left(\frac{1}{2} \times 37\right)$/$\left(\frac{1}{2} \times 37\right)^{th}$
= Ke-19/19th
= 55

Q_1 = Ke-$\left(\frac{1}{4} \times 37\right)$/$\left(\frac{1}{4} \times 37\right)^{th}$
= Ke-10/10th
= 45

Q_3 = Ke-$\left(\frac{3}{4} \times 37\right)$/$\left(\frac{3}{4} \times 37\right)^{th}$
= Ke-28/28th
= 70

Nilai maksimum/*Maximum value* = 92
Nilai minimum/*Minimum value* = 38



G 1 (*a*) Julat baharu/*New range* = 3 × 15 kg
= 45 kg
Julat antara kuartil baharu = 3 × 5 kg
New interquartile range
= 15 kg
Varians baharu = 3^2 × 36 kg
New variance
= 324 kg
Sisihan piawai baharu = 3 × 6 kg
New standard deviation
= 18 kg

(*b*) Julat baharu/*New range* = $\frac{15}{5}$ kg
= 3 kg
Julat antara kuartil baharu = $\frac{5}{5}$ kg = 1 kg
New interquartile range
Varians baharu/*New variance* = $\frac{36}{5^2}$ kg
= 1.44 kg
Sisihan piawai baharu = $\frac{6}{5^2}$ kg
New standard deviation
= 0.24 kg

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2 (*a*) 21, 25, 31, 33, 35, 39

Q_1 m Q_3

Julat baharu/*New range* = 39 − 21

= 18

(Julat banyak berkurang kerana pencilan dikeluarkan/*Range decrease drastically because extreme value is taken out*)

Median baharu/*New median* = $\frac{31 + 33}{2} = 32$

(Median beralih ke kanan)

(*Median shifts to the right*)

Julat antara kuartil baharu = 35 − 25

New interquartile range

= 10

(Julat antara kuartil berkurang)

(*Interquartile range decrease*)

Min baharu/*New mean*

$= \frac{21 + 25 + 31 + 33 + 35 + 39}{6}$

$= \frac{184}{6}$

= 30.67 (Min bertambah/*Mean increase*)

Sisihan piawai baharu

New standard deviation

$= \sqrt{\frac{21^2 + 25^2 + 31^2 + 33^2 + 35^2 + 39^2}{6} - \left(\frac{184}{6}\right)^2}$

= 6.046

(Sisihan piwai berkurang kerana nilai jauh daripada min telah dikeluarkan)

(*Standard deviation decrease because the value far from mean is taken out*)

(*b*) 12, 21, 25, 29, 31, 33, 35, 39

Q_1 m Q_3

Julat baru/*New range* = 27

(Julat kekal sama)

(*Range remains unchanged*)

Median baru/*New median* = $\frac{29 + 31}{2} = 30$

(Median beralih ke kiri)

(*Median shifts to the left*)

Julat antara kuartil baharu = $\frac{33 + 35}{2} - \frac{21 + 25}{2}$

New interquartile range

= 11

(Julat antara kuartil berkurang)

(*Interquartile range decrease*)

Min baharu/*New mean*

$= \frac{12 + 21 + 25 + 29 + 31 + 33 + 35 + 39}{8}$

$= \frac{225}{8}$

= 28.125

(Min bertambah sedikit kerana nilai yang hampir dengan min lama telah ditambahkan)

(*Mean increase a little because the value near to the old mean was added*)

Sisihan piawai baharu/*New standard deviation*

$= \sqrt{\frac{12^2 + 21^2 + 25^2 + 29^2 + 31^2 + 33^2 + 35^2 + 39^2}{8} - \left(\frac{225}{8}\right)^2}$

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$= 8.054$

(Sisihan piawai berkurang kerana nilai yang hampir dengan min lama telah ditambahkan)

(*Standard deviation decrease because the value near to the old mean was added*)

(*c*) $\underbrace{12, 21}, \underbrace{25, 31}, \underbrace{33, 35}, \underbrace{39, 60}$

$\uparrow Q_1 \quad \uparrow m \quad \uparrow Q_3$

Julat baru/*New range* $= 60 - 12 = 48$

(Julat bertambah banyak kerana pencilan ditambahkan)

(*Range increase drastically because the extreme value is added*)

Median baru/*New median* $= \dfrac{31 + 33}{2} = 32$

(Median beralih ke kanan)

(*Median shifts to the right*)

Julat antara kuartil baharu $= \dfrac{35 + 39}{2} - \dfrac{21 + 25}{2}$

New interquartile range

$= 14$

(Julat antara kuartil kekal sama kerana pencilan dimasukkan)

(*Interquartile range remains unchanged because extreme value is added*)

Min baharu/*New mean*

$= \dfrac{12 + 21 + 25 + 31 + 33 + 35 + 39 + 60}{8}$

$= \dfrac{256}{8} = 32$

(Min bertambah banyak kerana nilai jauh daripada min lama telah ditambahkan)

(*Mean increases a lot because the value far from initial mean was added*)

Sisihan piawai baharu/*New standard deviation*

$= \sqrt{\dfrac{12^2 + 21^2 + 25^2 + 31^2 + 33^2 + 35^2 + 39^2 + 60^2}{8} - \left(\dfrac{256}{8}\right)^2}$

$= 13.295$

(Sisihan piawai bertambah kerana nilai jauh daripada min lama telah ditambahkan)

(*Standard deviation increase because the value far from mean was added*)

H 1 Pekerja *A*/*Employee A*

Min/*Mean*, $x = \dfrac{\sum \bar{x}}{N}$

$= \dfrac{45 + 47 + 65 + 50 + 51}{5}$

$= \dfrac{258}{5}$

$= 51.6$ kg

Sisihan piawai

Standard deviation, σ

$= \sqrt{\dfrac{\sum (x - \bar{x})^2}{N}}$

$= \sqrt{49.44}$

$= 7.03$

Pekerja *B*/*Employee B*

Min/*Mean*, $x = \dfrac{\sum \bar{x}}{N}$

$= \dfrac{50 + 51 + 52 + 49 + 48}{5}$

$= \dfrac{250}{5}$

$= 50$ kg

Sisihan piawai

Standard deviation, σ

$= \sqrt{\dfrac{\sum (x - \bar{x})^2}{N}}$

$= \sqrt{2}$

$= 1.41$

Pekerja *B* mengamalkan cara hidup sihat secara konsisten kerana sisihan piawai pekerja *B* lebih kecil berbanding pekerja *A*.

Employee B practices a healthy lifestyle consistently because standard deviation of employee B is smaller compared to employee A.

I 1 $\bar{x} = 39$ $\qquad$ $\bar{y} = 45$

$\dfrac{\sum x}{f_x} = 39$ $\qquad$ $\dfrac{\sum y}{f_y} = 45$

$\frac{\sum x}{84} = 39$ $\qquad$ $\frac{\sum y}{76} = 45$

$\sum x = \text{RM3 276}$ $\qquad$ $\sum y = \text{RM3 420}$

$$\text{Min/}\textit{Mean} = \frac{\sum x + \sum y}{f_x + f_y}$$

$$= \frac{3\,276 + 3\,420}{84 + 76}$$

$$= \frac{6\,696}{160}$$

$$= \text{RM41.85}$$

$\sigma_x = 6$

$\sigma_x^2 = 6^2$

$\frac{\sum x^2}{f_x} - x^2 = 36$

$\frac{\sum x^2}{84} - 39^2 = 36$

$\sigma_x = 9$

$\sigma_y^2 = 9^2$

$\frac{\sum y^2}{f_y} - y^2 = 81$

$\frac{\sum y^2}{76} - 45^2 = 81$

$\sum x^2 = (36 + 1\,521) \times 84$

$\sum x^2 = \text{RM130 788}$

$\sum y^2 = (81 + 2\,025) \times 76$

$\sum y^2 = \text{RM160 056}$

$$\text{Varians/}\textit{Variance}, \sigma^2 = \frac{\sum x^2 + \sum y^2}{f_x + f_y} - \left(\frac{\sum x + \sum y}{f_x + f_y}\right)^2$$

$$= \frac{130\,788 + 160\,056}{84 + 76} - 41.85^2$$

$$= \frac{290\,844}{160} - 41.85^2$$

$$= \text{RM66.35}$$

2 $24, p, 37, 49, 57, q, 68$

$\uparrow Q_1 \qquad \uparrow m \qquad \uparrow Q_3$

Julat antara kuartil/*Interquartile range* = 29

$Q_3 - Q_1 = 29$

$q - p = 29 \longrightarrow$ Persamaan 1/*Equation* 1

Min/*Mean* = $46\frac{2}{7}$

$$\frac{\sum x}{f} = 46\frac{2}{7}$$

$$\frac{24 + p + 37 + 49 + 57 + q + 68}{7} = 46\frac{2}{7}$$

$$235 + p + q = 46\frac{2}{7} \times 7$$

$$p + q = 324 - 235$$

$q + p = 89 \longrightarrow$ Persamaan 2/*Equation* 2

Persamaan 1 + Persamaan 2/*Equation* 1 + *Equation* 2:

$q - p + q + p = 29 + 89$

$2q = 118$

$q = 59$

Gantikan $q = 59$ ke dalam Persamaan 2

Substitute $q = 59$ *into Equation* 2

$59 + p = 89$

$p = 30$

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Oleh itu/*Therefore*, $p = 30$, $q = 59$

Sisihan piawai/*Standard deviation* $= \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{\frac{24^2 + 30^2 + 37^2 + 49^2 + 57^2 + 59^2 + 68^2}{7} - \left(46\frac{2}{7}\right)^2}$

$= 15.135$

3 Min/*Mean* $= \frac{\sum x}{f}$

$= \frac{385}{14}$

$= 27.5$

Varians/*Variance* $= \frac{\sum x^2}{f} - \bar{x}^2$

$= \frac{10\ 876}{14} - (27.5)^2$

$= 20.607$

Min baharu/*New mean* $= \frac{\sum x}{f}$

$= \frac{385 - 12}{14 - 1} = \frac{373}{13} = 28.692$

Varians baharu/*New variance* $= \frac{\sum x^2}{f} - \bar{x}^2$

$= \frac{10\ 876 - 12^2}{14 - 1} - (28.692)^2 = 2.308$

Min bertambah tetapi sisihan piawai berkurang.
The mean increase but the standard deviation decrease.

PRAKTIS SPM/*SPM PRACTICE*

Kertas 1/*Paper 1*

1 D **2** C

Kertas 2/*Paper 2*

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*) $\sigma^2 = \frac{(3 \times 42^2) + (6 \times 47^2) + (11 \times 52^2) + (16 \times 57^2) + (10 \times 62^2) + (4 \times 67^2)}{3 + 6 + 11 + 16 + 10 + 4} - 55.6^2$

$= \frac{156\ 670}{50} - 55.6^2$

$= 42.04$

2 Min bagi mesin *R*/*Mean for machine R*, $\bar{x}$

$= \frac{153 + 150 + 151 + 147 + 148 + 152 + 149}{7}$

$= 150$ ml

Sisihan piawai/*Standard deviation*, σ

$= \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{\frac{153^2 + 150^2 + 151^2 + 147^2 + 148^2 + 152^2 + 149^2}{7} - 150^2}$

$= \sqrt{4}$

$= 2$

Min bagi mesin *S*/*Mean for machine S*, $\bar{y}$

$= \frac{158 + 155 + 153 + 148 + 162 + 149 + 160}{7} = 155$ ml

Sisihan piawai/*Standard deviation*, $\sigma = \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$

$= \sqrt{\frac{158^2 + 155^2 + 153^2 + 148^2 + 162^2 + 149^2 + 160^2}{7} - 155^2}$

$= \sqrt{24.5714}$

$= 4.9570$

Huraian/*Explanation*:

Produktiviti bagi mesin *R* adalah lebih konsisten daripada mesin *S*. Hal ini kerana sisihan piawai bagi mesin *R*, 2 adalah lebih kecil daripada mesin *S*, 4.957.

The productivity of machine R is more consistent than machine S. This is because the standard deviation of machine R, 2 is smaller than machine S, 4.957.

UNIT 9

SK 9.1

A 1

Dadu 1 *Dice* 1 \ Dadu 2 *Dice* 2	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6,6)

S = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

2 S = {(H, 1), (H, 2), (H, 3), (H, 4), (H, 5), (H, 6), (T, 1), (T, 2), (T, 3), (T, 4), (T, 5), (T, 6)}

3 S = {(M, H), (M, O), (M, M), (M, E), (A, H), (A, O), (A, M), (A, E), (Y, H), (Y, O), (Y, M), (Y, E)}

4 S = {(WWW), (WWY), (WWB), (WYY), (WBB), (WYB), (WBY), (YYY), (YYW), (YYB), (YWW), (YBB), (YWB), (YBW), (BBB), (BBW), (BBY), (BWW), (BYY), (BWY), (BYW)}

B 1 (*a*) $\frac{2}{5} = \frac{8}{n(S)}$

$n(S) = 20$

(*b*) $P(700 \text{ ml}) = 1 - \frac{2}{5} - \frac{8}{20} = \frac{1}{5}$

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(*c*) $P = (300\text{ ml}, 500\text{ ml}) + (300\text{ ml}, 700\text{ ml}) + (500\text{ ml}, 700\text{ ml})$

$= \left(\frac{2}{5}\right)\left(\frac{8}{20}\right) + \left(\frac{2}{5}\right)\left(\frac{1}{5}\right) + \left(\frac{8}{20}\right)\left(\frac{1}{5}\right) = \frac{8}{25}$

2 (*a*) $P = \frac{4}{11} \times \frac{4}{11}$

$= \frac{16}{121}$

(*b*) $P = \frac{7}{11} \times \frac{7}{11}$

$= \frac{49}{121}$

(*c*) $P = \frac{4}{11} \times \frac{7}{11}$

$= \frac{28}{121}$

3 (*a*) $A = \{1, 9, 21\}$

$B = \{4, 12, 16\}$

$C = \{4, 12, 16\}$

(*b*) $P(A) = \frac{3}{6} = \frac{1}{2}$

$P(B) = \frac{3}{6} = \frac{1}{2}$

$P(C) = \frac{3}{6} = \frac{1}{2}$

SK 9.2

A 1 Peristiwa bersandar. Kebarangkalian warna bola pertama dipengaruhi kebarangkalian warna bola kedua.
Dependent event. The probability of colour of the first ball is influenced the probability of colour of the second ball.

2 Peristiwa tak bersandar. Kebarangkalian mendapat kepala atau ekor pada kali pertama tidak mempengaruhi kebarangkalian mendapat kepala atau ekor pada kali kedua.
Independent event. The probability of getting head or tail in the first time do not influence the probability of getting head or tail in the second ime.

3 Peristiwa tak bersandar. Kebarangkalian atlet melompat melebihi 1.6 m sebelumnya tidak mempengaruhi kebarangkalian atlet melompat melebihi 1.6 m tinggi pada waktu berikutnya.
Independent event. The probability of the athlete jumped over 1.6 m *height in the previous event do not influence the probability of the athlete jumped over* 1.6 m *height for the next time.*

B 1 Hukum pendaraban/*Multiplication rule*

P(mendapat bola merah/*getting a red ball*) $= \frac{3}{5}$

P(mendapat kad hitam/*getting a black card*) $= \frac{2}{6}$

P(mendapat bola merah dan kad hitam)
P(*getting a red ball and black card*)
$= P(M \cap H)$

$= \frac{3}{5} \times \frac{2}{6}$

$= \frac{6}{30} = \frac{1}{5}$

Kesudahan yang mungkin/*Possible outcomes*,
$A = \{(M_1, H_1), (M_1, H_2), (M_2, H_1), (M_2, H_2), (M_3, H_1), (M_3, H_2)\}$
$n(A) = 6$
$n(S) = 5 \times 6 = 30$
$P(A) = \frac{n(A)}{n(S)} = \frac{6}{30} = \frac{1}{5}$

Maka, terbukti bahawa kedua-dua kaedah menghasilkan jawapan yang sama.
Therefore, it is shown that both methods give the same answer.

C 1 (*a*) $P = (0.3)(0.6)(0.8)$
$= 0.144$

(*b*) $P = (X'YZ) + (XY'Z) + (XYZ') + (XYZ)$
$= (0.7)(0.6)(0.8) + (0.3)(0.4)(0.8) + (0.3)(0.6)(0.2) + (0.3)(0.6)(0.8)$

$= 0.612$

(*c*) $P = (0.7)(0.4)(0.2)$

$= 0.056$

2 (*a*) P(Aina gagal dalam semua subjek)/P(*Aina fails in all subjects*) $= (0.4)(0.2)(0.6)$

$= 0.048$

P(Sammy gagal dalam semua subjek)/P(*Sammy fails in all subjects*) $= (0.5)(0.3)(0.1)$

$= 0.015$

P(Aina dan Sammy gagal dalam semua subjek)/P(*Aina and Sammy fail in all subjects*)

$= (0.048)(0.015)$

$= 0.00072$

(*b*) P(Aina hanya gagal dalam satu subjek/*Aina only failed one subject*)

$= (0.4)(0.8)(0.4) + (0.6)(0.2)(0.4) + (0.6)(0.8)(0.6)$

$= 0.464$

P(Sammy hanya gagal dalam satu subjek)/P(*Sammy only failed one subject*)

$= (0.5)(0.7)(0.9) + (0.5)(0.3)(0.9) + (0.5)(0.7)(0.1)$

$= 0.485$

P(Aina dan Sammy hanya gagal dalam satu subjek)/P(*Aina and Sammy only failed one subject*)

$= (0.464)(0.485)$

$= 0.225$

(*c*) P(Aina hanya lulus dalam subjek Matematik dan Sammy hanya lulus dalam subjek Sains)

P(*Aina only passed in Mathematics and Sammy only passed in Science*)

$= (0.6)(0.2)(0.6) \times (0.5)(0.3)(0.9)$

$= 0.00972$

P(Sammy hanya lulus dalam subjek Matematik dan Aina hanya lulus dalam subjek Sains)

P(*Sammy only passed in Mathematics and Aina only passed in Science*)

$= (0.5)(0.3)(0.1) \times (0.4)(0.2)(0.6)$

$= 0.00072$

P(Salah seorang daripada mereka hanya lulus dalam Matematik dan lagi seorang hanya lulus dalam subjek Sains)

P(*One of them only passed in Mathematics and another one passed in Science*)

$= 0.00972 + 0.00072$

$= 0.01044$

SK 9.3

A **1** Saling eksklusif/*Mutually exclusive*

2 Tidak saling eksklusif/*Non-mutually exclusive*

3 Tidak saling eksklusif/*Non-mutually exclusive*

4 Saling eksklusif/*Mutually exclusive*

B **1** (*a*) $P(A \cup C) = \dfrac{n(A \cup C)}{n(S)}$ $\qquad P(A) + P(C) = \dfrac{5}{9} + \dfrac{2}{9}$

$= \dfrac{7}{9}$

(*b*) $P(A \cup B) = \dfrac{n(A \cup B)}{n(S)}$ $\qquad P(A) + P(B) = \dfrac{5}{9} + \dfrac{4}{9}$

$= \dfrac{9}{9} = 1$

(*c*) $P(B \cup C) = \dfrac{n(A \cup C)}{n(S)}$

$P(B) + P(C) - P(B \cap C) = \dfrac{4}{9} + \dfrac{2}{9} - \dfrac{2}{9}$

$= \dfrac{4}{9}$

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C **1** (*a*) $n(A) = 3$

$P(A) = \frac{3}{6} = \frac{1}{2}$

(*b*) $n(B) = 3$

$P(B) = \frac{3}{6} = \frac{1}{2}$

(*c*) $P(A \cap B) = 0$,

$P(A \cup B) = \frac{1}{2} + \frac{1}{2} = 1$

2 (*a*) $P(A \cap B) = \frac{1}{3} + \frac{1}{6} - \frac{1}{2}$

$= 0$

(*b*) $P(A' \cup B') = P[(A \cap B)']$

$= 1 - P(A \cap B)$

$= 1$

(*c*) Oleh kerana $P(A \cap B) = 0$, peristiwa A dan B adalah saling eksklusif.
Since $P(A \cap B) = 0$, *hence event A and B are mutually exclusive*.

3 $A = \{2, 4, 6\}$, $B = \{1, 3, 5\}$, $C = \{3, 6\}$, $D = \{1, 2\}$
Oleh kerana $P(A \cap B) = 0$, peristiwa A dan B adalah saling eksklusif/*Since* $P(A \cap B) = 0$, *event A and B are mutually exclusive.*
Oleh kerana $P(A \cap C) \neq 0$, peristiwa A dan B adalah tidak saling eksklusif
Since $P(A \cap C) \neq 0$, *event A and C are not mutually exclusive*.
Oleh kerana $P(A \cap D) \neq 0$, peristiwa A dan D adalah tidak saling eksklusif
Since $P(A \cap D) \neq 0$, *event A and D are not mutually exclusive*.

4 S = {2 356, 2 365, 2 536, 2 563, 2 635, 2 653, 3 256, 3 265, 3 526, 3 562, 3 625, 2 652, 5 236, 5 263, 5 326, 5 362, 5 623, 5 632, 6 235, 6 253, 6 325, 6 352, 6 523, 6 532}

(*a*) $P(A) = \frac{12}{24}$

$= \frac{1}{2}$

(*b*) $P(B) = \frac{6}{24}$

$= \frac{1}{4}$

(*c*) $P(A \cup B) = P(A) + P(B)$

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

5 (*a*)

Dadu 2 *Dice 2* / **Dadu 1** *Dice 1*	**1**	**2**	**3**	**4**	**5**	**6**
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

(*b*) $P(M) = \frac{9}{36}$

$= \frac{1}{4}$

$P(N) = \frac{11}{36}$

(*c*) Oleh sebab $P(M \cap N) \neq 0$, maka peristiwa M dan N adalah tidak saling eksklusif.
Since $P(M \cap N) \neq 0$, *hence event M and N are not mutually exclusive*.

6 (*a*) $P = 0.80 \times 0.15$

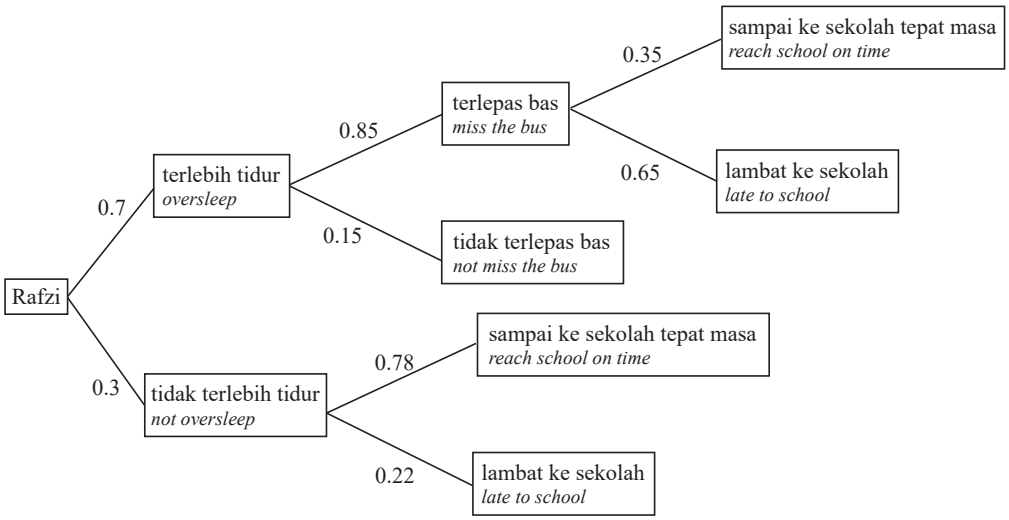
$= 0.12$

(*b*) $P = 0.20 \times 0.85$

$= 0.17$

SK 9.4

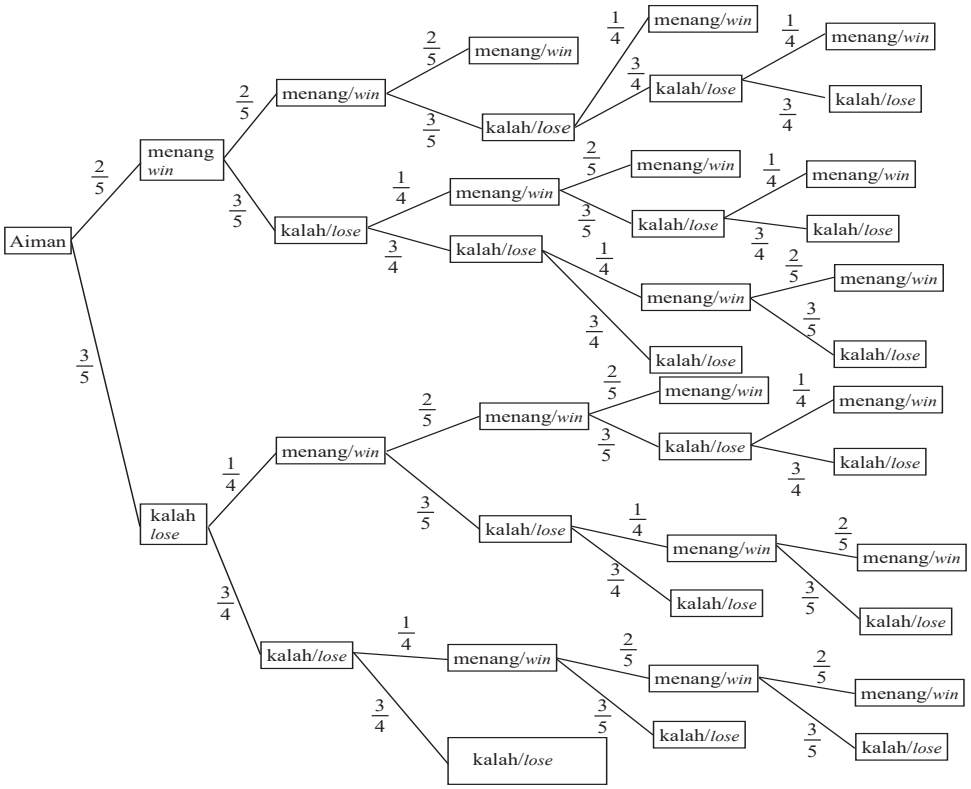
A 1 (*a*)



(*b*) *P*(Rafzi akan lewat ke sekolah jika dia terlebih tidur)
P(*Rafzi will late to school if he oversleep*)
$= (0.7)(0.85)(0.65)$
$= 0.387$

(*c*) *P*(Rafzi akan sampai ke sekolah tepat pada masanya walaupun dia terlebih tidur)
P(*Rafzi will reach to school on time although he oversleep*)
$= (0.7)(0.85)(0.35) \times (0.7)(0.15)$
$= 0.022$

2 (*a*)



(*b*) *P*(Aiman tidak pernah kalah dalam 3 perlawanan pertama/*Aiman never lose for the first* 3 *match*)
$= P(WWW)$

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$= \left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{2}{5}\right) = \frac{8}{125}$

(*c*) P(Aiman menjadi juara/*Aiman is a winner*)

$= P(WWW) + P(WWLW) + P(WLWW) + P(WWLLW) + P(WLLWW) + P(WLWLW)$

$= \left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{2}{5}\right) + \left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{3}{5}\right)\left(\frac{1}{4}\right) + \left(\frac{2}{5}\right)\left(\frac{3}{5}\right)\left(\frac{1}{4}\right)\left(\frac{2}{5}\right) + \left(\frac{2}{5}\right)\left(\frac{2}{5}\right)\left(\frac{3}{5}\right)\left(\frac{3}{4}\right)\left(\frac{1}{4}\right) + \left(\frac{2}{5}\right)\left(\frac{3}{5}\right)\left(\frac{3}{4}\right)\left(\frac{1}{4}\right)\left(\frac{2}{5}\right) + \left(\frac{2}{5}\right)\left(\frac{3}{5}\right)\left(\frac{1}{4}\right)\left(\frac{3}{5}\right)\left(\frac{1}{4}\right) = \frac{157}{1\,000}$

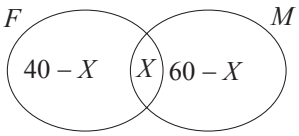
3 (*a*) $P = \frac{1}{3} \times \frac{5}{6}$

$= \frac{5}{18}$

(*b*) $P = \frac{1}{3} \times \frac{1}{6}$

$= \frac{1}{18}$

4 (*a*)



$40 - X + X + 60 - X = 80$

$100 - X = 80$

$X = 20$

(*b*) (i) P(lelaki)/P(*male*) $= \frac{40 + 20}{100}$

$= \frac{3}{5}$

(ii) P(sepenuh masa)/P(*full time*) $= \frac{100 - 20}{100}$

$= \frac{4}{5}$

5 (*a*) $n(A) = 80$

$m + 18 + 6 + 4 = 80$

$m = 52$

$n(B) = 70$

$p + 18 + 4 + 30 = 70$

$p = 18$

$n(C) = 50$

$6 + 4 + p + q = 50$

$q = 22$

(*b*) (i) P(kelab lukisan/*drawing clubs*) $= \frac{50}{200}$

$= \frac{1}{4}$

(ii) P(dua kelab/*two clubs*) $= \frac{6 + 18 + 18}{200}$

$= \frac{21}{100}$

(iii) P(lebih daripada satu kelab/*more than one club*) $= \frac{6 + 18 + 18 + 4}{200} = \frac{23}{100}$

6 (*a*)

	1	**2**	**3**	**4**
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8

(*b*) (i) P(mata yang sama/*same points*) $= \frac{4}{16}$

$= \frac{1}{4}$

(ii) P(memenagi hadiah/*win the prize*) $= \frac{6}{16}$

$= \frac{3}{8}$

7 (*a*) $P =$ (genap/*even*)(ganjil/*odd*) + (ganjil/*odd*)(genap/*even*)

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

$= \frac{2}{3}$

(*b*) P(kedua-duanya nombor genap) $= \frac{2}{4} \times \frac{1}{3}$
P(*both even numbers*)

$= \frac{1}{6}$

(*c*) P(kedua-duanya nombor ganjil) $= \frac{2}{4} \times \frac{2}{3}$
P(*both odd numbers*)

$= \frac{1}{3}$

(*d*) P(boleh dibahagikan dengan 4) $= \frac{1}{4} \times \frac{1}{3}$
P(*can be divisible by* 4)

$= \frac{1}{12}$

8 $P + 4P = 1$

$5P = 1$

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

Daripada 1 hingga 50, terdapat tujuh nombor kuasa dua sempurna iaitu 1, 4, 9, 16, 25, 36 dan 49.
Lima daripadanya kurang daripada atau sama dengan 25 manakala dua daripadanya lebih daripada 25.

Kebarangkalian untuk mendapatkan nombor kuasa sempurna daripada 1 hingga 50 $= \frac{7}{50} = 0.14$

From 1 *to* 50, *there are seven perfect square numbers which are* 1, 4, 9, 16, 25, 36 *and* 49.
Five of them are less than or equal to 25 *whereas two of them are more than* 25.

The probability to get a perfect square number from 1 *to* 50 $= \frac{7}{50} = 0.14$.

PRAKTIS SPM/*SPM PRACTICE*

Kertas 2/*Paper 2*

1 (*a*) $S =$ {(125), (127), (152), (157), (172), (175), (215), (217), (251), (257), (271), (275), (512), (517), (521), (527), (571), (572), (712), (715), (721), (725), (751), (752)}

(*b*) (i) P(nombor genap/*even number*) $= \frac{6}{24} = \frac{1}{4}$

(ii) P(boleh dibahagikan dengan 5/*divisible by* 5) $= \frac{6}{24} = \frac{1}{4}$

2 $\frac{7+5}{x} = \frac{1}{3}$

$\frac{12}{x} = \frac{1}{3}$

Jumlah murid/*Number of students* $= 3 \times 12$

$= 36$

Bilangan murid yang lulus/*Number of students who passed* $= 36 - 12$

$= 24$

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Lelaki/*Boys* $= \frac{24}{3} \times 1$

$= 8$

Perempuan/*Girls* $= \frac{24}{3} \times 2$

$= 16$

$\therefore x = 8, y = 16$

UNIT 10

SK 10.1

A **1** Menetapkan matlamat kewangan.
Set financial goals.

2 Menilai kedudukan kewangan.
Evaluate financial position.

3 Mewujudkan pelan kewangan.
Create a financial plan.

4 Melaksanakan pelan kewangan.
Carry out financial plan.

5 Mengkaji semula dan menyemak kemajuan.
Review and check progress.

B Khusus, boleh diukur, boleh dicapai, bersifat realistik, tempoh masa.
Specific, measurable, attainable, realistic, time-bound.

C Jumlah pendapatan – Jumlah perbelanjaan
Total income – Total expenses
= RM2 800 + RM800 – RM1 460
= RM2 140 (aliran tunai positif/*positive cash flow*)
Aliran tunai positif sebanyak RM2 140 adalah baik kerana Puan Tan mempunyai lebihan daripada pendapatan setelah menolak perbelanjaan. Hal ini membolehkan beliau mempunyai cukup wang untuk menghadapi situasi kecemasan jika berlaku.
Positive cash flow of RM2 140 *is good because Mrs Tan has extra money from her income after deducting her expenses. This allows her to have enough money whenever there is an emergency.*

D **1** Jumlah pendapatan – Jumlah perbelanjaan
Total income – Total expenses
= RM3 350 + RM1 100 – RM1 200 –RM480 – RM390 – RM540 – RM950
= RM890
Saya bersetuju dengan perbelanjaan Susan kerana Susan masih mempunyai lebihan setelah menolak perbelanjaan. Dia boleh menggunakan wang itu untuk melabur.
I agree with Susan's expenditure because she still has extra money after deducting her expenses. She can use her money to invest.

2 RM890 – RM215 = RM675
Ya, Susan wajar membeli beg itu kerana dia boleh menggunakan wang lebihan itu.
Yes, it is reasonable for her to buy the bag because she can use the extra money.

E **1** Perbelanjaan/*Savings* = RM480 × 7
= RM3 360
Tidak, Encik Lee tidak dapat mencapai matlamatnya kerana dia tidak mempunyai simpanan yang cukup untuk membeli komputer riba.
No, Mr Lee cannot achieve his target because he does not have enough savings to buy a laptop.

2 Simpanan bulanan/*Monthly savings* $= \frac{\text{RM4 200}}{7}$
= RM600

3 • Khusus: Membeli komputer riba
Specific: Buy a laptop

- Boleh diukur: Bernilai RM4 200 memerlukan simpanan bulanan RM600 untuk mencapai matlamat.
  Measurable: *Worth* RM4 200 *requires a monthly saving of* RM600 *to achieve the target*.
- Boleh dicapai: Boleh mencapai simpanan bulanan sebanyak RM600 daripada jumlah pendapatan RM4 800.
  Attainable: *Can attain monthly savings of* RM600 *from total income* RM4 800.
- Bersifat realistik: RM600 daripada jumlah pendapatan sebanyak RM4 800 hanya merupakan 12.5% daripada pendapatan.
  Realistic: RM600 *from total income of* RM4 800 *is only* 12.5% *from the income*.
- Tempoh masa: 7 bulan adalah cukup untuk mengumpulkan RM4 200 dengan simpanan bulanan sebanyak RM600.
  Time-bound: 7 *months is enough to collect* RM4 200 *with monthly savings of* RM600.

4 Supaya individu tersebut dapat mengurus pendapatannya dengan berkesan.
So that the individual can manage his income more effectively.

F 1 Wang pendahuluan/*Down payment* $= \frac{10}{100} \times 42\ 000$

$= \text{RM}4\ 200$

Jumlah simpanan bulanan dalam tempoh setahun
Total of monthly savings in a year
= RM260 × 12
= RM3 120
Jumlah pendapatan lebihan dalam tempoh setahun
Total of surplus income in a year
= RM320 × 12
= RM3 840
Jumlah simpanan dalam setahun
Total savings in a year
= RM3 120 + RM3 840
= RM6 960
Matlamat kewangan Orked boleh dicapai kerana jumlah simpanannya selepas setahun melebihi wang pendahuluan yang diperlukan.
Orked's financial goal can be achieved because the amount of savings after a year exceeds the required down payment.

2 Perancangan kewangan Orked tidak berkesan kerana ia akan menghasilkan aliran tunai negatif. Hal ini kerana pendapatan lebihan hanya RM320 berbanding ansurans bulanan kereta sebanyak RM444.50.
Orked's financial planning is ineffective as it will result in negative cash flow. This is the surplus income is only RM320 *compared to monthly car instalment of* RM444.50.

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3

Perkara/*Description*	RM	
Gaji Orked/*Orked's income*	2 500	
Pendapatan pasif/*Passive income*	100	
Jumlah pendapatan bulanan/*Total monthly income*	2 600	
Tolak simpanan tetap bulanan/*Deduct fixed monthly deposit* (10% daripada pendapatan bulanan)/(10% *from monthly income*)	260	
Tolak simpanan untuk kecemasan/*Deduct savings for emergency*	100	
Simpanan Tabung Haji/*Tabung Haji savings*	100	
Ansurans kereta/*Car instalment*	444.50	
Baki pendapatan/*Income balance*		1 695.50
Tolak perbelanjaan tetap bulanan/*Deduct monthly fixed expenses*		
Sewa bilik/*Room rent*	250	
Pinjaman pendidikan/*Education loan*	170	
Jumlah perbelanjaan tetap bulanan/*Total monthly regular expenses*		420
Tolak perbelanjaan tidak tetap bulanan/*Deduct monthly variable expenses*		
Makanan dan minuman/*Food and drinks*	600	
Pelan internet/*Internet plan*	100	
Melancong/*Travel*	100	
Membeli-belah/*Shopping*	100	
Elaun ibu bapa/*Allowances for parents*	200	
Jumlah perbelanjaan tidak tetap bulanan/*Total monthly non-regular expenses*		1 100
Pendapatan lebihan/*Extra income*		175.50

PRAKTIS SPM/*SPM PRACTICE*

Kertas 2/*Paper 2*

1 (*a*) Jangka pendek/*Short-term*

(*b*) Simpanan bulanan yang diperlukan untuk mencapai matlamat
Monthly savings needed to achieve goal

$= \frac{\text{RM5 208}}{2 \times 12}$

$= \frac{\text{RM5 208}}{24}$

= RM217

Encik Halim mempunyai pendapatan lebihan RM340. Jadi, beliau boleh mencapai matlamat kewangannya dengan menyimpan RM217 setiap bulan daripada pendapatan lebihannya.
Mr Halim has a surplus income of RM340. *Hence, he can achieve his financial goals by saving* RM217 *every month from his surplus income.*

(*c*) Encik Halim menguruskan kewangan dengan cekap kerana beliau mempunyai aliran tunai yang positif, mempunyai simpanan tetap dan simpanan kecemasan.
Mr Halim manages his finances efficiently as he has positive cash flow, has fixed deposits and emergency savings.

2 Pendapatan/*Income* = 3 200
Perbelanjaan/*Expenses* = 1 950
Baki/*Balance* = 3 200 – 1 950 = RM1 250

14 400 ÷ 12 bulan/*months* = RM1 200

Muaz dapat mencapai matlamat kewangannya kerana baki gajinya melebihi simpanan yang diperlukan untuk beliau membeli motosikal tersebut.

Muaz was able to achieve his financial goals because his remaining salary exceeded the savings required for him to buy the motorcycle.

PRAKTIS TOPIKAL OBJEKTIF
OBJECTIVE TOPICAL PRACTICE

1	A	**2**	A	**3**	C	**4**	C	**5**	C
6	D	**7**	A	**8**	D	**9**	B	**10**	A
11	C	**12**	A	**13**	B	**14**	D	**15**	C
16	B	**17**	D	**18**	A	**19**	A	**20**	B
21	D	**22**	D	**23**	C	**24**	B	**25**	B
26	A	**27**	D	**28**	C	**29**	A	**30**	B
31	A	**32**	C	**33**	C	**34**	D	**35**	B
36	B	**37**	A	**38**	B	**39**	D	**40**	C

PRAKTIS TOPIKAL STRUKTUR
STRUCTURE TOPICAL PRACTICE

1 (*a*) Benar/*True*

(*b*) *p*: 63 ialah gandaan bagi 3./63 *is a multiple of* 3.

q: 63 ialah gandaan bagi 7./63 *is a multiple of* 7.

2 (*a*)

Batang *Stem*	**Daun** *Leaves*
1	2 3 3 8
2	1 2 4 4 5 5
3	6 7
4	1 6 6 6 6 7
5	0 9

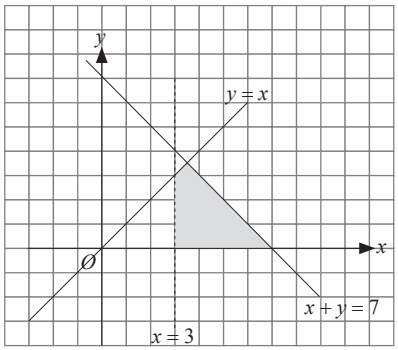
Kekunci: 2 | 1 mewakili 21 mm

Key: 2 | 1 *represents* 21 mm

(*b*) Julat/*Range* = 59 – 12

= 47

3



4 (*a*) Jumlah pendapatan – jumlah perbelanjaan

Total income – total expenses

= (RM3 200 + RM400) – (RM2 450 + RM700)

= RM450 (Aliran tunai positif/*Positive cash flow*)

Aliran tunai positif sebanyak RM450 adalah baik kerana Encik Ong mempunyai lebihan daripada pendapatan setelah menolak perbelanjaan. Hal ini membolehkan beliau mempunyai cukup wang yang cukup jika berlaku situasi kecemasan.

Positive cash flow of RM450 *is good because Mr Ong has extra money from his income after deducting his expenses. This allows him to have enough money whenever there is an emergency.*

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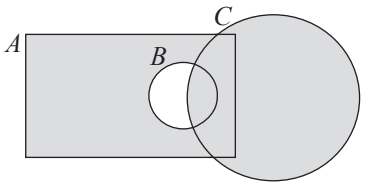
(*b*) RM450 – RM550 = –100
Tidak, Encik Ong tidak wajar membeli kasut itu kerana dia tidak mempunyai wang lebihan yang mencukupi.
No, it is not reasonable for him to buy the shoes because he does not have enough extra money.

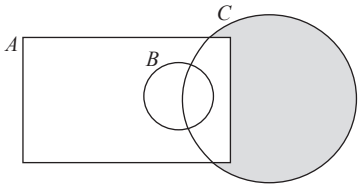
5 (*a*) $4x^2 - 169 = 0$
$(2x + 13)(2x - 13) = 0$
$x = -\frac{13}{2}, \frac{13}{2}$

(*b*) $9x^2 + 3x - 30 = 0$
$3x^2 + x - 10 = 0$
$(3x - 5)(x + 2) = 0$
$x = \frac{5}{3}, x = -2$

6 (*a*)



(*b*)



7 (*a*) $101_2 = (1 \times 2^2) + 0 + (1 \times 2^0) = 5$
$1111_2 = (1 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$
$= 15$
$\therefore 101_2 + 1111_2 = 5 + 15$
$= 20_{10}$

(*b*) $1034_5 = (1 \times 5^3) + 0 + (3 \times 5^1) + (4 \times 5^0) = 144$
$1022_5 = (1 \times 5^3) + 0 + (2 \times 5^1) + (2 \times 5^0) = 137$
$\therefore 1034_5 - 1022_2 = 144 - 137$
$= 7_{10}$

8 (*a*) $S = \{(1, Q), (1, R), (1, S), (2, Q), (2, R), (2, S), (8, Q), (8, R), (8, S), (12, Q), (12, R), (12, S)\}$

(*b*) (i) Gunakan A = Nombor genap dan R
Let A = Even number and R
$A = \{(2, R), (8, R), (12, R)\}$
$n(A) = 3$
$P(A) = \frac{3}{12} = \frac{1}{4}$

(ii) Gunakan B = Gandaan 2 atau S
Let B = Multiple of 2 *or* S
$B = \{(1, S), (2, Q), (2, R), (2, S), (8, Q), (8, R), (8, S), (12, Q), (12, R), (12, S)\}$
$n(B) = 10$
$P(B) = \frac{10}{12} = \frac{5}{6}$

9 (*a*) $V = P, Q, R, S, T, U, V$
$n(V) = 7$

(*b*) $E = \{(P, Q), (P, S), (Q, S), (Q, T), (S, T), (Q, R), (R, U), (U, V)\}$
$n(E) = 8$

(*c*) Bilangan darjah/*Sum of degree* = 2(8)
= 16

10 (*a*) Kadar perubahan laju/*Rate of change of speed*

$= \frac{40 - 0}{15 - 0} = 2\frac{2}{3}$ m s^{-2}

(*b*) Jarak perjalanan *Y*/*Distance travelled by Y*

$= \frac{1}{2}(40)(t)$

$= 20t$ m

(*c*) Jarak perjalanan *X*/*Distance travelled by X*

$= \frac{2}{3}(15)(40) + (t - 15)(40)$

$= (40t - 300)$ m

$(40t - 300) - 20t = 45$

$t = 17.25$ m

11 (*a*)

Bilangan bilik *Number of rooms*	**Kekerapan** *Frequency*
2	2
3	9
4	16
5	15
6	5
7	2
8	1

(*b*)

Bilangan bilik *Number of rooms*	**Kekerapan** *Frequency*	*fx*	fx^2
2	2	4	8
3	9	27	81
4	16	64	256
5	15	75	375
6	5	30	180
7	2	14	98
8	1	8	64

Min/*Mean* $= \frac{4 + 27 + 64 + 75 + 30 + 14 + 8}{50}$

$= 4.44$

$\sigma = \sqrt{\frac{8^2 + 81^2 + 256^2 + 375^2 + 180^2 + 98^2 + 64^2}{50} - 4.44^2}$

$= 52.24$

Min lebih sesuai./*Mean is more suitable.*

(*c*) Julat antara kuartil/*Interquartile range* $= 5 - 4$

$= 1$

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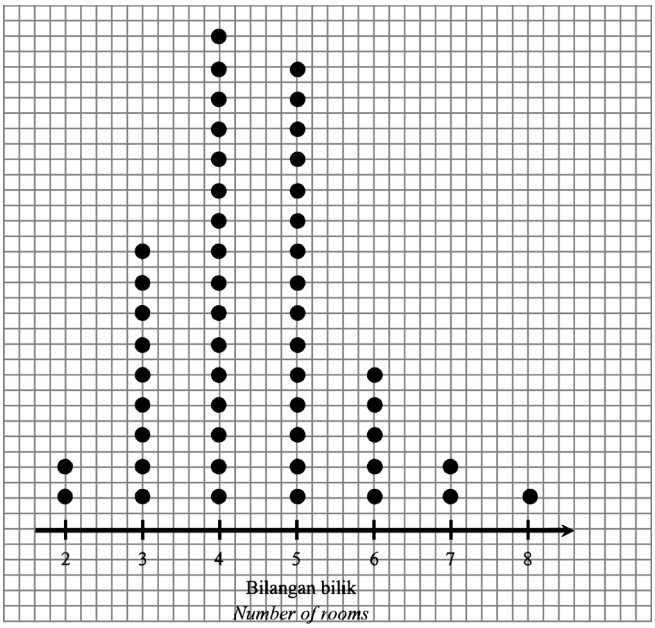
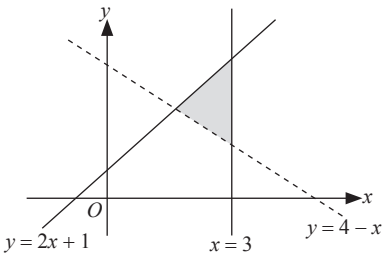
(*d*)

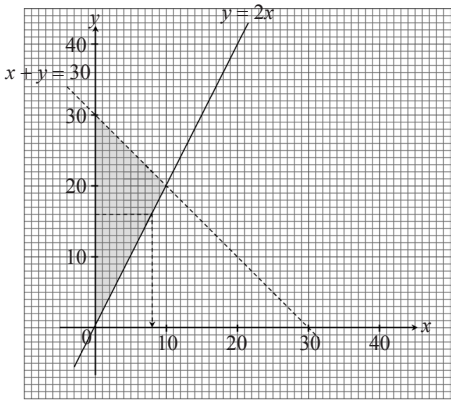


12 (*a*)



(*b*) (i) $y \geq 2x, x + y < 30$

(ii)



(iii) 8 buku/*books*

13 (*a*) Implikasi 1: Jika x ialah nombor positif, maka x lebih besar daripada 0.
Implication 1: *If x is a positive number, then x is greater than* 0.
Implikasi 2: Jika x lebih besar daripada 0, maka x ialah nombor positif.
Implication 2: *If x is greater than* 0, *then x is a positive number*.

(*b*) (i) Palsu/*False*
(ii) Benar/*True*
(iii) Benar/*True*
(iv) Palsu/*False*

(*c*) $2(2^1) - 1 = 3$
$2(2^2) - 1 = 7$

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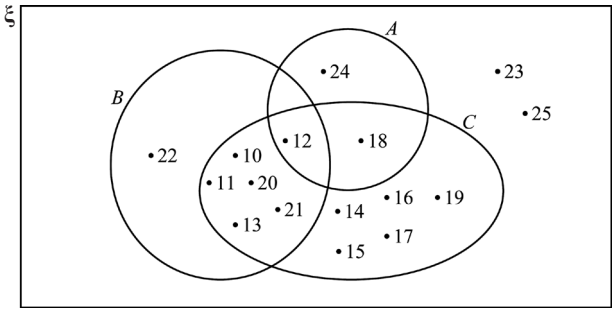
$2(2^3) - 1 = 15$
$2(2^4) - 1 = 31$
$2(2^n) - 1, n = 1, 2, 3, 4, \ldots$

(*d*) Jika poligon itu ialah poligon sekata, maka sudut yang dicangkum di pusat poligon itu ialah $\frac{360}{n}$ di mana *n* ialah bilangan sisi.

If the polygon is a regular polygon, then the angle subtended at the centre of the polygon is $\frac{360}{n}$ *where n is the number of sides.*

14 (*a*) (i) $A = \{12, 18, 24\}$
(ii) $A = \{10, 11, 12, 13, 20, 21, 22\}$

(*b*)



(*c*) $(A \cup B)' = \{14, 15, 16, 17, 19, 23, 25\}$
(*d*) $(A \cap B') = \{18, 24\}$
$n(A \cap B') = 2$
(*e*) P(Kedua-dua adalah gandaan 6 yang kurang daripada 22/*Both are multiple of* 6 *which is less than* 22)

$= \frac{2}{16}\left(\frac{1}{15}\right)$

$= \frac{1}{120}$

(*f*) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{3}{16} + \frac{7}{16} - \frac{1}{16}$

$= \frac{9}{16}$

15 (*a*) 36 m s^{-1}
(*b*) (i) Kadar perubahan laju/*Rate of change of speed* $= \frac{36 - 0}{28 - 0}$

$= \frac{9}{7}$ m s^{-2}

(ii) Kadar perubahan laju/*Rate of change of speed* = 0 m s^{-2}

(*c*) $1.67 = \frac{v - 0}{45 - 30}$

$\therefore v = 25.05$ m s^{-1}

(*d*) Jarak dilalui oleh kereta *A*/*Distance travelled by car A*

$= \frac{1}{2}(28)(36) + (45 - 28)(36)$

= 1 116 m

Jarak dilalui oleh kereta *B*/*Distance travelled by car B*

$= \frac{1}{2}(30)(25.05 + 48) + \frac{1}{2}(45 - 30)(25.05)$

= 1 283.63 m

Perbezaan antara jumlah jarak yang dilalui oleh kereta *A* dan kereta *B*
Difference between distance travelled by car A and car B
= 1 283.63 m – 1 116 m
= 167.63 m

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