ANSWERS

CHAPTER 1 Patterns and Sequences

1.1 Patterns

1 (a) 

(b) 

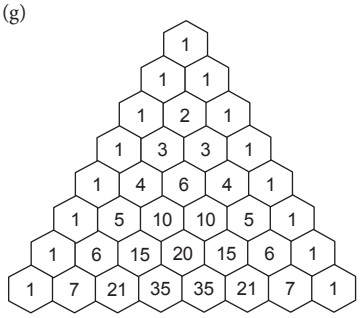
(c) 22, 24

(d) 31, 33

(e) 19, 31

(f) 25, 36

(g)



1.2 Sequences

1 (a) Add 4 to each number to obtain the next number.

(b) Add increasing integers, starting with 2, to each number to obtain the next number.

(c) Add increasing odd numbers, starting with 3, to each number to obtain the next number.

2 (a) 14, 17, 20

(b) 18, 36, 72, 144, 288

3 (a) –1, –5

(b) 48, 60

(c) 81, 243

(d) 17, 22

(e) 21, 31

4 (a) 5, 11, 35

(b) 243, 3

(c) 11, 18

(d) 20, 47

(e) 8, 0

1.3 Patterns and Sequences

1 (a) $14, 18, 6 + 2n$

(b) $1, 3, 5, 7, 2n - 1$

(c) $8, 12, 16, 20, 4n + 4$

(d) $5, 8, 11, 14, 3n + 2, 62$

2 (a) 15

(b) 66

KBAT CORNER

1 (a) 4 tables and 12 chairs

(b) $2n + 4$

(c) 9 tables

PISA/TIMSS CORNER

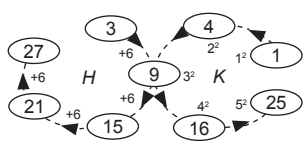
1 32 matchsticks

2 (a) 3, 6

(b) 36 small squares

PT3 PRACTICE

1 (a)

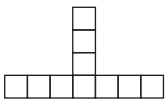


(b) 81

(c) (i) $6n - 3$

(ii) 177

2 (a)



(b) Number of cards in Shape N $= 3N - 2$

(c) (i) 148

(ii) Shape 100

3 (a) $\frac{4}{5}, \frac{5}{6}$

(b) (i) 100, 101

(ii) 46, 46

(c) (i) $\frac{n}{n+1}$

(ii) Every term is a fraction with the term number, n, as the numerator. The denominator is 1 greater than the numerator, or $n + 1$.

Therefore, the nth term is $\frac{n}{n+1}$.

CHAPTER 2 Factorisation and Algebraic Fractions

2.1 Expansion

1 (a) $15 + 3n$

(b) $pq - p^2$

(c) $-12 - 4x$

(d) $-5h + 5$

(e) $-3k + k^2$

(f) $x - 4y$

(g) $3u + 6v$

(h) $-14m^2 + 21m$

2 (a) $mn + 3m + 8n + 24$

(b) $p^2 - 10p + 21$

(c) $3x^2 - xy - 2y^2$

(d) $30a^2 - 3a - 6$

(e) $12h - 6h^2 + 6k - 3hk$

(f) $n^2 - 16n + 64$

(g) $9k^2 + 24k + 16$

(h) $4x^2 - 9$

3 (a) $n^2 + 6n + 9$

(b) $36 + 12k + k^2$

(c) $x^2 - 8x + 16$

(d) $25y^2 + 10y + 1$

(e) $4x^2 - 28x + 49$

4 (a) $h^2 - 64$

(b) $y^2 - 36$

(c) $9 - k^2$

(d) $9h^2 - 16$

(e) $16x^2 - 49y^2$

5 (a) $15x - 5$

(b) $5d - 13e$

(c) $m^2 + 3mn - 4n^2$

(d) $-8 - p^2$

(e) $x^2 + 2x - 19$

(f) $16h^2 - 3hk$

(g) $3x^2 + 9x - 10$

6 (a) $9x - 1$

(b) $x^2 + 8x + 12$

(c) $p^2 + 4p$

2.2 Factorisation

1 (a) $1, 2, 4, 8, x, 2x, 4x, 8x$

(b) $1, 2, 3, 5, 15, m, 3m, 5m, 15m$

(c) $1, 5, x, 5x, y, 5y, xy, 5xy$

(d) $1, 2, 4, p, 2p, 4p, p^2, 2p^2, 4p^2$

(e) $1, h, k, h^2, hk, h^2k$

2 (a) $4x$

(b) $9y$

(c) $2n$

(d) $6p$

(e) $4mn$

3 (a) $4(3 + m)$

(b) $6(3 - y)$

(c) $x(x - 7)$

(d) $4h(5h + k)$

(e) $2pq(3 + 2p^2)$

4 (a) $(m + 3n)(m - 3n)$

(b) $(5x + y)(5x - y)$

(c) $(4k + 1)(4k - 1)$

(d) $(2a + 3b)(2a - 3b)$

(e) $(mn + 9)(mn - 9)$

5 (a) $(m + n)(a + x)$

(b) $(a - m)(2 + x)$

(c) $(2 + y)(x + 3)$

(d) $(5 - b)(a + 1)$

(e) $(p + 3a)(a + 2)$

6 (a) $(x + 3)^2$

(b) $(m - 2)^2$

(c) $(2x + y)^2$

(d) $(3a - 4)^2$

(e) $(5x + 2y)^2$

7 (a) $(x + 2)(x + 7)$

(b) $(m - 1)(m + 4)$

(c) $(v + 3)(2v + 5)$

(d) $(n + 2)(3n - 7)$

(e) $(2x - 1)(3x + 5)$

8 (a) $2m + 1$

(b) $\frac{3x}{5y}$

(c) $x + 3$

(d) $\frac{1}{3}$

(e) $\frac{3}{4}$

(f) $h - 3$

(g) $\frac{2}{x+4}$

(h) $\frac{2 + 3m}{2}$

2.3 Algebraic Expressions and the Basic Operations of Arithmetic

1 (a) $\frac{5x}{12}$

(b) $\frac{7r}{6}$

(c) $\frac{m^2 - 2m + 9}{3m}$

(d) $\frac{r - 5q}{pqr}$

(e) $\frac{2x + 1}{2}$

(f) $\frac{x + 5}{3xy}$

(g) $\frac{4a^2 + 9}{12ab}$

(h) $\frac{8 - h}{2h^2k}$

2 (a) $\frac{6}{2xy - 5x}$

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

(c) $\frac{3k}{2}$

(d) $\frac{x - 1}{2}$

(e) $\frac{m - 2}{7(m + 2)}$

3 (a) $\frac{5m}{mn - 3n}$

(b) 6

(c) $\frac{2}{uv - v^2}$

(d) $\frac{xy - y}{2}$

(e) $\frac{2}{m + n}$

4 (a) $4xy - 5x - 3y$

(b) $p^2 - p - 1$

(c) $7pq - 3p^2$

(d) $\frac{x - 5}{3}$

(e) $\frac{x + 5}{x + 2}$

(f) $\frac{2h}{h + k}$

(g) $\frac{8x - 5y}{(x + y)(x - y)}$

(h) $\frac{3d - 4}{d - 3}$

KBAT CORNER

1 (a) $(1 + b^2)(1 - a^2)$

(b) $(ax + b)(bx + a)$

(c) $4x(2x + 1)(2x - 1)$

2 $x^2 + 1$

PISA/TIMSS CORNER

1 E

2 $\frac{5k}{3}$

3 $2x^2 + 6x$

PT3 PRACTICE

1 (a) $2xy, 5x^2, x^2y$

(b) (i) a. $6p - 3pq$

b. $5d^2 - 13d - 6$

(ii) $(2x + 5)(x + 3)$

ANSWERS

(c) $\frac{m-1}{4m^2}$

2 (a) (i) $3x^2$
(ii) $6a$
(iii) $2xy$
(b) (i) a. $3(p+4)$
b. $5(2-q)(2+q)$
(ii) $9c^2 - cd$
(c) $\frac{4}{3(a-2)}$

3 (a) (i) $\frac{3pq+5}{5q}$ (ii) $\frac{2x+1}{6}$
(iii) $\frac{10m}{n}$
(b) (i) a. $5p(3-q)$
b. $2(m+4)(m-4)$
(ii) $x^2 - 3$
(c) $9y$, $8y$, $4y - 6$

CHAPTER 3 Algebraic Formulae

3.1 Algebraic Formulae

1 (a) $y = x + 8$ (b) $L = \frac{1}{2}xy$
(c) $J = vt$ (d) $N = x + y$
(e) $I = \frac{V}{R}$ (f) $J = 10 + 6n$

2 (a) $x = y - 5z$ (b) $x = 2ab$
(c) $x = \frac{8d}{c}$ (d) $x = \frac{4p}{q}$
(e) $x = \frac{m-3n}{12}$

3 (a) $m = K^2 + 10K + 25$ (b) $m = 25 - n$
(c) $m = 16y^2 - 8xy + x^2$
(d) $m = \pm\sqrt{3x}$ (e) $m = \pm\sqrt{d+8}$

4 (a) $x = \frac{5}{z-y}$ (b) $x = \frac{4}{m+n}$
(c) $x = \frac{9+hk}{h}$ (d) $x = \frac{2a}{c-b}$
(e) $x = \frac{6c-5d}{6}$

5 (a) 10 (b) –3
(c) –7 (d) 50
(e) 2

6 (a) (i) 720° (ii) 5
(b) (i) $Y = 20 + 15S + 10.5L$
(Y = total examination fee)
(S = number of science subjects)
(L = number of other subjects)
(ii) 128

KBAT CORNER

1 (a) $J = 250 + 9n + 15m$
(J = total price)
(n = number of guests)
(m = number of waiters needed)
(b) 45

PISA/TIMSS CORNER

1 E **2** B
3 180

PT3 PRACTICE

1 (a) 28, 0, 18
(b) (i) $x = \frac{3x+4}{2}$
(ii) –1
(c) (i) $J = 3.6x + 4.5y$
(ii) 6 pieces cheese cupcake

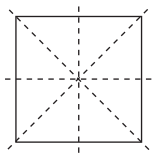
2 (a) (i) $P = 6x$ (ii) 2.15 cm
(b) (i) $q = \frac{3p-2r}{2}$ (ii) 11
(c) (i) $C = \frac{5F-160}{9}$ (ii) 215°C

CHAPTER 4 Polygons

4.1 Regular Polygons

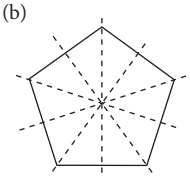
1 (a) Regular polygon
(b) Non-regular polygon
(c) Non-regular polygon
(d) Regular polygon
(e) Non-regular polygon

2 (a)



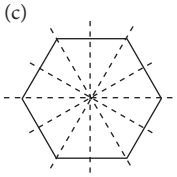
4, 4

(b)



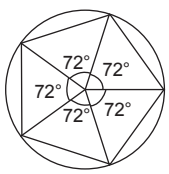
5, 5

(c)

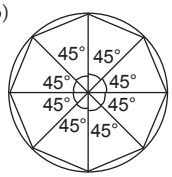


6, 6

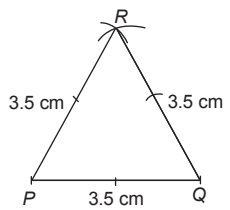
3 (a)



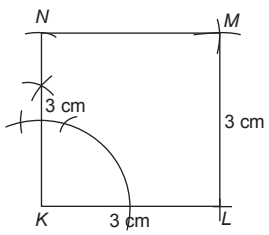
(b)



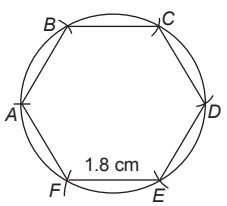
4 (a)



(b)



(c)



4.2 Interior and Exterior Angles of a Polygon

1 (a) 360° (b) 540°
(c) 720° (d) 900°
(e) 1 080°

2 (a) 360° (b) 360°
(c) 360°

3 (a) 90° (b) 108°
(c) 135° (d) 144°
(e) 150°

4 (a) 90° (b) 72°
(c) 60° (d) 45°
(e) 24°

5 (a) 4 (b) 20
(c) 15 (d) 36
(e) 5

6 (a) 4 (b) 9
(c) 10 (d) 12
(e) 15

7 (a) 105 (b) 85
(c) 320 (d) 36

8 (a) 70 (b) 15

KBAT CORNER

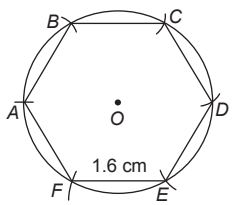
1 Not possible
2 84°

PISA/TIMSS CORNER

1 60 **2** 50

PT3 PRACTICE

1 (a) (i) a. (ii) 15
(b) (i)



(ii) 1.6
(c) $x = 60$

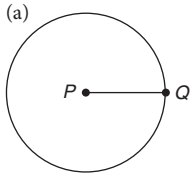
2 (a) (i) c.
(ii) $m = 216$
(b) (i) 45°
(ii) 8
(c) $x = 122$

CHAPTER 5 Circles

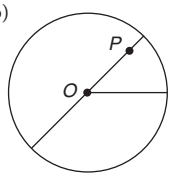
5.1 Properties of a Circle

1 (a) Centre
(b) Circumference
(c) Radius
(d) Diameter
(e) Arc
(f) Chord
(g) Sector
(h) Segment

2 (a)

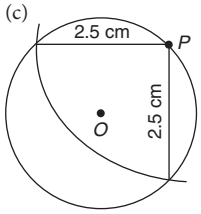


(b)

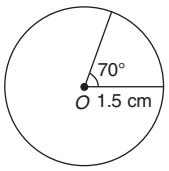


ANSWERS

(c)



(d)



5.2 Symmetrical Properties of Chords

1 (a) BD (b) AC
2 (a) 24 cm (b) 5 cm
(c) 50°
3 (a) 5 cm (b) 10 cm
4 (a) 5 cm (b) 4 cm
5 (a) 2.5 cm (b) 2 cm
6 (a) 16 cm (b) 10 cm

5.3 Circumference and Area of a Circle

1 (a) 7.855 m (b) 44 cm
(c) 62.84 cm (d) 132 mm
(e) 110 cm
2 (a) $2\frac{1}{2}$ cm (b) 10.5 cm
3 (a) 2 462 cm^2 (b) 78.55 cm^2
4 (a) 7 cm (b) 16.58 cm
5 (a) 2.2 m (b) 188.52 mm
6 (a) 72° (b) 120°
7 (a) 105 mm (b) 14 cm
8 (a) 462 cm^2 (b) 1 848 m^2
9 (a) 140° (b) 336°
10 (a) 9 m (b) 3.5 cm
11 (a) $35\frac{1}{3}$ cm (b) $47\frac{1}{3}$ cm
(c) 13.86 cm^2 (d) 224 cm^2

KBAT CORNER

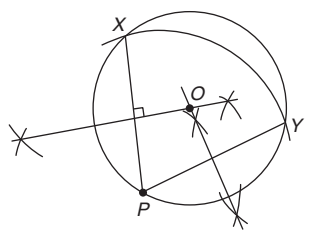
1 5.6 cm
2 The amount bugeted is insufficient.

PISA/TIMSS CORNER

1 (a) Cookie P has a larger area. Cookie P resembles a circle more closely while cookie Q is a circle with parts of it around the edge removed.
(b) Place a piece of string along the entire edge of the cookie, then measure the length of the string used.
2 B

PT3 PRACTICE

1 (a) P: Circumference, Q: Diameter, R: Chord
(b) (i) 9π cm (ii) 814.2 cm^2
(c) 231 cm^2
2 (a) (i) Q (ii) 462 cm^2
(b) (i) & (ii)

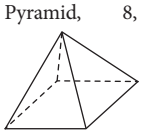


(iii) 1.8 cm
(c) 122 m

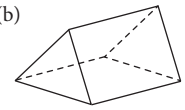
CHAPTER 6 Three-dimensional Geometric Shapes

6.1 Geometric Properties of Three-dimensional Shapes

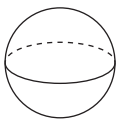
1 (a) Prism, 12, 6, 0, 8
(b) Cylinder, 2, 2, 1, 0
(c) Cone, 1, 1, 1, 1
(d) Sphere, 0, 0, 1, 0
(e) Pyramid, 8, 5, 0, 5
2 (a)



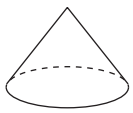
(b)



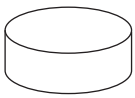
(c)



(d)

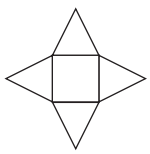


(e)

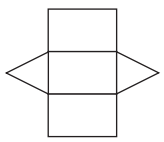


6.2 Nets of Three-dimensional Shapes

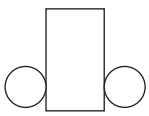
1 (a)



(b)



(c)



2 (a) Cuboid (b) Cylinder
(c) Cone (d) Pyramid
(e) Prism

6.3 Surface Area of a Three-dimensional Shape

1 (a) 184 cm^2 (b) 572 cm^2
(c) 484 cm^2 (d) 160 cm^2
(e) 55.44 m^2
2 (a) $x = 7$ (b) 12 cm
(c) 5 cm
3 (a) 2 436 cm^2 (b) 1 122 cm^2
(c) 297 cm^2

6.4 Volume of A Three-dimensional Shape

1 (a) 360 cm^3 (b) 390 cm^3
(c) 720 cm^3
2 (a) 770 cm^3 (b) 1 800 cm^3
3 (a) $116\frac{2}{3}$ cm^3 (b) 171 cm^3
4 (a) 616 cm^3 (b) 280 cm^3
5 (a) $1\,437\frac{1}{3}$ cm^3 (b) 38.808 m^3
6 (a) 115 cm^2 (b) 90 cm^2
7 (a) $h = 3.5$ (b) $h = 6$
(c) $h = 10$
8 (a) $x = 5$ (b) $x = 10$
(c) $x = 9$
9 (a) $r = 3$ (b) $r = 6$
(c) $r = 7$
10 (a) 19.85 cm (b) 33.264 cm^3
(c) 360 000 litres (d) 6 cm
(e) 7 cm (f) 7 cm

KBAT CORNER

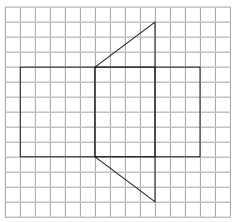
1 Comparing solid A and solid B with the original cone, there are two additional faces, that is, the circular base of solid A and the top circular face of solid B.
Therefore, the total surface area of solid A and solid B is not equal to the total surface area of the orginal cone.

PISA/TIMSS CORNER

1 C **2** 240 m^2

PT3 PRACTICE

1 (a) (i) 9
(ii) 8
(iii) 2
(b)



(c) 462 cm^2
2 (a) (i) ✓ (ii) ✗
(iii) ✓
(b) 96 cm^2 (c) 602 cm^3

CHAPTER 7 Coordinates

7.1 Distances in the Cartesian Coordinate System

1 (a) 5 units (b) 7 units
(c) 10 units (d) 10 units
(e) 6 units (f) 7 units
2 (a) 8.60 units (b) 12.73 units
(c) 5 units (d) 10 units
(e) 13 units
3 (a) 25 unit^2 (b) 117 unit^2
(c) 4 or –2

7.2 Midpoints in the Cartesian Coordinate System

1 (a) B (b) E
(c) D (d) D
2 (a) (–2, 4)
(b) (0, –2)
(c) (–1, –4)
(d) (1, 2)
(e) (1, 0)
(f) (5, 1)
(g) (–5, 1)
3 (a) (6, 0)
(b) (8, –6)
(c) (0, –6)
(d) (–8, –7)
(e) (–4, 7)
4 (a) (–1, –3)
(b) (18, 6)
(c) $k = 2$

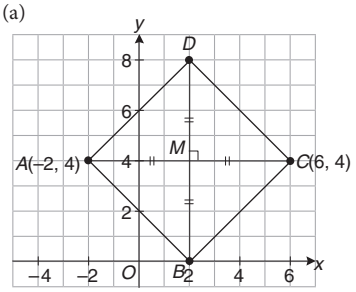
7.3 Cartesian Coordinate System

1 (a) ΔABC is an isosceles triangle.
(b) (i) (7, 5)
(ii) (9, 10)
(c) 42.425 unit^2
(d) 38.422 unit

ANSWERS

KBAT CORNER

1 (a)



(b) The diagonals of a square are equal in length and bisect one another at right angles. Therefore, we can first determine the midpoint of the diagonal *AC*, that is, the point *M*. Then, the other diagonal is the perpendicular line passing though point *M*. Since the diagonals are equal in length, we can locate the position of corner *B* and of corner *D*.

PISA/TIMSS CORNER

1 A **2** C

PT3 PRACTICE

1 (a) (i) (–6, 8) (ii) (–6, –8)
(iii) (8, –6)
(b) (i) (1, 8) (ii) 10 units
(c) (i) (2, 5) (ii) (8, 7)

2 (a) (0, –7), (0, 12), (0, 0)
(b) (i) 1 : 1, 1 : 2 (ii) *D*(3, –8)
(c) (i) Tree *K*
(ii) A lamp post can be erected between tree *K* and tree *L*. The midpoints of the other pairs of trees are located either inside the fountain area or too near the fountain.

CHAPTER 8 Graphs of Functions

8.1 Functions

1 (a) Function (b) Function
(c) Not a function

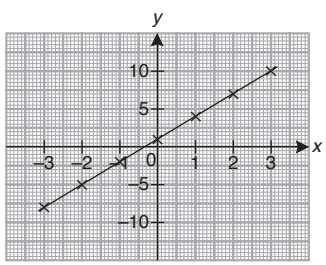
2 (a) {(–3, 1), (0, 2), (2, 1), (3, –3)}
Function
(b) {(–2, –3), (–2, 3), (1, 1), (3, –2)}
Not a function

3 (a) (i) 14 (ii) –1
(b) (i) 3 (ii) 3
(c) (i) 68 (ii) –23

8.2 Graphs of Functions

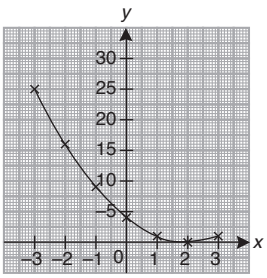
1 (a)

x	–3	–2	–1	0	1	2	3
y	–8	–5	–2	1	4	7	10



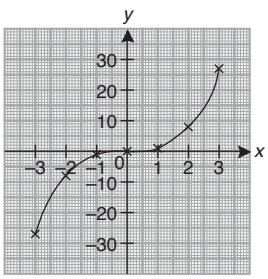
(b)

x	–3	–2	–1	0	1	2	3
y	25	16	9	4	1	0	1



(c)

x	–3	–2	–1	0	1	2	3
y	–27	–8	–1	0	1	8	27

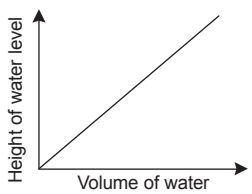


2 (a) (i) 50 (ii) 1.8°F
(b) (i) 40 m
(ii) 3 seconds after the ball is hit
(iii) 6 seconds after the ball is hit

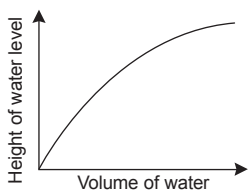
3 (a) (i) RM60 (ii) RM60
(ii) Mr Halim's estimate is correct.

KBAT CORNER

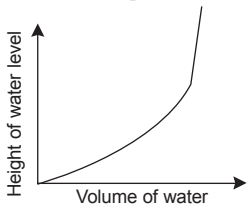
1 (a) The cross section of the beaker is the same at any height. Therefore, the water level in the beaker rises at a uniform rate. Thus, the graph of the water level against the volume of water is a straight line.



(b) The area of the cross section of the pail increases with height. Therefore, the water level in the pail rises at a decreasing rate. Thus, the graph of the water level against the volume of water is a curve.



(c) The cross section of the conical flask can be divided into two parts. First, the cross section of the flask is increasingly smaller in size, but near the mouth of the flask, the cross section is uniform. Therefore, the water level in the flask will first rise with increasing rate. Near the mouth of the flask, the water level rises at a higher but uniform rate. So, the graph of the water level against the volume of water consists of a curved part and a linear part.

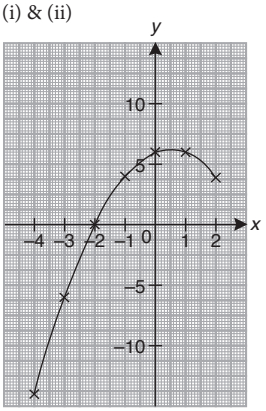


PISA/TIMSS CORNER

1 A **2** B

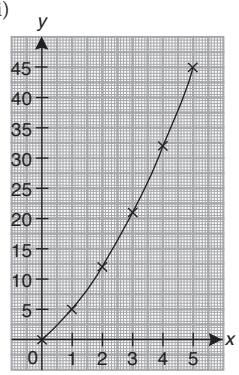
PT3 PRACTICE

1 (a) (i) ✓ (ii) ✓
(iii) ✗
(b) (i) & (ii)

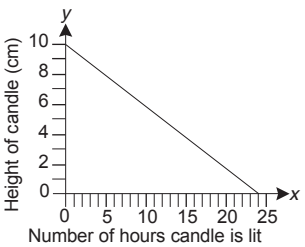


(c) 40 m above the ground

2 (a) (i) $y = 5 - x$
(ii) $y = x^2 + 5$
(iii) $y = 5 - x^2$
(b) (i) 32
(ii)



(c)



ANSWERS

CHAPTER 9 Speed and Acceleration

9.1 Speed

1 (a) ✗ (b) ✓
(c) ✓ (d) ✗
(e) ✓ (f) ✗

2 (a) 4 cm/min (b) 19.2 km/h
(c) 75 km/h

3 (a) 128 km (b) 40 s
(c) 12 minutes

4 (a) 36 km/h
(b) (i) 135 km (ii) $2\frac{1}{2}$ hours
(c) $18\frac{6}{7}$ km/h

5 (a) (i) 5 km (ii) 19.2 km/h
(b) 12.36 p.m.

9.2 Acceleration

1 (a) -5 m/s^2 (b) 450 km/h^2
(c) $-10\,800$ km/h^2

2 (a) $-1\,200$ km/h^2 (b) 15 minutes

KBAT CORNER

1 50.4 km/h

PISA/TIMSS CORNER

1 (a) 10.5 km/h (b) 8.4 km/h

PT3 PRACTICE

1 (a) (i) ✗ (ii) ✗
(iii) ✓
(b) (i) 60 km/h (ii) 280 km
(c) Ali and his family will arrive in town *B* at 1.30 p.m.

2 (a) (i) Uniform speed
(ii) Uniform speed
(iii) Non-uniform speed
(b) (i) c. (✓)
(ii) 1 000, 60, 60, 54
(c) 54 km/h

CHAPTER 10 Gradient of a Straight Line

10.1 Gradient

1 (a) $1\frac{1}{4}$ (b) 0
(c) $-\frac{1}{3}$ (d) Undefined
(e) -3

2 (a) $\frac{4}{9}$ (b) 4

3 (a) $\frac{3}{4}$ (b) $\frac{2}{3}$

4 (a) 4 (b) -10

5 (a) No
(b) Gradient of $AB = \frac{2}{5}$
Gradient of $BC = -\frac{5}{2}$
Gradient of $CD = \frac{2}{5}$
Gradient of $AD = -\frac{5}{2}$
Opposite sides of the square *ABCD* have the same gradient.
(c) 12 cm
(d) 1 045 m from the initial position

KBAT CORNER

1 The required straight line must intersect the *y*-axis at -3. Only graph *A* and graph *C* fulfil this condition. The gradient of the straight line is positive. So, the straight line will slant upwards from the left to the right. Therefore, graph *C* may be the required straight line.

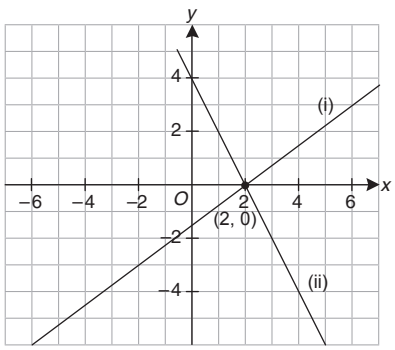
PISA/TIMSS CORNER

1 C
2 Positive

PT3 PRACTICE

1 (a) (i) $\frac{1}{2}$
(ii) $-\frac{1}{2}$
(iii) -2
(b) (i) Negative
(ii) -4
(c) (i) 19

2 (a) *Q, P, R*
(b) (i) & (ii)



(c) Rizal's statement is true.

CHAPTER 11 Isometric Transformations

11.1 Transformations

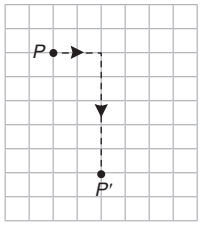
1 (a) *Q,B, D, SP*
(b) *R, Q, B, A, RP*
(c) *Q, S, B, D, QP*

2 (a) Congruent – The object and the image have the same shape and size although their orientations are not the same.
(b) Not congruent – The object and the image have the same shape but are different in size.
(c) Congruent – The object and the image have the same shape and size although their orientations are not the same.

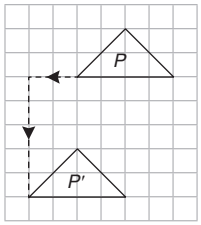
11.2 Translations

1 (a) 8 units to the right and 1 unit downwards; $\begin{pmatrix} 8 \\ -1 \end{pmatrix}$
(b) 7 units to the left; $\begin{pmatrix} -7 \\ 0 \end{pmatrix}$

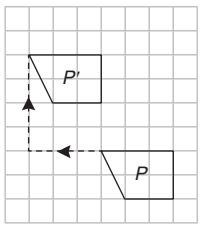
2 (a)



(b)



(c)



3 (a) (5, −1) (b) (−7, 11)
(c) (6, −1) (d) (3, −4)
(e) (−1, −3)

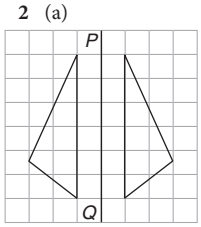
4 (a) (−3, 6) (b) (−4, 10)
(c) (4, −11) (d) (13, −3)
(e) (−2, 17)

5 (a) $s = -5$, $t = 2$ (b) (2, 8)
(c) $p = -4$

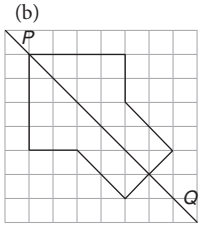
11.3 Reflections

1 (a) Reflection in the line *AE*
(b) Reflection in the line *BE*
(c) Reflection in the line *AE*

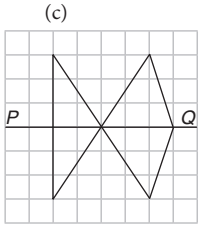
2 (a)



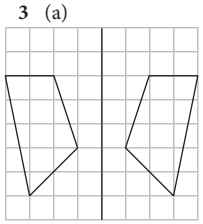
(b)



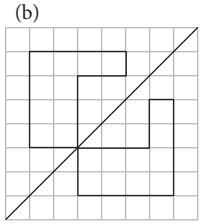
(c)



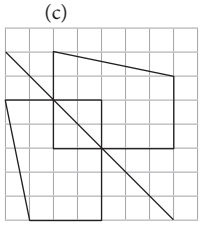
3 (a)



(b)



(c)



ANSWERS

4 (a) (−2, 4), (4, 2)
(b) (3, −1), (−3, 1), (1, 3)
(c) (3, 3), (−3, −3), (−3, 3)
(d) (−3, 4), (3, −4), (−4, −3)
(e) (−4, −2), (4, 2), (2, −4)

5 (a) (i) x-axis (ii) (−4, 3)
(b) (0, 1)

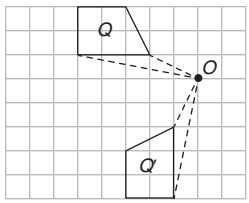
11.4 Rotations

1 (a) 90°; Anticlockwise;
Anticlockwise rotation of 90° about the point O
(b) 180°; Clockwise or anticlockwise;
Clockwise rotation of 180° about the point O
(c) 90°; Clockwise;
Clockwise rotation of 90° about the point O

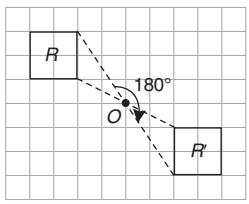
2 (a) $P'(5, 7)$, $Q'(2, 6)$ (b) $P'(3, -1)$, $Q'(6, 6)$

3 (a) $P(-5, -2)$, $Q(-4, 4)$ (b) $P(3, -1)$, $Q(3, 7)$

4 (a)



(b)



5 (a) Rotation of 180° about the origin
(b) Clockwise rotation of 90° about the point (2, 2)

6 (a) (i) Clockwise rotation of 90° about the point (1, 0)
(ii) (3, −4)
(b) (i) Clockwise rotation of 120° about the point O
(ii) Point F
(c) 110°

11.5 Translations, Reflections and Rotations as Isometries

1 (a) Yes (b) No
(c) Yes

2 (a) Not congruent (b) Congruent
(c) Not congruent

3 (a) (i) 6 cm (ii) 69°
(b) (i) 45° (ii) 45°

11.6 Rotational Symmetry

1 (a) ✓ (b) ✓
(c) ✗ (d) ✓

2 (a) 5 (b) 2
(c) 4 (d) 5
(e) 4 (f) 3
(g) 6

KBAT CORNER

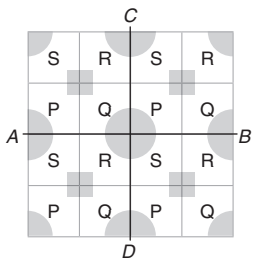
1 (a) Starting with the top-left triangle, it is reflected aout its vertical side. Next, the two triangles (the object and its image) are reflected in the horizontal line passing through the bottom corners of the two triangles.
(b) 12 cm^2

2 (a) $\Delta P \rightarrow \Delta B$ under a reflection about the vertical diameter of the circle.
$\Delta P \rightarrow \Delta B$ under a clockwise rotation of 135° about the centre of the circle.
(b) Triangle C

PISA/TIMSS CORNER

1 B

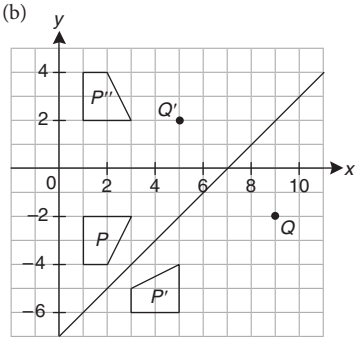
2



PT3 PRACTICE

1 (a) (i) ΔE (ii) ΔD
(iii) ΔC

(b)



(c) a. (i) R (ii) $\angle PRS/QRP$
b. 54 cm

2 (a) (i), (ii) & (iv) ✓
(b) (i) Angle of rotation: 90°
Direction of rotation: Anticlockwise
(ii) (1, 1)
(c) Clockwise rotation of 105° about the point S

CHAPTER 12 Measures of Central Tendency

12.1 Measures of Central Tendency

1 (a) The number 18 occurs three times, the number 12 occurs twice, and the other numbers each occurs once. So, the mode is 18.
(b) The number 2.5 occurs three times, the number 3.0 occurs twice, and the other numbers each occurs once. So, the mode is 2.5.
(c) RM5 occurs twice while each of the other sums of money occurs once only. So, the mode is RM5.
(d) Each mass occurs only once in the set of data. So, this set of data does not have a mode.
(e) The numbers 3.2 and 5.4 each occurs twice, and the other numbers each occurs once. So, this set of data has two modes, that is, 3.2 and 5.4.

2 (a) 15 (b) 69.2
(c) 4.3 (d) 7 cm
(e) 2.0 g

3 (a) 22 (b) 0.8
(c) 62 (d) 8 m
(e) 2.9 g

4 (a) The value of the mode, mean and median each decreases by 20.
(b) The value of the mode, mean and median are each multiplied by 100.
(c) The value of the mode, mean and median are each halved.

5 (a) (i) 15
(ii) 4
(iii) 20%
(b) (i) 32 (ii) 17
(c) (i) 40 (ii) 15

6 (a) (i) 11 – 15 minutes
(ii) 10.25 minutes
(b) (i) 160 cm – 164 cm
(ii) 157.83 cm

7 (a) The mean can be used to represent this set of data. The calculation of the mean involves every data value in the set. Therefore, the mean will represent the set accurately.
(b) This set of data includes an extreme value, that is, 809 g. The value of the mean will take this extraordinary value into account. Therefore, the mean is not a suitable measure of central tendency in this case. The median is more appropriate.
(c) This set of data consists of three categories of data, and we will probably want to know which category is the most popular, whether it is the bus, car or bicycle. Therefore, the mode can be used.

8 (a) (i) 2 points
(ii) 1.55 points
(iii) 2 points
(b) (i) 41 – 45 seconds
(ii) 41 seconds
(c) (i) Badminton
(ii) 5 students
(d) (i) 8
(ii) 8.5 cars
(e) (i) 65
(ii) 64.2
(iii) 65
(f) (i) 3.4 m
(ii) 3.24 m
(iii) 3 m

KBAT CORNER

1 (a) Mode = 60 minutes, Mean = 58.5 minutes, Median = 60 minutes, Range = 25 minutes
(b) Mode = 70 minutes, Mean = 54.5 minutes, Median = 57.5 minutes, Range = 45 minutes
(c) Faizal is more consistent. The smaller range indicates that for Faizal, the times spent exercising are more consistent when compared to Jamil's times.
(d) Both Jamil's mode and median for the time spent exercising are higher than that of Faizal. Jamil's mean time is lower as a result of a few unusually short sessions.
On the whole, the higher mode and median shows that Jamil exercise more.

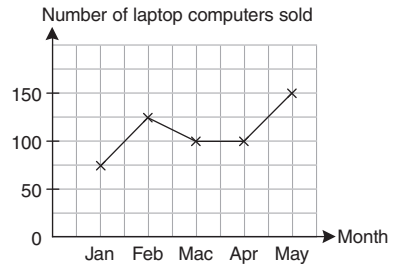
PISA/TIMSS CORNER

1 Year 2006

ANSWERS

PT3 PRACTICE

1 (a) (i)



(ii) 100 laptop computers

(b) (i)

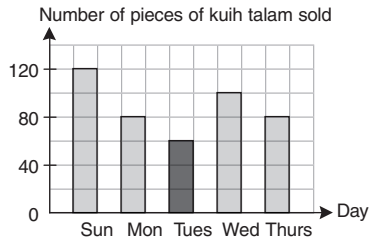
Score	Frequency
0	9
1	11
2	6
3	4

(ii) 1 point

(c) (i) Teen cadets

(ii) 12.5 members

2 (a) (i)



(ii) 88

(b) (i)

Marks	f	x	fx
50 – 59	2	54.5	109.0
60 – 69	7	64.5	451.5
70 –79	10	74.5	745.0
80 – 89	1	84.5	84.5
Total	20		1 390

(ii) 69.5 marks

(c) 1.75 books

CHAPTER 13 Simple Probability

13.1 Experimental Probability

1 (a) $\frac{17}{40}$ (b) $\frac{3}{50}$

(c) 0

13.2 Theorectical Probability

1 (a) $S = \{1, 2, 3, 4, 5, 6\}$
$B = \{5, 6\}$

(b) With R representing the red balls and B representing the blue balls,
$S = \{R1, R2, B1, B2, B3\}$
$C = \{R1, R2\}$

(c) $S = \{ P, E, R, I, S, T, I, W, A\}$
$D = \{E, I, I, A\}$

(d) $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$E = \{2, 3, 7\}$

2 (a) (i) With A representing apples and O representing oranges:
{AA, AO, OA, OO}

(ii) {AA}

(iii) $\frac{1}{4}$

(b) (i) With B representing the blue buttons, W the white buttons and K the black buttons:
{BB, BW, BK, WB, WW, WK, KB, KW, KK}

(ii) {BW, BK, WB, WK, KB, KW}

(iii) $\frac{2}{3}$

(c) (i) With H representing 'heads' and T 'tails':
{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

(ii) {HHH, HHT, HTH, THH}

(iii) $\frac{1}{2}$

3 (a) $\frac{2}{5}$ (b) $\frac{1}{3}$

(c) $\frac{1}{4}$ (d) $\frac{3}{8}$

(e) $\frac{7}{10}$

13.3 Probability of a Complementary Event

1 (a) B' = {not choosing a vowel}
= {M, T, M, T, K]

(b) C' = {number indivisible by 3}
= {1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20}

(c) D' = {not choosing a local fruit}
= {3 pears}

2 (a) $\frac{3}{5}$ (b) $\frac{2}{3}$

(c) $\frac{2}{5}$

13.4 Simple Probability

1 (a) (i) $\frac{25}{26}$ (ii) $\frac{21}{26}$

(b) $\frac{7}{10}$

(c) (i) $\frac{3}{4}$ (ii) $\frac{7}{12}$

(b) $\frac{19}{20}$

2 (a) $\frac{3}{8}$ (b) $\frac{1}{9}$

(c) $n = 6$ (d) 400

KBAT CORNER

1 (a) Add 3 red balls.

(b) Add 2 red balls.

PISA/TIMSS CORNER

1 D **2** D

3 C

PT3 PRACTICE

1 (a) 0.8, 15%, $\frac{3}{8}$ ✓

(b) (i) $\frac{3}{8}$ (ii) $\frac{7}{8}$

(c) $x = 4$

2 (a) (i) Very likely

(ii) Not likely

(iii) Impossible

(b) (i) Bag A

(ii) $\frac{2}{5}$

(c) $x = 15$

Pre-PT3 Assessment

1 (a) (i) Add 8 to the preceding term.

(ii) Multiply the preceding term by 3.

(iii) Divide the preceding term by 2.

(b) (i) Total cost = $23.55x + 160.40y$

(ii) Total cost = $23.55x + 16.40y$
$= 23.55(15) + 16.40(9)$
$= \text{RM}500.85$

(c) (i) $p = 405 \times 3 = 1\,215$

(ii) 3, 7, 11, m, …
$m = 11 + 4 = 15$
8, 16, 32, n, …
$n = 32 \times 2 = 64$

2 (a) (i) $9n - 13n^2 = n(9 - 13n)$

(ii) $9(x + 2)^2 - 25$
$= [3(x + 2) + 5][3(x + 2) - 5]$
$= [3x + 6 + 5][\ 3x + 6 - 5]$
$= [3x + 11][\ 3x + 1]$

(b) (i) $\frac{4x - y}{3m} = \frac{2k}{4x + y}$

$(4x - y)(4x + y) = 6km$

$16x^2 - y^2 = 6km$

$16x^2 = 6km + y^2$

$\sqrt{x^2} = \sqrt{\frac{6km + y^2}{16}}$

$x = \frac{\sqrt{6km + y^2}}{4}$

(ii) $x = \frac{\sqrt{6(4)(12) + 36}}{4}$

$= \frac{\sqrt{324}}{4}$

$= \frac{18}{4}$

$= 4.5$

(c) $\frac{12m}{4m^2 - 49} \div \frac{36p}{2m^2 + 7m}$

$= \frac{\overset{1}{\cancel{12}m}}{(\cancel{2m + 7})(2m - 7)} \times \frac{m(\cancel{2m + 7})}{\underset{3}{\cancel{36}p}}$

$= \frac{m^2}{p(2m - 7)}$

3 (a) (i) $x + 85° + 100° + 135° = 360°$

$x + 320° = 360°$

$x = 40°$

(ii) $n = \frac{360}{40} = 9$

(b) (i) Length of arc MNP

$= \frac{\theta}{360°} \times 2\pi r$

$= \frac{126°}{360°} \times 2 \times \frac{22}{7} \times 7 \text{ cm}$

$= 15.4 \text{ cm}$

(ii) Area of shaded region

$= \frac{90}{360}\pi r^2 - \frac{1}{2}bh$

$= \left(\frac{90}{360} \times \frac{22}{7} \times 14^2\right) - \left(\frac{1}{2} \times 14 \times 14\right)$

$= 154 - 98$

$= 56 \text{ cm}^2$

ANSWERS

(c) (I) A regular polygon

$n = \frac{360}{30} = 12$

(II) Not a regular polygon

$n = \frac{360}{42} = 8.57$

(III) A regular polygon

$n = \frac{360}{60} = 6$

4 (a) (i) $80° + x = 140°$

$x = 60°$

(ii) $55° + y = 180°$

$y = 180° - 55°$

$= 125°$

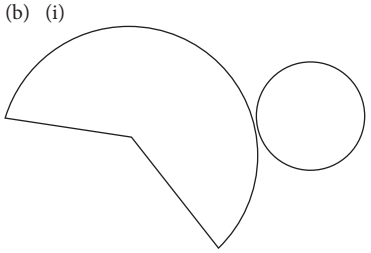
(iii) $42° + 42° + \theta = 180°$

$\theta = 96°$

$z + 48° = 180°$

$z = 132°$

(b) (i)



(ii) Total surface area = 312 cm^2

$2\left[\frac{1}{2}(7 + 2)\,x\right] + 6x + 12 + 42 + 78 = 312$

$9x + 6x + 132 = 312$

$15x = 180$

$x = 12$

(c) Total surface area = 1 144

$2\pi r(r + h) = 1\,144$

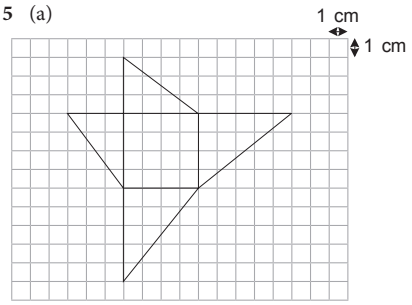
$2 \times \frac{22}{7} \times 7(7 + h) = 1\,144$

$44\,(7 + h) = 1\,144$

$7 + h = 26$

$h = 19$

5 (a)



(b) (i) $PQ = \sqrt{(-6 - 8)^2 + (-2 + 4)^2}$

$= \sqrt{196 + 4}$

$= \sqrt{200}$

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

$= \sqrt{36 + 64}$

$= 10$

$QR = \sqrt{(-6 - 2)^2 + (-2 - 4)^2}$

$= \sqrt{64 + 36}$

$= 10$

(ii) $PQ^2 = \left(\sqrt{200}\right)^2 = 200$

$PR^2 + QR^2 = 10^2 + 10^2 = 200$

$PQ^2 = PR^2 + QR^2$

So, PQR is a right-angled triangle.

(c) (i) $K(-3, 17)$

(ii) $L(h, k)$

$(-3, 17)$ = Midpoint of JL

$(-3, 17) = \left(\frac{-7 + h}{2}, \frac{17 + k}{2}\right)$

$\frac{-7 + h}{2} = -3$

$-7 + h = -6$

$h = 1$

$\frac{17 + k}{2} = 17$

$17 + k = 34$

$k = 17$

$L = (1, 17)$

6 (a) (i) x

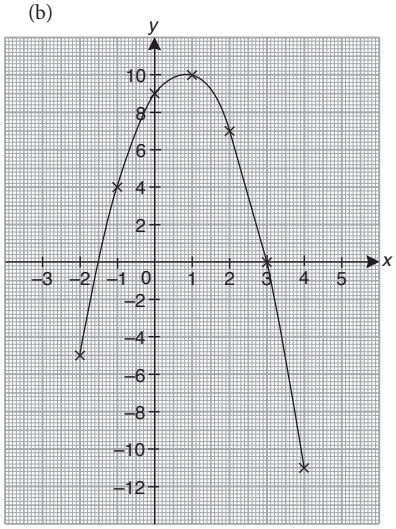
(ii) $y = 2x^2 - 5x + 1$

$= 2(-3)^2 - 5(-3) + 1$

$= 18 + 15 + 1$

$= 34$

(b)



(c) $y = x^2 + 2x - 15$

$y = 0,\ x^2 + 2x - 15 = 0$

$(x - 3)(x + 5) = 0$

$x - 3 = 0$

$x = 3$

$x + 5 = 0$

$x = -5$

$p + q = 3 + (-5)$

$= 2$

7 (a) (i) Non-uniform speed

(ii) Uniform speed

(iii) Non-uniform speed

(b) (i) 24 m/s $= \frac{24\text{ m}}{1\text{ s}}$

$= \frac{24 \div 1\,000\text{ km}}{1 \div 3\,600\text{ h}}$

$= 86.4$ km/h

(ii) a. Time taken

$= \frac{60}{80}$ h

$= 0.75$ h

$= 45$ min

b. Time taken

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

$= 1\frac{3}{4}$ h

Distance $QR = 64 \times 1\frac{3}{4}$

$= 112$ km

(iii) Acceleration $= \frac{36 - 48}{5}$

$= -2.4$ m s^2

Its speed decreases 2.4 m/s in one second.

8 (a) (i) Gradient $= -\frac{-5}{8} = \frac{5}{8}$

(ii) Gradient $= -\frac{4}{5}$

$\frac{2k - 10}{2 + k} = -\frac{4}{5}$

$5(2k - 10) = -4(2 + k)$

$10k - 50 = -8 - 4k$

$14k = 42$

$k = 3$

(b) (i) Clockwise (ii) (2, 0)

(iii) Reflection in the x-axis

(c) (i) A translation of $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$

(ii) Congruent

9 (a) (i) 6 (ii) 4

(iii) 2

(b)

Montly savings (RM)	Frequency	Midpoint	Frequency × Midpoint
40 – 49	5	44.5	222.5
50 – 59	10	54.5	545
60 – 69	13	64.5	838.5
70 – 79	7	74.5	521.5
80 – 89	3	84.5	253.5
90 – 99	2	94.5	189
	40		2 570

(i) 60 – 69

(ii) Mean $= \frac{2\,570}{40} =$ RM64.25

(c) (i) 6 kg

(ii) Median $= \frac{5 + 6}{2} = 5.5$ kg

(iii) Mean $= \frac{3(2) + 4(3) + 5(5) + 6(7) + 7(3)}{2 + 3 + 5 + 7 + 3}$

$= \frac{106}{20} = 5.3$ kg

10 (a) (i) $x + 65° + 100° + 85° = 360°$

$x = 360° - 250°$

$= 110°$

(ii) A rotation of 180° about the centre O.

A reflection in the point O.

(b) (i) $S = \{(1, 2), (2, 1), (1, 3), (3, 1), (1, 5), (5, 1), (2, 3), (3, 2), (2, 5), (5, 2), (3, 5), (5, 3)\}$

(ii) a. $\{(1, 5), (5, 1)\}$

Probability $= \frac{2}{12} = \frac{1}{6}$

b. $\{(2, 3), (3, 2), (2, 5), (5, 2), (3, 5), (5, 3)\}$

Probability $= \frac{2}{12} = \frac{1}{2}$

(c) (i) $P = \{6, 7, 8, 9, \ldots 23\}$

$n(P) = 18$

Factors of 30 $= \{6, 10, 15\}$

Probability $= \frac{3}{18} = \frac{1}{6}$

(ii) Multiples of 4 $= \{8, 12, 16, 20\}$

P(not a multiple of 4) $= 1 - \frac{4}{18} = \frac{7}{9}$

ANSWERS