

# Answers

## Chapter 1 Using the distributive law in an expression with a numerical common factor to produce a sum of terms

### Exercise 1A Using the distributive law

- 1 a  $3k$       b  $24x$       c  $35fg$       d  $16d$   
e  $-30c$       f  $63hj$       g  $-32x^2$       h  $6n$   
i  $-30abc$       j  $14dm$       k  $27x^2$       l  $48dkn$   
m  $6x$       n  $\frac{9y}{2}$       o  $\frac{9x}{y}$       p  $\frac{3a}{4b}$
- 2 a  $12 + 3m$       b  $18 + 6p$       c  $16 - 4y$   
d  $18 + 21k$       e  $12 - 20f$       f  $8 - 46w$   
g  $7g + 7h$       h  $8k + 16m$       i  $12d - 6n$   
j  $t^2 + 5t$       k  $10x - 35$       l  $63x + 42$   
m  $65 - 52y$       n  $48x - 12y$       o  $22x + 33z$   
p  $18x - 45y + 54$
- 3  $y + y = 2y$   
 $3y + 6 = 3(y + 2)$   
 $5y - 10 = 5(y - 2)$
- 4 a  $-6g + 15$       b  $-30d - 35$   
c  $-x + 2y$       d  $14x + 21y - 35$   
e  $30y - 40a - 70c$       f  $-8b - 20a + 36m$   
g  $-15c + 18g + 12k$       h  $-2x - 5y$   
i  $-4x + 12y + 8 - 28z$
- 5  $9(2x - 3) = (18x - 27) \text{ cm}^2$
- 6  $7(3y + 4) = (21y + 28) \text{ cm}^2$
- 7 She has calculated  $7 \times 4$  incorrectly (27 instead of 28) and placed a plus sign (+) instead of a minus sign (-) in front of  $20v$ ; correct answer is:  $8x - 28y - 20v$ .
- 8 a  $(x + 5)$  years old  
b  $3(x + 5) = (3x + 15)$  years old
- 9 a  $\pounds(y - 7)$       b  $\pounds 4(y - 7) = \pounds(4y - 28)$

## Chapter 2 Factorising a sum of terms with a numerical common factor

### Exercise 2A Factorising

- 1 a 1, 2, 3, 4, 6, 8, 12, 24  
b 1, 5, 7, 35  
c 1, 3, 7  
d 1, 2, 5, 10, 25, 50  
e 1, 2, 3, 6, 9, 18, 27, 54  
f 1, 2, 4, 8, 16, 32, 64
- 2 a 2      b 4      c 6  
d 14      e 12      f 4
- 3 a  $3(3m + 4t)$       b  $3(3t + 2p)$       c  $4(m + 3k)$   
d  $2(2r + 3t)$       e  $4(w - 2t)$       f  $2(5p - 3k)$   
g  $2(6h - 5k)$       h  $6(4x - 3)$       i  $9(3y - 8)$   
j  $12(2a + 5h)$       k  $8(4m + 5n)$       l  $25(6c + 7d)$
- 4 a  $2(2x + y + 3z)$       b  $5(4q + 3n - 9r)$   
c  $6(2a - 6b - 9c)$       d  $7(5k + 3j + 2)$   
e  $17(v - 3w + 1)$       f  $3(2x + 7y - 6z + 9)$
- 5 a He did not divide by HCF (4 is HCF, not 2); correct answer is:  $4(h + 3)$ .  
b Second term inside bracket is incorrect (he did not divide by common factor); correct answer is:  $2(2x - 3y)$ .  
c He wrote a plus (+) sign inside the brackets instead of minus (-), and he did not include  $y$  in the second term inside the brackets; correct answer is:  $5(2x - 5y)$ .  
d He wrote a plus (+) sign inside the brackets instead of minus (-); correct answer is:  $3(2x - y + 3)$ .
- 6  $(3t - 2) \text{ cm}$

### Chapter 3 Simplifying an expression which has more than one variable

#### Exercise 3A Simplifying expressions with more than one variable

- 1 a  $9t$       b  $7m$       c  $7y$       d  $10d$   
 e  $2e$       f  $3g$       g  $2p$       h  $4t$   
 i  $5t^2$       j  $3y^2$       k  $7ab$       l  $a^2d$

- 2 a  $7x + 3y$       b  $12a + 5b$       c  $5c + 7d$   
 d  $6e + 6f$       e  $3g + h$       f  $9i + 2j$   
 g  $15x + x^2$       h  $3m$       i  $4k - 2$   
 j  $-6p + 2r$       k  $18s - 10t - v$       l  $-x - 4y - 10$

- 3 a She added  $x$  instead of subtracting;  
 correct answer is:  $3x + 9y$ .  
 b She treated  $x$  and  $x^2$  as the same variable;  
 correct answer is:  $2x + 5x^2$ .  
 c She added the  $8b$  instead of subtracting it;  
 correct answer is:  $2a - 10b$ .  
 d She forgot to put a negative sign in front  
 of each term; correct answer is:  $-4m - k$ .

- 4 a  $6x + 22$       b  $12y - 24$       c  $10k + 5$   
 d  $15h - 66$       e  $17m - 24n$       f  $36 - 6a$

- 5 a  $7x + 14$       b  $10y - 15$       c  $3n + 18$   
 d  $10b - 8$       e  $8 - 8g$       f  $19 - d$

- 6 a  $18 + 7t$       b  $22 + 24k$       c  $13 + 32m$   
 d  $17 + 13y$       e  $28 + 12f$       f  $20 + 33g$

- 7 a  $-9 - 7h$       b  $4g - 7$       c  $-3y + 1$   
 d  $-t + 1$       e  $4k + 9$       f  $-e + 6$

8  $2(x - 3) + 2(3x + 2) = (8x - 2)$  cm

### Chapter 4 Evaluating an expression or a formula which has more than one variable

#### Exercise 4A Evaluating simple expressions with more than one variable

1 a 15      b 27      c 47

2 a 5      b 14      c 29

3 a 9      b 12      c 19

4 a 2      b -4      c -16

5 a  $\frac{1}{2}$       b  $\frac{13}{2}$       c  $\frac{53}{2}$

6 a -8      b -3      c 109.5

7 a -11      b -15      c 7

8 a 13      b 16      c 5.4

9 a 11      b -14      c -0.75

10 a 3.5      b 19.4      c 8.03

11 a 25      b 23      c -11

12 a 11      b -19      c 11

13 a 23      b -4      c 51.5

14 a 22      b 26      c  $\frac{27}{2}$

15 a 64.4      b 76      c 57.2

16 a i  $4a + 6b - 5c$       ii  $4a - 4b + c$       b 48

#### Exercise 4B Evaluating more complex expressions including those with more than one variable

1 a 17      b 28

2 a 624      b 217

3 a 51      b 36      c 19

4 a 25      b 169

5 a 16      b 21

6 a 102      b 791

7 a £155.25      b £20.25 in debit

8 £44.50

9 a 9      b 10      c 8

10 a 8      b 23      c 32

11 a 45      b 80      c 28

12 a 81      b 88      c 270

13  $80 \text{ cm}^2$

14  $7 \text{ m/s}^2$

15 a £265      b £209

16  $336 \text{ cm}^2$

## Chapter 5 Extending a straightforward number or diagrammatical pattern and determining its formula

### Exercise 5A Finding the $n$ th term of a linear sequence

1 a 12, 14, 16; + 2

b 15, 18, 21; + 3

c 32, 64, 128;  $\times 2$

d 25, 36, 49; square numbers

e 300, 30, 3;  $\div 10$

f 19, 12, 5; - 7

2 a 112, 224, 448;  $\times 2$

b 38, 45, 52; + 7

c 63, 127, 255;  $\times 2 - 1$

d 30, 25, 19; subtract 1 more each time

e 38, 51, 66; add 2 more each time

f 25, 32, 40; add 1 more each time

g 13, 15, 16; alternating + 2, + 1

h 20, 23, 26; + 3

i 26, 32, 39; add 1 more each time

j 0, -5, -11; subtract 1 more each time

k 250, 125, 62.5;  $\div 2$

l 4, 2.5, 1; - 1.5

3 a 34, 55; add previous two terms

b 23, 30; add 1 more each time

4 a  $2n + 3$       b  $8n - 5$       c  $5n + 1$

d  $6n - 3$       e  $3n + 1$       f  $7n - 4$

5 a i  $2n + 1$       ii 101

b i  $4n + 1$       ii 201

c i  $5n + 3$       ii 253

d i  $6n - 4$       ii 296

e i  $3n + 2$       ii 152

f i  $7n - 5$       ii 345

6 a i  $3n + 1$       ii 301

b i  $2n + 5$       ii 205

c i  $5n - 2$       ii 498

d i  $4n - 3$       ii 397

e i  $8n - 6$       ii 794

f i  $n + 4$       ii 104

7 a

Number of tables ( $n$ )	1	2	3	4		8
Number of people ( $P$ )	3	6	9	12		24

b  $P = 3n$

c 36

d 17



b

Diagram number ( $n$ )	1	2	3	4		9
Number of matchsticks ( $M$ )	6	11	16	21		46

c  $M = 5n + 1$

d  $M = 126$

e 39



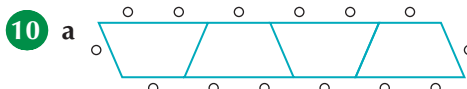
b

Diagram number ( $n$ )	1	2	3	4		10
Number of matchsticks ( $M$ )	10	19	28	37		91

c  $M = 9n + 1$

d 541

e 11



<b>b</b>	Number of tables ( $n$ )	1	2	3	4		8
	Number of people ( $P$ )	5	8	11	14		26

c  $P = 3n + 2$

d 47

e 50

## Chapter 6 Calculating the gradient of a straight line from horizontal and vertical distances

### Exercise 6A Gradient of a straight line

1 A 2                      B  $\frac{2}{3}$

C -3                      D  $-\frac{1}{3}$

E 4                        F  $-\frac{4}{5}$

G  $-\frac{1}{4}$                       H  $\frac{1}{3}$

I 8                        J -3

2 a to f: Check students' own diagrams.

3 a  $-\frac{1}{2}$                       b  $\frac{1}{3}$                       c -2

d  $-\frac{2}{3}$                       e 3

4 a Gradient =  $\frac{3000}{6200} = 0.48$ ; green

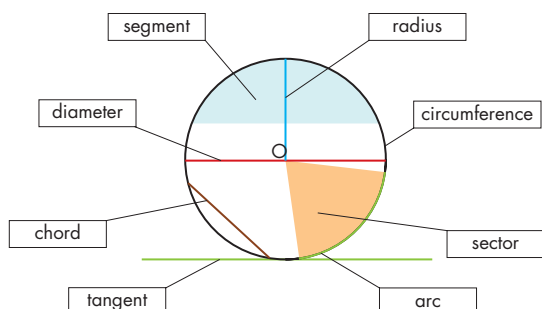
b Gradient =  $\frac{2475}{3300} = 0.75$ . Ben is not correct; it is a blue run as it is between 0.5 and 0.8.

5 Gradient =  $\frac{8.5}{2} = 4.25$ . The ladder does not meet the regulations as  $4.25 > 4$ .

## Chapter 7 Calculating the circumference and area of a circle

### Exercise 7A Circumference of a circle

1



2 a 9.4 cm                      b 28.3 cm                      c 31.4 cm

d 37.7 cm                      e 66.0 cm

3 a 12.6 cm                      b 22.0 cm                      c 44.0 cm

d 62.8 cm                      e 78.5 cm

4 48 m

5 a 314.2 m                      b 16

6 51.4 m

7 12.7 cm

8 15.9 cm

9 849

### Exercise 7B Area of a circle

1 a 12.6 cm<sup>2</sup>                      b 113.1 cm<sup>2</sup>                      c 201.1 cm<sup>2</sup>

d 314.2 cm<sup>2</sup>                      e 452.4 cm<sup>2</sup>

2 a 3.1 cm<sup>2</sup>                      b 28.3 cm<sup>2</sup>                      c 78.5 cm<sup>2</sup>

d 227.0 cm<sup>2</sup>                      e 490.9 cm<sup>2</sup>

3 15

4 a 113.1 m<sup>2</sup>                      b 7 m

c 153.9 m<sup>2</sup>                      d 40.8 m<sup>2</sup>

e No, he needs about 41 square metres and the cost would be close to £500.

5 9.3 cm<sup>2</sup>

6 a 357 m                      b 6963 m<sup>2</sup>

7 a i perimeter = 20.6 cm

ii area = 25.1 cm<sup>2</sup>

b i perimeter = 22.3 m

ii area = 30.3 m<sup>2</sup>

8 a The circumference is 251 cm.

In total, six people need 420 cm.

$251 \text{ cm} < 420 \text{ cm}$ , therefore the table is not big enough for six people to sit comfortably.

b A tablecloth with a diameter of 1 metre.

- 9 a 15.9 cm  
 b 8.0 cm  
 c  $198.9 \text{ cm}^2$  (using the value on the calculator for part b); rounded value of 8.0 cm gives  $201.1 \text{ cm}^2$

## Chapter 8 Calculating the area of a parallelogram, kite and trapezium

### Exercise 8A Area of a parallelogram, kite and trapezium

- 1 a  $15 \text{ cm}^2$       b  $40 \text{ cm}^2$   
 c  $16 \text{ m}^2$       d  $240 \text{ cm}^2$
- 2  $256 \text{ cm}^2$
- 3 B and C have the same area,  $36 \text{ cm}^2$ .
- 4 a 14 cm      b 11 cm
- 5 a  $126 \text{ cm}^2$       b  $240 \text{ cm}^2$   
 c  $56.25 \text{ cm}^2$       d  $972 \text{ cm}^2$
- 6 14 cm
- 7  $196 \text{ cm}^2$
- 8  $6300 \text{ cm}^2$
- 9 a  $28 \text{ cm}^2$       b  $66.5 \text{ cm}^2$
- 10  $A = \frac{1}{2} (10 + 16) \times 5$   
 $= \frac{1}{2} (26) \times 5 = 13 \times 5 = 65 \text{ cm}^2$
- 11 about 3 kg (3060 g)
- 12 5 cm
- 13 a  $89 \text{ m}^2$       b  $35.5 \text{ cm}^2$
- 14 a  $45 \text{ cm}^2$       b  $24 \text{ cm}^2$

## Chapter 9 Investigating the surface area of a prism

### Exercise 9A Surface area of prisms

- 1 a  $108 \text{ cm}^2$       b  $160 \text{ cm}^2$   
 c  $222 \text{ cm}^2$       d  $150 \text{ cm}^2$

- 2 a A  $94 \text{ cm}^2$       B  $376 \text{ cm}^2$   
 b i 2      ii 4
- 3  $528 \text{ cm}^2$
- 4 a  $190 \text{ cm}^2$       b  $84 \text{ cm}^2$       c  $211.2 \text{ cm}^2$
- 5 a  $477.5 \text{ cm}^2$       b  $133.5 \text{ cm}^2$       c  $714.7 \text{ cm}^2$
- 6 a  $471.2 \text{ cm}^2$       b  $314.2 \text{ cm}^2$
- 7  $240 \text{ cm}^2$

## Chapter 10 Calculating the volume of a prism

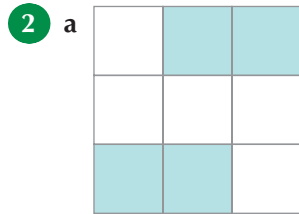
### Exercise 10A Volume of prisms

- 1 a  $72 \text{ cm}^3$       b  $100 \text{ cm}^3$   
 c  $180 \text{ cm}^3$       d  $125 \text{ cm}^3$
- 2  $90 \text{ cm}^3$
- 3 35
- 4 a  $24 \text{ cm}^3$       b 5 cm  
 c 5 cm      d 6 cm
- 5  $480 \text{ cm}^3$
- 6 a  $42 \text{ m}^3$       b  $250 \text{ m}^3$
- 7 a 187.8 g      b 189 g
- 8 a A is the heaviest (190 g)  
 b B is the lightest (187.8 g)  
 (C weighs 189 g)
- 9 a  $785 \text{ cm}^3$       b  $393 \text{ cm}^3$
- 10 a  $754.0 \text{ cm}^3$   
 b  $117.8 \text{ cm}^3$   
 c  $1460.1 \text{ cm}^3$
- 11 4.0 kg
- 12 a  $8100 \text{ cm}^3$   
 b  $35.34 \text{ cm}^3$   
 c 458  
 d She would only need one.

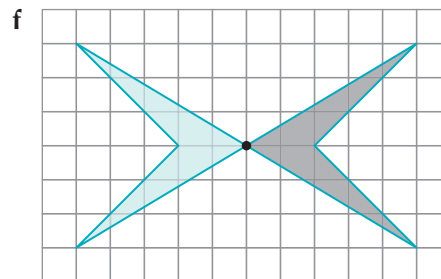
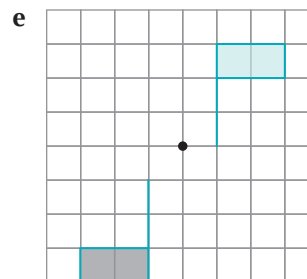
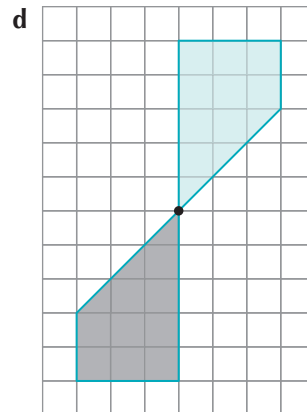
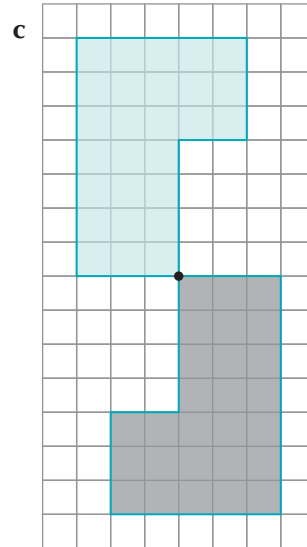
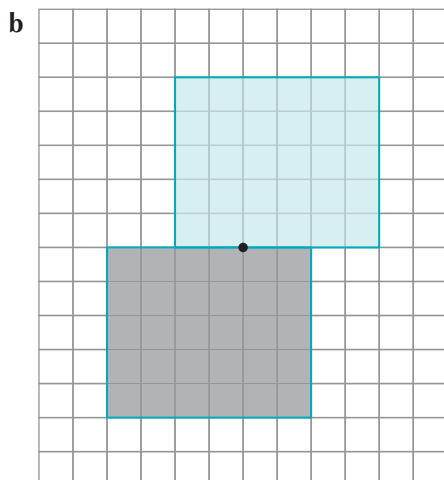
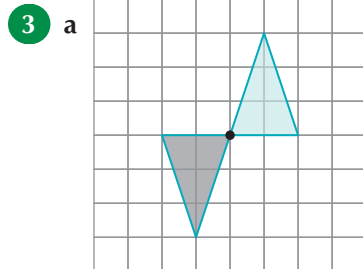
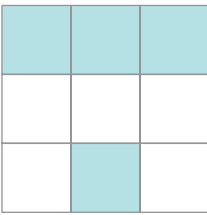
## Chapter 11 Using rotational symmetry

### Exercise 11A Rotational symmetry

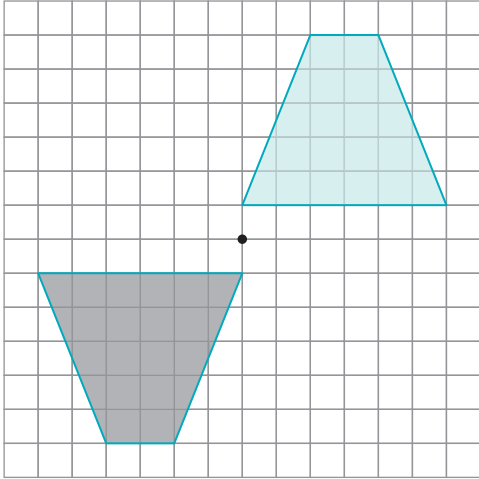
- 1 a 4                      b 2                      c 2  
 d 3                      e 2                      f 5  
 g 6                      h 2                      i 2  
 j 8                      k 2                      l 2  
 m 4                      n 4                      o 5



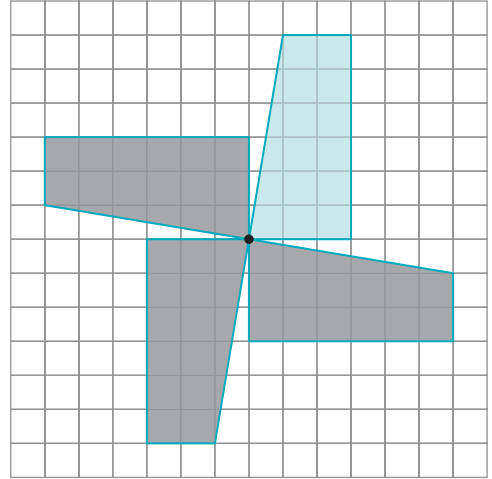
b For example:



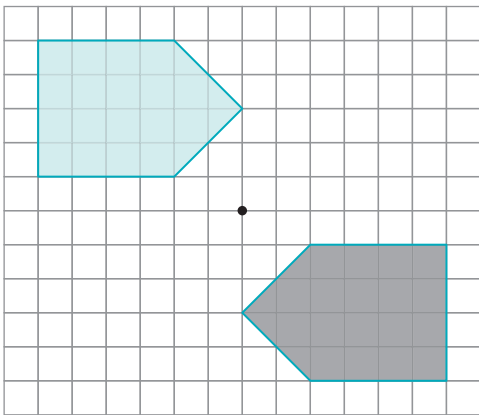
g



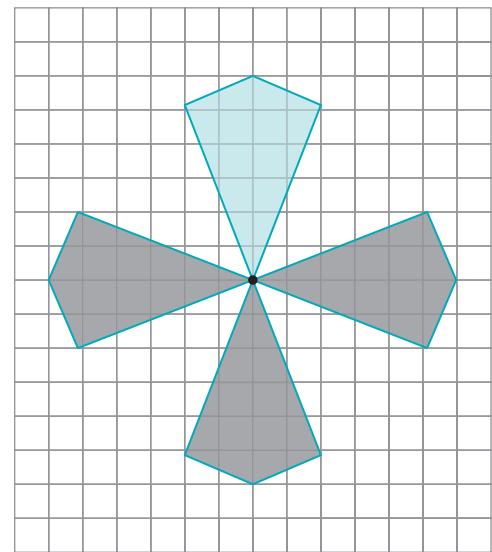
c



h

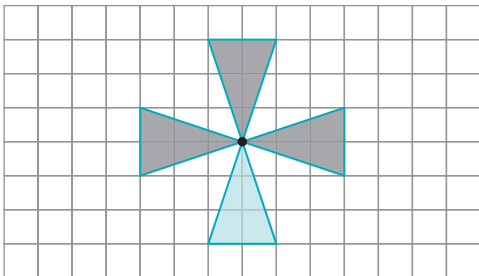


d

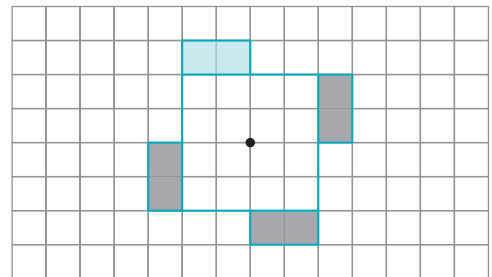


4

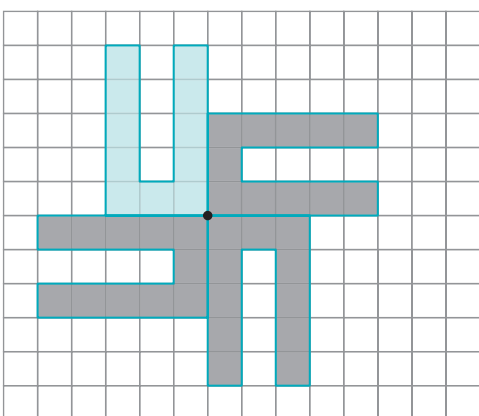
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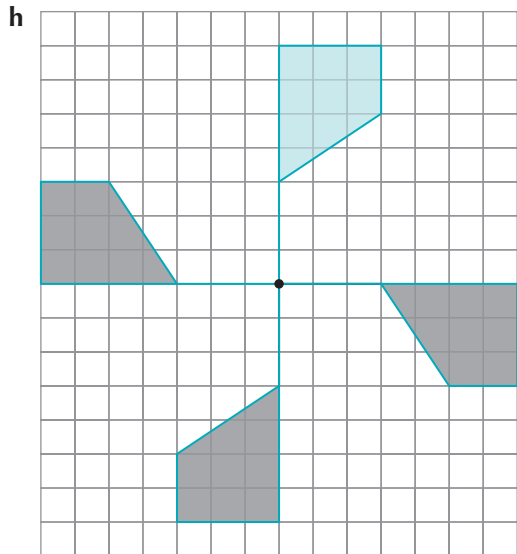
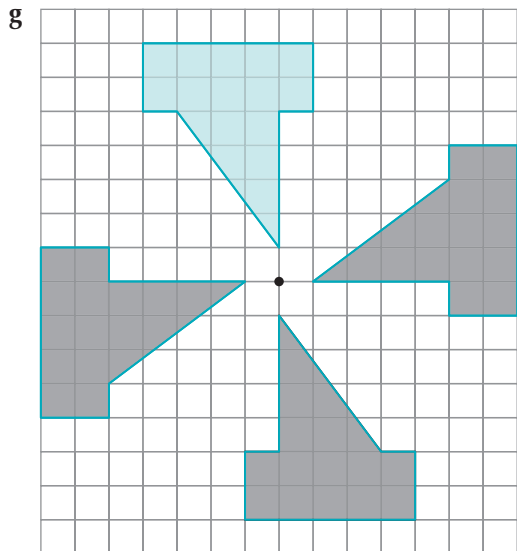
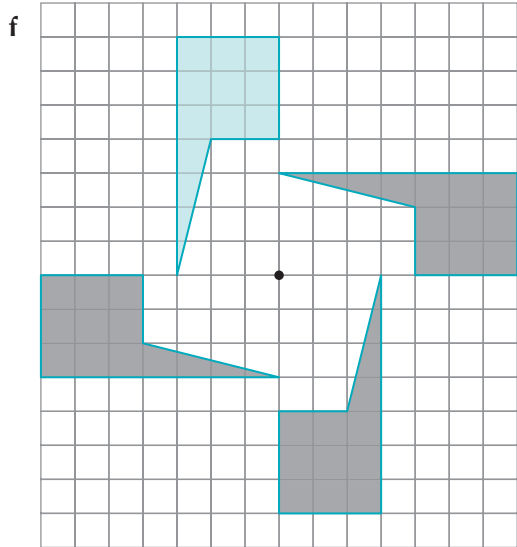


e

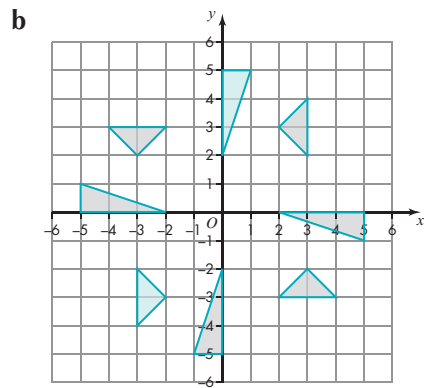
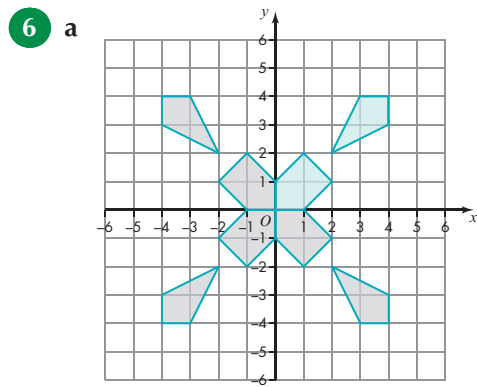


b





- 5 a  $A(0, 4), B(3, 4), C(3, 3), D(2, 3), E(2, 1), F(1, 1), G(1, 3), H(0, 3)$   
 b  $A(0, -4), B(-3, -4), C(-3, -3), D(-2, -3), E(-2, -1), F(-1, -1), G(-1, -3), H(0, -3)$



## Chapter 12 Constructing a frequency table with class intervals from raw data

### Exercise 12A Frequency tables

1

Age (years)	Tally	Frequency
12–14		4
15–17		3
18–20		6
21–23		2
24–26		3
27–29		2
	<b>Total</b>	20

2

Violin grade	Tally	Frequency
1–2		5
3–4		4
5–6		5
7–8		7
	<b>Total</b>	21



3	Number of holidays abroad	Tally	Frequency
	0–3		5
	4–7		8
	8–11		3
	12–15		2
		<b>Total</b>	21

4	Age (years)	Tally	Frequency
	18–20		2
	21–23		6
	24–26		3
	27–29		1
	30–32		1
		<b>Total</b>	13

5	Marks in test	Tally	Frequency
	1–5		1
	6–10		2
	11–15		4
	16–20		8
	21–25		10
	26–30		5
		<b>Total</b>	30

6	Time (minutes)	Tally	Frequency
	0–3		9
	4–7		13
	8–11		6
	12–15		2
		<b>Total</b>	30

7	Number of km	Tally	Frequency
	1–100		6
	101–200		3
	201–300		7
	301–400		3
	401–500		4
	501–600		3
	601–700		2
	701–800		2
	801–900		1
		<b>Total</b>	31

## Chapter 13 Determining statistics of a data set and interpreting calculated data sets

### Exercise 13A Calculating and using the mean

- 1 a 4                      b 24                      c 333  
 d 22.1                    e 98.9                    f 9.8

2 3 hours 18 minutes

3 There are many correct ways of achieving a total combined weight of 180–200 kg, e.g.:  
 Key family: Brian, Ann, Steve and Albert vs  
 Charlton family: Hannah, Pete, Chris and George.

- 4 a 31 runs                b 47 runs

### Exercise 13B Calculating and using the median

- 1 a 15                      b 34                      c 0  
 d 11                      e 1.6

- 2 a £800                    b £910  
 c i 5                      ii 2

d Median, as it is not distorted by the extreme values.

3 a Three higher than or equal to 11 and one less than or equal to 11. There are many possible correct answers, e.g. 10, 14, 20 and 20.

b Four higher than or equal to 11 and two lower than or equal to 11.

c Eight numbers, all 3 or under.

4 The mean is based on all data items, so might be distorted by the 4 kg outlier.

5 a 71 kg

b 70 kg

c Median; 53 kg is an extremely low mass.

6 The teacher might be quoting the mean, while the student is quoting the mode.

### Exercise 13C Using the mode and other averages

- 1 a 2                      b 15                      c 101  
     d 1                      e  $6\frac{1}{2}$
- 2 a i mode 135 g  
     ii median 141 g  
     iii mean 143 g
- b Mean; it takes all weights into account.
- 3 Adam mean, Maya median, Faisal mode (his scores are bimodal, with modes 0 and 4, but the mean is 1.8)
- 4 a 71 kg                      b 62 kg  
     c Median; it is a more central value.

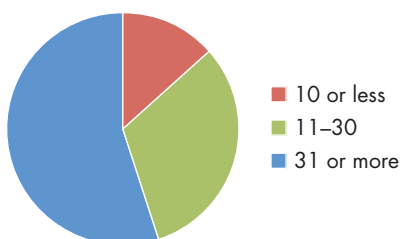
### Exercise 13D Calculating and using the range and averages

- 1 a 13                      b 14  
     c 2.7                      d 10
- 2 a 25                      b 16                      c 5 years
- 3 a  $76^{\circ}\text{F}$                       b  $15^{\circ}\text{F}$   
     c The means are similar, but Crete's temperatures are more consistent.
- 4 a Week 1: £194.20; Week 2: £176.20  
     b Week 1: £313; Week 2: £320  
     c Week 1 had the higher average takings and it also had the more consistent takings.

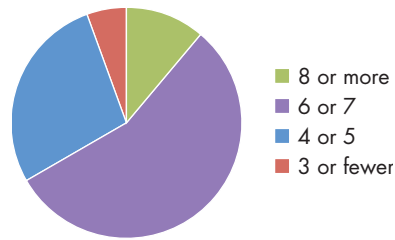
## Chapter 14 Representing raw data in a pie chart

### Exercise 14A Pie charts

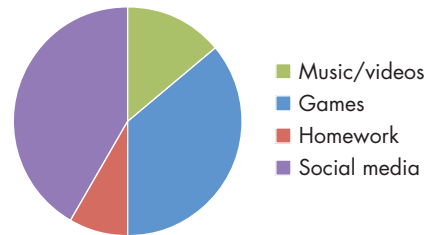
- 1 Time (in minutes) taken to get to work



- 2 National 4 passes obtained

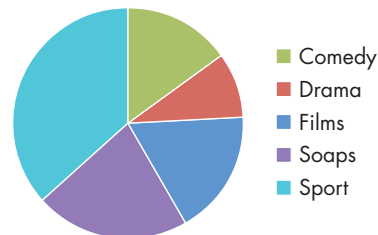


- 3 a Main use of computers and tablets



- b Most used the computer/tablet for social media and only a few used it for homework.
- c Not enough in sample, only a small age range of people, probably only boys, etc.

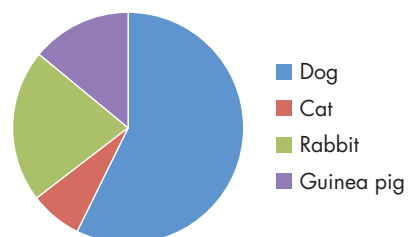
- 4 a Favourite type of TV programme



- b No; the researcher only asked people who are likely to have similar interests, e.g. sport.

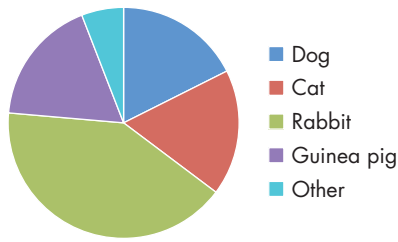
- 5 A sample of students and the frequencies or numbers of different types of breakfasts taken.

- 6 a Boys' favourite pet



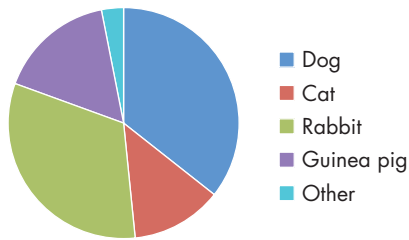
b

Girls' favourite pet



c

Whole class's favourite pet



## Chapter 15 Using probability

### Exercise 15A Calculating probabilities

1 a  $\frac{1}{10}$                       b  $\frac{1}{2}$

c  $\frac{3}{5}$                               d  $\frac{2}{5}$

e  $\frac{3}{10}$                              f 0

2 a  $\frac{2}{9}$                              b  $\frac{1}{3}$

c  $\frac{5}{9}$                                 d 0

e  $\frac{7}{9}$                                 f 1

3 a i  $\frac{1}{5}$

ii  $\frac{1}{3}$

iii  $\frac{7}{15}$

b They add up to 1.

c All possible outcomes are used.

4 a AE, AK, AD, AM, EK, ED, EM, KD, KM, DM

b 3

c  $\frac{3}{10}$

d 6

e  $\frac{6}{10} = \frac{3}{5}$

f  $\frac{1}{10}$

5 S2

### Exercise 15B Calculating the probability of an event not happening

1 a  $\frac{24}{25}$                               b 35%

c 0.2                                d  $\frac{35}{36}$

2 a i  $\frac{5}{11}$

ii  $\frac{6}{11}$

b i  $\frac{1}{2}$

ii  $\frac{1}{2}$

3 a  $\frac{4}{6}$  or  $\frac{2}{3}$

b  $\frac{5}{6}$

c  $\frac{2}{6}$  or  $\frac{1}{3}$

4 Harris

5 The game might end in a draw.

### Exercise 15C Calculating the probability of expected outcomes

1 100

2 250

3 1250

4 a 100                                b 100

c 130                                d 0

5 Multiply the number of students by 0.14.

6 a 28000

b Yes;  $112 \pm 10\%$  means that at least 100.8 out of 200 (i.e more than half) should vote for party A.

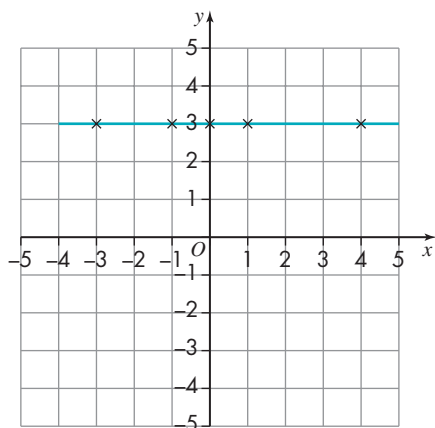
7 a You cannot add probabilities for events like this.

b increase, as he is more experienced

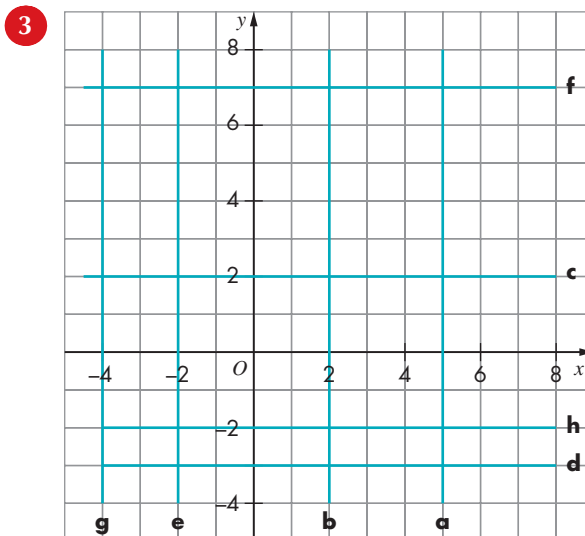
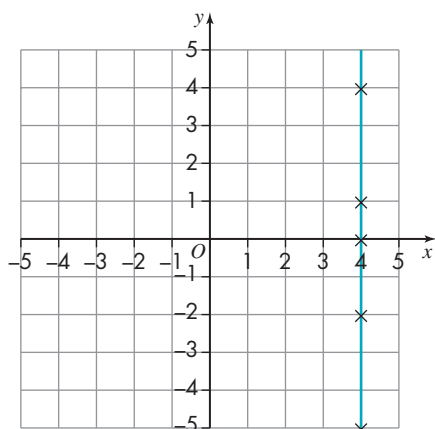
### Chapter 16 Drawing and recognising a graph of a linear equation

#### Exercise 16A Equations of vertical and horizontal lines

1 a, b  $y = 3$



2 a, b  $x = 4$



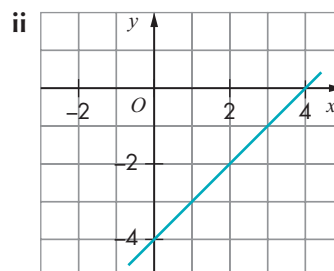
4 a  $y = 5$       b  $y = 2$       c  $y = -3$

d  $x = -3$       e  $x = 3$       f  $x = 7$

#### Exercise 16B Equations of straight lines

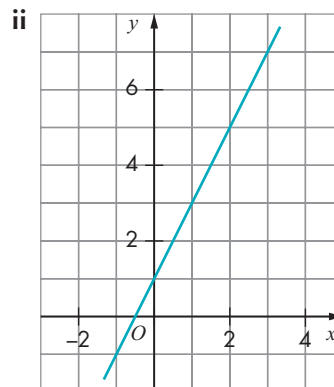
1 a i

$x$	1	2	3
$y$	-3	-2	-1



b i

$x$	0	1	2
$y$	1	3	5



c i

$x$	0	1	2
$y$	-2	2	6