# > Learner's Book answers

# Unit 1 The number system

# Getting started а

- 9 ones 9 hundredths h 9 tenths С 2 two hundred and 205408.9 а five thousand, four
- hundred and eight point nine
  - five hundred and 570.036.01 h seventy thousand and thirty six point zero one
- 5.55 3 а 0.1 b 10 Л

Τ.	10			
5	а	6 m	b	37 cm
	с	12 m	d	11 cm
6	а	99.5	b	10.4

#### Exercise 1.1

1	а	7 hundred	b	7 thousandths
	с	7 tenths	d	7 hundredths

- 2 2.046
- Odd one out is 12.34. All the others are 3 equivalent to 1.234.
- 2.139 two point one а three nine
  - -909.909negative nine b hundred and nine point nine zero nine
  - twenty-five point 25.431 four three one
  - negative three point -3.481d four eight one
- 0.8 or  $\frac{8}{10}$  and 0.004 or  $\frac{4}{1000}$ 5
  - 0.14

b

0.019

7	а	7200	b	85	с	42.8
	d	6.7	е	0.151	f	0.55
8	а	С	b	D	с	Е
9	5					

# Think like a mathematician

98 889 petals left  $(100\,000 - 1111 = 98\,889)$ 

## Exercise 1.2

1	4	8	3	7
2	\$15			
3	4.5	5.05	4.55	5.35
4	4.5	7.8	2.4	9.1

- 5 7.51 7.49 7.53
- False, 3.04 is 3.0 when rounded to the 6 A nearest tenth.
  - B True
  - C False, 6.95 is 7.0 when rounded to the nearest tenth.
- 7 55.6 litres 12.2 metres 35.5 kilograms
- 0.5 8
- 7.97 is 8 when rounded to the nearest whole 0 number.

7.97 is 8.0 when rounded to the nearest tenth. The 7 in the hundredths place increases the tenths by one so 7.9 becomes 8.0. If the number is rounded to the nearest tenth, there must be a digit in the tenths place, even if it is zero.

# Think like a mathematician

5 cm is between 4.50 and 5.49 cm

6 cm is between 5.50 and 6.49 cm Smallest possible perimeter = 4.50 + 4.50 + 5.50 +

 $5.50 = 20.00 \,\mathrm{cm}$ Largest possible perimeter = 5.49 + 5.49 + 6.49 + $6.49 = 23.96 \,\mathrm{cm}$ 

6 а

# Check your progress

- 1 0.6 + 0.05 + 0.005
- **2** 97.314
- **3** 1000
- **4 a** 3.1 **b** 10 **5 a** 10 **b** 100
  - c 1000 d 0.034
- 6 13.94 seconds

# Unit 2 Numbers and sequences

#### Getting started

- **1** 1, 4, 9, 16, 25, 36, 49, 64, 81, 100
- **2 a** 4, 11, 18, 25, 32, 39
  - **b** 2, 11, 20, 29, 38, 47
- **3** 4, 7, 10
- 4 a Any three from 12, 24, 36 or 48
  b Any three from 2, 4, 6 or 12

# Exercise 2.1

**1 a** multiply by 6 **b** 60

b

add 3

- **2 a** 6, 9, 12
  - c multiply by 3
- **3 a** 8, 16, 24, 32, 40, 48
  - **b** multiply by 8
  - **c** 400
- 4 a 100 triangles and 150 triangles and rectangles altogether

b	Position	Term
	1	3
	2	6
	3	9
	4	12
	5	15

- c multiply by 3
- **d** 60

- **5**  $1\frac{1}{4}$  and  $1\frac{3}{4}$
- **6 a** 1, 1.01, 1.02, 1.03, 1.04 **b** 1.09
- 7 All the tenths digits are even and 5 is odd.

**8** 
$$-2$$
  $-3\frac{3}{5}$   $-4$ 

9 30.01 (30.010)

# Think like a mathematician

+5, +9, +13, +17, +21 (the difference between the terms increases by 4 each time)

Next number: 45 + 21 = 66

12=6+6, 21=15+6, 29=28+1, 30=15+15

#### Exercise 2.2

81

2	а	25	b	100	с	49
_	-	20		100	•	

**3** 9 and 36

1

5

**4** A: 8, B: 64, C: 125

а	125	<b>b</b> 1	<b>c</b> 27

6	Odd	Not odd
Cube number	1 or 27	8 or 64
Not a cube	Learners'	Learners'
number	own answers	own answers

- **7** 27 and 125
- 8  $2^3$ , half of  $4^2$ ,  $3^2 1$  and  $2^2 \times 2 = 8$  $3^2$  and  $2^3 + 1 = 9$

# Think like a mathematician

Adding two consecutive square numbers

4 + 9 = 13	
9+16=25	25-13=12
16 + 25 = 41	41-25=16
25+36=61	61 - 41 = 20
36+49=85	85-61=24

The differences between the terms increase by 4 each time.

#### Adding odd numbers

1 + 3 = 4	The sum of the first two odd numbers = $2^2$
1+3+5=9	The sum of the first three odd numbers = $3^2$
1+3+5+7=16	The sum of the first four odd numbers = $4^2$
1 + 3 + 5 + 7 + 9 = 25	The sum of the first five odd numbers = $5^2$

## Exercise 2.3



Common multiples of 2, 3 and 5: 30, 60

- **2** 105, 120, ... (any multiple of 15 bigger than 100)
- **3** 24 and 48
- 4 once more on day 12 (12 is a common multiple of 3 and 4)

Common multiples. 12 is a common multiple of 3 and 4 so they both play football on the 12th day which is one time in a fortnight.

- **5 a** 1, 2, 3, 6, 9, 18
  - **b** 1, 2, 3, 4, 6, 8, 12, 24
  - **c** 1, 2, 3, 6 circled
- **6** 1, 2, 5 and 10
- 7 Pierre shares the cards equally so any factor of 32 could be the number of friends. The factors of 32 are 1, 2, 4, 8, 16 and 32.

**8** a 65 b 15

#### Think like a mathematician

One possible answer is: 5, 1, 3, 6, 2, 4

# Check your progress

- **1** 4.6
- **2** a multiply by 7 **b** 70
- **3**  $7 \times 7$  and 7 + 7 + 7 + 7 + 7 + 7 + 7
- **4** 42
- **5** 8

# **Unit 3 Averages**

#### Getting started

**1** a red **b** blue

white

C

- 2 Group A: 6 years old Group B: 7 years old Group C: 9 years old Group D: 11 years old
- **3** The mode is 2. The median is 3.

The shopkeeper should use the mode as the average as only one size 3 was sold. Size 2 is more typical of the data as four size 2 tops were sold.

### Exercise 3.1

- 1 a mode: 4 cm and 5 cm median: 5 cm
  - b mode: 51 mm and 59 mm median: 52 mm
  - c mode: 1.2 m and 1.8 m median: 1.5 m
  - d mode: 101 cm and 102 cm median: 101.5 cm
- **2** a 6 b 7 c 11 d 4
- **3** a Player C has the highest mean bowling score.
  - **b** B is better because their scores are more consistent and all their scores are above 100 or D is better because they scored over 150 in two of their games whereas B never scored over 150.

4 The range of Sarah's practice times is 18 minutes.

The range of Anita's practice times is 4 minutes.

Anita has the smallest range of times, so she is more consistent in the amount of time she practises for over the 5 days.

**5 a** 3 **b** 10 **c** 65 **d** 42 **e** 5 **f** 9 **g** 25

6 The range of Group 1 is 25 cm.

The range of Group 2 is 14 cm.

Group 1 has the largest range.

The children in Group 2 are closer in height to each other. The heights of the children in Group 1 are more spread out and there is a bigger difference between the tallest and smallest child in Group 1.

7а	Range	Mode	Median	Mean
Kali	6	6	6	7
Summer	8	0	3	3
Benji	4	0	0	1
Kyle	5	4 and 7	5	5

- **b** Kali has been most successful at skipping because Kali has the highest median and mean averages.
- c Learners should indicate the mean or the median. The mode could represent two tries that were much lower or higher than all the others; the mean and the median represent the middle of the data.

8 a	Range	Mean	Mode	Median
Week 1	7°C	22°C	20°C	20°C
Week 2	6°C	27 °C	25°C	27 °C
Week 3	8°C	25°C	27°C	27 °C
Week 4	8°C	18°C	19°C	19°C
Week 5	10°C	23°C	28°C	23°C
Week 6	8°C	30°C	26°C	30°C

- b Week 5
- c Learners should use the information from the table to argue which is the warmest, for example: Week 6 is the warmest because it has the highest mean and median, and the mode in Week 6 is the third highest, which also makes it warmer than four other weeks.

- d range: 12 °C mode: 20 °C median: 25 °C mean: 25 °C
- Fratania: mean (99 mm)
   Spanila: mode (95 mm)
   Brimland: mode (97 mm)
   Gretilli: median (92 mm)

# Think like a mathematician

Many possible solutions. For example:

- 5, 5, 5, 5
- 4, 5, 5, 6
- 3, 5, 5, 7
- 4, 4, 6, 6
- 1, 1, 9, 9

The total number of puppies in each solution is 20, because 20 divided by 4 equals 5.

# Check your progress

- **1** a mode: 4
  - median: 5
  - mean: 6
  - range: 6
  - b mode: 7 median: 6 mean: 6 range: 12
  - c mode: 29 median: 29.5 mean: 30
    - range: 19
  - d mode: 6 and 11 (bimodal) median: 11 mean: 10.5 range: 9
- 2 mode: \$0, median: \$37, mean: \$61The median best describes the average amount of money collected.

The mode \$0 is not typical of the data because 5 of the 7 buckets collected more. The mean \$61 is not typical because one amount (\$263) has pushed up the mean and 6 of the 7 buckets collected less than \$61. **c** 1

or

7 spaces

# Unit 4 Addition and subtraction (1)

# Getting started

**1** □=15 ○=9

- **2** a 4412 (3214+1198)
  - 1016 (3154 2138)
- **3** a −5

b

# Exercise 4.1

1	а	120 000	b	140 000
2	а	3428 km	b	34 530 km

- **3** Ravi should have regrouped 800 into 700 + 100 and written:

**b** -4

30000 + 6000 + 700 + 100 + 4

 $30\,000 + 1000 + 0 + 80 + 0 = 31\,080$ 

$$\begin{array}{r}
7 \\
3 6 & 10 4 \\
- & 5 7 2 4 \\
3 1 0 8 0
\end{array}$$

- **4** 137 points
- **5** −9°C
- **6** 3°C
- **7** −21 °C
- **8** 12°C

9

**a** 9°C **b** 19°C **c** 33°C

**10 a** 4 **b** 55

# Think like a mathematician

Three digits: answer is always 1089 Four digits: answer is always 10890 Two digits: answer is always 99

# Exercise 4.2

1 a 3 spaces b 4 spaces c

2 a equal b equal

c not equal

4

3 No, Khalid is not correct. Learners use a counter example or other explanation, for example:

If d=2 then 2+3=3+2 but 2-3=-1 and 3-2=1

а	x	1	2	4
	у	3	4	6

**b** y-x=2, or equivalent

5	а	x	1	2	3	4	5	6	7	8	9
		y	8	7	6	5	4	3	2	1	0

- **b** x+y=9, or equivalent
- 6  $a=6 \operatorname{cm} \operatorname{and} b=9 \operatorname{cm}$
- **7** a 20 cm b 28 cm c 8 cm
- 8 a For example, x=4, y=7; x=6, y=3; x=7, y=1
  - **b** p=x+x+y or p=2x+y

# Think like a mathematician

а	1	1	1	1	1	2	2	2	2	3	3	3	4	4	5
b	1	2	3	4	5	1	2	3	4	1	2	3	1	2	1
с	5	4	3	2	1	4	3	2	1	3	2	1	2	1	1

## Check your progress

- Missing answers: 5, 6 and 5 Calculation is: 43259+8526=51785
- **2** a −5°C b 9°C
- 3 m = 3 cm and n = 7 cm

Method:

• m + n + n = 17

$$m+n=10$$

n = 7

• m+7+7=17m+14=17m=3 3

# Unit 5 2D shapes

# Getting started

- 1 A and iii, B and v, C and iv, D and i, E and vi, F and ii
- **2** a 1 b 0 c
- **3** a The shape has 2 right angles.
  - **b** The shape has 1 curved edge.
  - **c** The shape has 3 straight edges.
  - **d** The shape has 1 pair of parallel sides.



# Exercise 5.1

**1** a A square is a <u>quadrilateral</u>.



**b** It has <u>4</u> equal sides.



c It has <u>2</u> pairs of parallel sides.



**d** The sides meet at  $90^{\circ}$ .



e The diagonals <u>bisect</u> each other at 90°.



**f** It has  $\underline{4}$  lines of symmetry.



2 a A parallelogram is a <u>quadrilateral</u>.



**b** It has <u>2</u> pairs of equal sides.



c It has <u>2</u> pairs of parallel sides.



d It has <u>2</u> pairs of equal angles.



e The diagonals <u>bisect</u> each other.



**f** It has  $\underline{0}$  lines of symmetry.



# Think like a mathematician 1 3 a square Group 1: A, D, E Group 2: B, C, F а An isosceles trapezium is b i a quadrilateral. It has one pair of equal sides. rectangle It has 1 pair of parallel sides. It has 2 pairs of equal angles. parallelogram It has 1 line of symmetry. trapezium ii A trapezium that is not isosceles is a quadrilateral. It has 1 pair of parallel sides.

isosceles trapezium





b

			Qua	drilateral			
	Square	Rectangle	Parallelogram	Trapezium	Isosceles trapezium	Rhombus	Kite
Four equal sides	1					1	
Two pairs of equal sides		1	1				1
One pair of equal sides					1		
One pair of parallel sides				1	1		
Two pairs of parallel sides	1	1	1			1	
All angles 90°	1	1					
One pair of equal angles							1
Two pairs of equal angles			<i>√</i>		1	1	
Diagonals bisect each other	1	1	✓			1	
Diagonals meet at 90°	1					1	~

4 Sofia is correct. An isosceles trapezium is the only quadrilateral with one pair of equal sides.

5 ii True. Learners' own answers, for example: Because we are told that the shape is a parallelogram and opposite sides of a parallelogram are parallel.

iii True. Learners' own answers, for example: Because we are told a is parallel to e and in the parallelogram we know that c is parallel to a, so c must also be parallel to e.

iv False. Learners' own answers, for example: Because in the trapezium there is only one pair of parallel sides and these are the opposite sides e and g, so f cannot be parallel to g.

6 Learners' own answers, for example:



# Think like a mathematician 2

Learners' own posters showing how you can decompose each of the seven special quadrilaterals into other shapes.

#### Exercise 5.2



- 2 Learners' accurate drawings of a circle with a radius of:
  - **a** 5 cm **b** 60 mm

#### Think like a mathematician 1

- a Arun is correct. Learners' own explanations, for example: Sofia's circle has a diameter of 60 mm, which is the same as 6 cm. The diameter is the distance all the way across the circle, so halfway across is 3 cm, which is the radius.
- **b** radius = half of diameter or diameter = twice the radius
- Group 1 (radius of 2 cm): A, F, H
   Group 2 (radius of 4 cm): C, E, G
   Group 3 (radius of 10 cm): B, D, I
- 4 a Gethin's diameter does not go through the centre of the circle.



- a, b Learners' accurate drawings of a circle with a radius of 3.5 cm
- 6 a radius
- **b** circumference
- **c** diameter

# Think like a mathematician 2

Learners' own answers

## Think like a mathematician 3

- a, b Learners' accurate drawings of the circles A and B
- **c** 8.5 cm
- d Learners' own answers, for example: Distance between the centres is the same as the sum of the two radii.
- e Learners' own answers, for example: Distance between the centres is the same as the sum of the two radii.
- f The distance between the centres of two touching circles is the same as the sum of the two radii.

#### Exercise 5.3

- 1 а rotational symmetry order 4
  - b rotational symmetry order 2
  - С rotational symmetry order 2
  - **d** rotational symmetry order 1
  - rotational symmetry order 4 е
  - f rotational symmetry order 2
- 2 B, c and i A, b and ii C, a and iii

#### Think like a mathematician 1

- No. Learners' own answers, for example: A trapezium has no lines of symmetry but rotational symmetry order 1.
- b No. Learners' own answers, for example: A parallelogram has no lines of symmetry but rotational symmetry order 2.

## Think like a mathematician 2

Learners' own answers

- 3 а rotational symmetry order 2
  - rotational symmetry order 4 b
  - rotational symmetry order 3 С
- 4 а A: rotational symmetry order 4 B: rotational symmetry order 2 C: rotational symmetry order 1 D: rotational symmetry order 3
  - b rotational symmetry order 2
  - С rotational symmetry order 4
  - d rotational symmetry order 2

#### Check your progress

- а A square has <u>4</u> equal sides.
  - A parallelogram has 2 pairs of b parallel sides.
  - The diagonals of a kite meet at  $90^{\circ}$ . С
  - d An isosceles trapezium has 1 pair of equal sides.
  - A rectangle has <u>2</u> lines of symmetry. е
  - f A rhombus has 2 pairs of equal angles.
- 2 a Learners' accurate drawings of a circle with a radius 2.5 cm

b Correct labelling of the centre, circumference, a radius and a diameter on their circle. For example:



- 3 rotational symmetry order 3 а
  - b rotational symmetry order 2
    - rotational symmetry order 1 С
    - d rotational symmetry order 4

# Unit 6 Fractions and percentages

#### Getting started

1

2

3

4

5

150 g  $44\%, \frac{44}{100}$ **b** 75%,  $\frac{75}{100}$ а  $30\%, \frac{30}{100}$ С 4.8>4.5 4.8 < 5.5  $\frac{1}{4}$ 0.2 0.3 70%  $\frac{1}{5} = 0.2$ Exercise 6.1

1	а	$\frac{5}{6}$	b	$\frac{6}{5}$	с	$\frac{10}{4}$	d	$\frac{4}{10}$
2	$\frac{3}{5}$							
3	op	erator						
4	а	\$12			b	\$15		
	с	10 metr	es					

 $\frac{3}{4}$ 

- 5 Halima swims further than Bella.  $\frac{1}{2}$  of 500 = 250 m and  $\frac{3}{10}$  of 800 = 240 m
- 6 Bricks left:  $\frac{2}{5}$  of 90 = 36 and  $\frac{1}{6}$  of 90 = 15 36+15=51

7	Fi	raction	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{5}{4}$	$\frac{7}{4}$	$\frac{9}{4}$	$\frac{11}{4}$	
	A	mount	6	18	30	42	54	66	
8	а	36	b	49	с	16		d	20

$\frac{6}{6}$	$\frac{6}{5}$	$\frac{6}{4}$	$\frac{6}{3}$	$\frac{6}{2}$	$\frac{6}{1}$	$\frac{3}{3}$	$\frac{3}{2}$
$\frac{5}{5}$	$\frac{5}{4}$	$\frac{5}{3}$	$\frac{5}{2}$	$\frac{5}{1}$		$\frac{2}{2}$	$\frac{2}{1}$
$\frac{4}{4}$	$\frac{4}{3}$	$\frac{4}{2}$	$\frac{4}{1}$			$\frac{1}{1}$	
9	$4\frac{6}{10}$	4.6	4	$\frac{3}{5}$	$\frac{23}{5}$		
10	$9\frac{3}{5}$	48÷:	5	9.6			

## Exercise 6.2

1	а	4	b	7 cm
	с	\$2	d	12 kg

**2** 48 kg

4

- 3  $10\% = \frac{1}{10}$  and to find  $\frac{1}{10}$  of a quantity you divide it by 10
  - $50\% = \frac{50}{100} = \frac{5}{10} = \frac{1}{2}$  so you divide by 2, not by 5 75%
- **a** 34% 5 b 20% С 20% 108 **a** 18 b С 117 6 7 \$160 8 25%
- **9 a** \$44 **b** \$6
- **10** 80 children

32 children is 40% of the class so 8 children are 10% of the class. 100% or the whole class is  $8 \times 10$  or use the diagram to show that each division represents 8 children or any other suitable method

# Think like a mathematician

10% of 600 is 60	20% of 500 is 100
50% of 150 is 75	25% of 160 is 40

#### Exercise 6.3

 $\frac{3}{1}$ 



23%=0.23

$$75\% < \frac{4}{5}$$

**11** Anil is correct.

 $\frac{2}{5} = 0.4$  and 0.4 > 0.25

**12** 50% 
$$\frac{3}{5}$$
 0.65  $\frac{7}{10}$ 

5

Think like a mathematician

$$\frac{1}{1} = 1, \frac{1}{2} = 50\%, \frac{1}{4} = 25\%, \frac{1}{5} = 20\%, \frac{2}{1} = 2, \frac{2}{2} = 1,$$
  
$$\frac{2}{4} = 50\%, \frac{2}{5} = 40\%, \frac{4}{1} = 4, \frac{4}{2} = 2, \frac{4}{4} = 1, \frac{4}{5} = 80\%,$$
  
$$\frac{5}{1} = 5, \frac{5}{2} = 2.5, \frac{5}{4} = 1.25, \frac{5}{5} = 1$$
  
$$5, 4, 2.5, 2, 1.25, 1; 80\%, 50\%, 40\%, 25\%, 20\%$$

# Check your progress

1  $\frac{4}{3}$  of 24 because  $\frac{3}{4}$  of 40 = 30 and  $\frac{4}{3}$  of 24 = 32

8

- **2**  $\frac{3}{4}$
- **3** 0.42  $\frac{9}{20}$  55%  $\frac{3}{5}$  66% **4 a** A: true; B: false; C: true
  - b 30% c

# Unit 7 Exploring measures

#### Getting started

- **1** a area:  $12 \text{ m}^2$ , perimeter: 16 m
  - **b** area: 25 mm<sup>2</sup>, perimeter: 26 mm
  - **c** area: 115 km<sup>2</sup>, perimeter: 48 km
  - **a** 22:03 **b** 11:44

## Exercise 7.1

2

- **1 a**  $18 \, \text{cm}^2$  **b**  $9 \, \text{cm}^2$
- **2 a**  $81 \, \text{cm}^2$  **b**  $40.5 \, \text{cm}^2$
- **3 a** 630 cm<sup>2</sup> **b** 315 cm<sup>2</sup> **c** 315 cm<sup>2</sup>
- 4 A: 2 cm<sup>2</sup>, B: 5 cm<sup>2</sup>, C: 6 cm<sup>2</sup>, D: 4.5 cm<sup>2</sup>, E: 7, 7.5 or 8 cm<sup>2</sup>

а	Triangle	1	2	3	4	5	6
	Area (cm <sup>2</sup> )	0.5	2	4.5	8	12.5	18

- **b** The area of the triangle would be  $24.5 \text{ cm}^2$ .
- **c** The area of the triangle would be  $50 \text{ cm}^2$ .
- **d** Learners should notice that the area increases with each triangle. They might notice that the pattern of the increase between the areas is 1.5, 2.5, 3.5, 4.5, etc. so they could use this to predict the area of the next triangle. Learners might notice that the area of the triangle is the number of the triangle multiplied by itself and divided by 2, or link this to the area of the rectangle that the triangle sits inside.

# Think like a mathematician

The area of each rectangle is 9 cm<sup>2</sup>. The triangles all have approximately the same area. (The triangles have exactly the same area, but this cannot be seen from the investigation.)

- **6** a rectangle: 16 cm<sup>2</sup> triangle: 8 cm<sup>2</sup>
  - **b** rectangle: 15 cm<sup>2</sup> triangle: 7.5 cm<sup>2</sup>
  - c rectangle: 20 cm<sup>2</sup> triangle: 10 cm<sup>2</sup>
  - d rectangle:  $12 \text{ cm}^2$ triangle:  $6 \text{ cm}^2$
  - e rectangle: 21 cm<sup>2</sup> triangle: 10.5 cm<sup>2</sup>
  - **f** rectangle: 12 cm<sup>2</sup> triangle: 6 cm<sup>2</sup>
- **7** 18 cm<sup>2</sup>
- 8 27 biscuits

#### Exercise 7.2

1

Hours	Hours and minutes
0.1 hours	0 hours and 6 minutes
0.2 hours	0 hours and 12 minutes
0.3 hours	0 hours and 18 minutes
0.4 hours	0 hours and 24 minutes
0.5 hours	0 hours and 30 minutes
0.6 hours	0 hours and 36 minutes
0.7 hours	0 hours and 42 minutes
0.8 hours	0 hours and 48 minutes
0.9 hours	0 hours and 54 minutes
1 hour	1 hour and 0 minutes
1.1 hours	1 hour and 6 minutes
2.2 hours	2 hours and 12 minutes
3.8 hours	3 hours and 48 minutes
4.9 hours	4 hours and 54 minutes

#### **2** a 1.25 hours

**b** Tom has converted 1.25 hours to 1 hour and 25 minutes. This is wrong because 0.25 hours equals one quarter of an hour which is 15 minutes. Each child can have the console for 1 hour and 15 minutes.

3	Runner	Hours	Minutes	Seconds
	Emmanuel	2	8	39
	Paul	2	9	15
	Kazuyoshi	2	15	27
	Florence	2	21	33
	Yared	2	21	42
	Susan	2	38	54
	Gianmarco	2	39	6
	Mai	2	54	18
	Emily	3	2	48
	Maria	3	3	3

# Think like a mathematician

Times where the decimal part of the hours are 0 have the same digits as the time in hours and minutes, for example, 12.0 hours is equal to 12 hours and 0 minutes.

## Check your progress

**1** A  $18 \, \text{cm}^2$ 

B  $3 \text{ cm}^2$ 

С

 $10\,\mathrm{cm}^2$ 

**2 a**  $4 \text{ cm}^2$  **b**  $4.5 \text{ cm}^2$  **c**  $6 \text{ cm}^2$ 

**3** C

- **4** a 3 hours 30 minutes
  - **b** 14 hours and 6 minutes
  - **c** 9 hours and 15 minutes
  - **d** 5 hours and 42 minutes
  - e 11 hours and 24 minutes
  - f 1 hour and 3 minutes
- **5** 2.4 hours
  - 2 hours and 24 minutes

# Unit 8 Addition and subtraction (2)

# Getting started

- **1** 5 tenths
- **2** 13.13
- **3** 0.2 metres

4	а	98.73	b	7.55		
5	а	$\frac{7}{5}$	b	$\frac{4}{8} = \frac{1}{2}$	с	$\frac{5}{10} = \frac{1}{2}$

 $6 \frac{5}{6}$ 

## Exercise 8.1

- **1** D
- 2 0.8 or  $\frac{8}{10}$  and 0.004 or  $\frac{4}{1000}$
- **3** 0.88 and 0.12
- $4 \quad 5.05 + 5.115 = 10.165$

5	а	20.478	b	30.864	С	76.934
	d	29.46	е	15.853	f	20.614

6 Ahmed should make sure the decimals have the same number of decimal places, then write down the calculation in columns.

	0	7	0
ł	0	4	1
	1	1	1



- 8 18.95 kg
- **9** \$191.27
- $10 \ 0.066 \, kg$

1.604 + 2.375 = 3.979 and 3.476 - 2.501 = 0.975 or 3.501 - 2.476 = 1.025

#### Think like a mathematician 1

Both fractions are almost a half. Both are a half of a fraction away from a half. Since sevenths are bigger than ninths, the fraction with ninths is closer to a half, so  $\frac{4}{9}$  must be bigger.

## Exercise 8.2

1	Calculation	Common denominator	Equivalent calculation	Answer
	$\frac{1}{3} + \frac{1}{6}$	6	$\frac{2}{6} + \frac{1}{6}$	$\frac{3}{6} = \frac{1}{2}$
	$\frac{7}{10} - \frac{1}{2}$	10	$\frac{7}{10} - \frac{5}{10}$	$\frac{2}{10} = \frac{1}{5}$
	$\frac{6}{5} + \frac{1}{2}$	10	$\frac{12}{10} + \frac{5}{10}$	$\frac{17}{10} = 1\frac{7}{10}$
2	<b>a</b> $\frac{23}{20} = 1\frac{3}{20}$	<b>b</b> $\frac{7}{24}$	ī	<b>c</b> $\frac{59}{40} = 1\frac{19}{40}$
3	$\frac{19}{20}$ and $\frac{31}{12} = 2\frac{7}{12}$			
4	They are both o	correct because $\frac{19}{15} = 1\frac{4}{15}$		
5	<b>a</b> $\frac{23}{10} = 2\frac{3}{10}$	<b>b</b> $\frac{53}{12}$	$=4\frac{5}{12}$	<b>c</b> $\frac{43}{24} = 1\frac{19}{24}$
6	<b>a</b> $\frac{19}{10} = 1\frac{9}{10}$	<b>b</b> $\frac{13}{12}$	$=1\frac{1}{12}$	<b>c</b> $\frac{28}{15} = 1\frac{13}{15}$
7	$\frac{7}{12}$			
8	$\frac{1}{36}$			
9	$\frac{1}{12}$			

# Think like a mathematician 2

$\frac{1}{5} + \frac{1}{2} = \frac{7}{10}$	$\frac{1}{5} + \frac{1}{3} = \frac{8}{15}$	$\frac{1}{5} + \frac{1}{4} = \frac{9}{20}$	$\frac{1}{5} + \frac{1}{5} = \frac{10}{25}$	$\frac{1}{5} + \frac{1}{6} = \frac{11}{30}$	$\frac{1}{5} + \frac{1}{7} = \frac{12}{35}$
$\frac{1}{7} + \frac{1}{2} = \frac{9}{14}$	$\frac{1}{7} + \frac{1}{3} = \frac{10}{21}$	$\frac{1}{7} + \frac{1}{4} = \frac{11}{28}$	$\frac{1}{7} + \frac{1}{5} = \frac{12}{35}$	$\frac{1}{7} + \frac{1}{6} = \frac{13}{42}$	$\frac{1}{7} + \frac{1}{7} = \frac{14}{49}$
$\frac{1}{9} + \frac{1}{2} = \frac{11}{18}$	$\frac{1}{9} + \frac{1}{3} = \frac{12}{27}$	$\frac{1}{9} + \frac{1}{4} = \frac{13}{36}$	$\frac{1}{9} + \frac{1}{5} = \frac{14}{45}$	$\frac{1}{9} + \frac{1}{6} = \frac{15}{54}$	$\frac{1}{9} + \frac{1}{7} = \frac{16}{63}$

General case:  $\frac{1}{m} + \frac{1}{n} = \frac{m+n}{mn}$ 



# Unit 9 Probability

#### Getting started

- 1 Learners' own answers. C and D should point to 'impossible'. F should point to 'certain'.
- 2 a true b false c true d false
- **3** Gabriela is not correct. The next flip has an even chance of being a head or a tail.

#### Exercise 9.1

- **1** a 1 out of 4 b 1 out of 4
- **c** 2 out of 4 or 50%
- **2** a 50% **b** 0%
  - **c** 50% **d** 100%
- **3** a Learners' own answers. Set of numbers where less than 50% of the numbers are 8
  - **b** Learners' own answers. Set of numbers where 5 out of 6 of them are less than 5
  - c Learners' own answers. Set of numbers where there are more 3s than 1s
  - d Learners' own answers. Set of numbers where more than 50% of them are 4
  - e Learners' own answers. Set of numbers where 2 out of 5 of them are 3
- **4 a** 40 **b** heads up
  - **c** 16 out of 40, or 2 out of 5

- **d** Learners' own answers
- e Learners' own answers
- f Learners' own answers
- g Learners' own answers

#### 5 a – c



- **d** The chance of winning a big prize is 0 because there are no numbers that are odd and multiples of 10.
- e yes

6

7

- a mutually exclusive
  - **b** not mutually exclusive
  - c mutually exclusive
- a i yes
  - ii no
  - iii yes
  - iv yes
  - v yes
  - vi no
  - **b** A and C, C and D
  - c Learners' own answers, for example: Event 1: You roll a 3 on the red dice. Event 2: You roll an even number on the blue dice.
  - d Learners' own answers, for example: Event 1: You roll a 1 on the red dice.

Event 2: You roll a number on the blue dice that is less than the number on the red dice.

- **8** a 8 red (★), 6 blue (③), 2 yellow (**\***)
  - **b** 20 red (★), 15 blue (ⓒ), 5 yellow (**\***)
  - **c** 100 red ( $\star$ ), 75 blue ( $\odot$ ), 25 yellow ( $\circledast$ )
- 9 Learner's own answers.

Learners' own answers. Learners should compare experimental probability with actual probability, and show that they know that the more trials that are carried out, the more likely that the results would be closer to the experimental probability.

#### Check your progress

- a 1 out of 8
  - **b** 2 out of 8 (or 1 out of 4)
  - **c** 1 out of 8
  - **d** 2 out of 8 (or 1 out of 4)
  - **e** 50% **f** 75%
- 2 Events 1 and 3

# Unit 10 Multiplication and division (1)

918

67

С

#### Getting started

- **1** a 4224 b
- **2**  $180 \times 8 = 1440$  metres
- **3** 2
- **4** 40
- **5**  $12 \times 30 \text{ or } 30 \times 12$

#### Exercise 10.1

- 1 No, there are too many zeros. A good estimate would be  $1500 \times 60 = 90000$
- **2** a 29568 b 37044 c 29984
- **3** 8638
- 4 Pierre thinks that 0 hundreds multiplied by 7=7 hundreds. The correct answer is 42168.
- **5**  $400 \times 60$   $8000 \times 3$   $20 \times 1200$
- **6**  $79 \times 60 \times 24 = 113760$  beats
- **7** a 164670 b 163950 c 533470
- **8** a 25764 b 67553 c 434625
- **9**  $7 \times 18 \times 25 = 3150$
- **10** 6, 7 and 4 (3627×42)

#### Think like a mathematician

25 and 26

#### Exercise 10.2

- 1 No. The estimate of  $564 \div 14$  is not 30 because  $600 \div 15 = 40$  (or  $600 \div 10 = 60$ )
- **2** a 109 r2 or  $109\frac{2}{7}$ 
  - **b** 27
  - **c** 28
- 3 Both girls are correct because a remainder of 3 in this case is equivalent to  $\frac{3}{7}$
- 4 8  $(588 \div 14 = 42 \text{ and } 374 \div 11 = 34)$
- **5** a 77
  - **b** 64
    - **c** 49
- 6 57 boxes
- 7 Mandy is wrong. She should find factors of 15 not decompose it.

She should divide by 5 and 3.

 $825 \div 5 \div 3 = 165 \div 3 = 55$ 

- **8**  $576 \div 72 = 8$   $306 \div 34 = 9$
- **9** a 2 and 1 (246  $\div$  4 = 61 r2)

**b** 
$$61\frac{2}{4} = 61\frac{1}{2}$$

- **10** \$27
- **11 a** 3 **b** 4

#### Think like a mathematician

Answers will depend on the numbers chosen by learners, but the largest answer is always found by dividing the largest dividend by the smallest divisor and the smallest answer is always found by dividing the smallest dividend by the largest divisor.

#### Exercise 10.3

- 1 43719 because the sum of the digits is divisible by 3(4+3+7+1+9=24)
- **2 a**  $19 \times 3 = 57$  **b**  $17 \times 3 = 51$ 
  - **c**  $14 \times 3 = 42$  or  $15 \times 3 = 45$  or  $16 \times 3 = 48$

- **3** 84
- 4 99, 108, 117, 126, 135
- **5** 96

6



They are multiples of 3, 6 and 9.

7		Divisible by 3	Divisible by 6	Divisible by 9
	987	1		
	495	1		1
	3594	1	1	

#### **8** 210

- **9** a 231 or 234 or 237
  - **b** 315 or 345 or 375
  - **c** 83**0**49 or 83**3**49 or 83**6**49 or 83**9**49

## Think like a mathematician

2334, 1335, 2337, 1338 2367, 1368 2634, 1635, 2637, 1638 2667, 1668 2934, 1935, 2937, 1938 2967, 1968

# Check your progress

1	а	27672	b	235380	с	256428
	d	77	е	54	f	19

- 2 Always true because the number is a multiple of 2 and a multiple of 3
- **3** a  $92 \div 4 = 23$  so the calculation is correct
  - **b**  $14 \times 9 = 126$  so the calculation is incorrect

4 Kofi is correct.

Vijay has forgotten to add in the 1 hundred that has been carried.

**5** 80

# Unit 11 3D shapes

#### Getting started

- 1 A and iii, B and i, C and iv, D and ii
- **2** a ii, iv **b** i, vi **c** iii, v
- **3** G, A, D, B, F, E, C, H

#### Exercise 11.1

- **1** a cube and a (square-based) pyramid
  - **b** cuboid and a triangular prism
  - c cylinder and a cone
- **2** Group 1: A, D, E, G Group 2: B, C, F, H
- 3 Learners' sketches of a compound shape made from these simple shapes
  - a two different cuboids, for example:



**b** a cuboid and a square-based pyramid, for example:



**c** two different cylinders, for example:



- 4 Learners' own answers. For example:
  - a A cube has 6 faces.All the faces are squares.



**b** A square-based pyramid has one square face and four triangular faces.



**c** A cylinder has two circular faces and a curved face which is a rectangle when flat.



d A triangular-based pyramid has four triangular faces.



# Think like a mathematician 1

Learners' own answers. For example:

- a The surface area is the total area of all the faces. You work it out by finding the area of each face then adding them all together.
- **b i** Find the area of one square face then multiply by six because all six faces are the same size.

- ii Work out the area of the square base. Calculate the area of one triangular face. Add the area of the square to four times the area of the triangle.
- **c** The surface area of a 3D shape is the total area of all its <u>faces</u>.
- **5 a** A triangular prism has a total of <u>five</u> faces. Two of the faces are <u>triangles</u> and <u>three</u> of the faces are rectangles.
  - **b** Any correct net for the triangular prism. For example:



6 A and iii, B and i, C and ii

#### Think like a mathematician 2

- а
- **b** Learners' own answers. For example, count how many you need to complete each layer then add these together to get the total.
- **7** a 7 b 6 c 6

# Think like a mathematician 3

Learners' own answers

# Exercise 11.2

- a i 500 ml ii 300 ml
- **b** i 100 ml ii 80 ml
- **c** i 5000 ml ii 2000 ml
- 2 a Learners' own answers. For example: 1000 ml = 1 litre, so 2000 ml = 2 litres 2500 ml = 2000 ml + 500 ml, so 2500 ml = 2 litres 500 ml

Also 500 ml = 0.5 of a litre, so 2500 ml = 2.5 litres

millilitres	litres and millilitres	litres
2500 ml	21 500 ml	2.51
3200 ml	31 200 ml	3.21
4300 ml	41 300 ml	4.31
3700 ml	31 700 ml	3.71
800 ml	01 800 ml	0.81
12100ml	12  100 ml	12.11

- a Arun is correct. Learners' own answers. For example: There are five increments on the scale for 1 litre, so each increment on the scale is worth 200 ml. The water is one increment above the 6 litres mark, so there is 6 litres 200 ml of water. This is the same as 6.2 litres.
- b Learners' own answers. For example: Marcus has assumed that each increment is worth 100 ml not 200 ml.
- c 3.8 litres or 3 litres 800 ml

4	а	80	ml	b	34 ml	с	2.61
	С	i	1000 ml		ii	650 ml	
	b	i	21		ii	1.61	
3	а	i	600 ml		ii	340 ml	

- 5 Learners' own answers. For example: Fill the jug to capacity (500 ml) four times then measure an extra 300 ml.
- **6** 90 litres

b

## Think like a mathematician 2

- a One solution for each is given. There may be other alternatives.
  - i 400 ml cup A + cup B
  - ii 360 ml cup A + cup C
  - iii 420 ml cup A+cup C+cup D
  - iv  $320 \,\mathrm{ml}$   $2 \times \mathrm{cup B}$
  - v 180 ml cup C + cup D
  - vi  $600 \,\mathrm{ml}$   $5 \times \mathrm{cup} \,\mathrm{C}$
- 7 Estimates should be approximately:
  - A: 500 ml/0.5 litres
  - B: 200 ml/0.2 litres
  - C: 1000 ml/1 litre

D: 600 ml/0.6 litres

E: 750 ml/0.75 litres

F: 1500 ml/1.5 litres

Order: B, A, D, E, C, F

8	Volume of 500 ml or less	Volume of more than 500 ml
Capacity of 1 litre or less	E	C F
Capacity of more than 1 litre	В	A D

# Think like a mathematician 3

a 1 litre: Fill B, fill A from B, empty A. There is 1 litre in B.

2 litres: Fill A, pour contents of A into B, fill A, fill B from A, empty B. There are 2 litres in A.

3 litres: Fill A.

4 litres: Fill B.

5 litres: Make 1 litre as above. Pour the 1 litre into A. Fill B.

6 litres: Fill A, pour A into B, fill A. There are 3 litres in each jug which equals 6 litres.

7 litres: Fill both A and B.

**b** 1 litre: Fill A, pour A into B, fill A, fill B from A, pour away B. There is 1 litre in A.

2 litres: Fill B, fill A from B, pour away A. There are 2 litres in B.

3 litres: Fill A.

4 litres: Make 2 litres as above. Pour B into A, fill B, fill A from B, pour away A. There are 4 litres in B.

5 litres: Fill B.

6 litres: Fill A, pour A into B, fill A. There are 3 litres in each jug which equals 6 litres.

7 litres: Make 2 litres as above. Pour B into A, fill B. There are 2 litres in A and 5 litres in B which equals 7 litres.

8 litres: Fill both A and B.

- **c** Only 3, 6 and 9 litres can be made. This could be because 6 is a multiple of 3.
- d Learners' own answers

# Check your progress

- cylinder and a cone 1 а
  - b cuboid and (rectangular-based) pyramid
  - three cuboids С
- 2 Learners' sketches of a compound shape made from a cuboid and a triangular prism. For example:



- A square-based pyramid has a total of 3 а five faces. Four of the faces are triangles and one of the faces is a square. The surface area of a square-based pyramid is the total area of all its faces.
  - b Learners' sketches of a net for the squarebased pyramid.

For example:



 $\Delta$ 

h

600 ml 5 i а

220 ml

380 ml ii .

# 12 Ratio and proportion

#### Getting started

- **b**  $\frac{4}{10}$  or 40% 4:5 а
  - 1:5:4 С

2

20

а

false (it should be 3:2)

- b true С
- true d false (it should be 2 in every 5 parts)

3 Odette has confused ratio and proportion. She saw one triangle and three circles. The ratio of triangles to circles is 1 : 3. She should have said that 1 out of every 4 shapes is a triangle (or 1 in every 4 shapes is a triangle).

# Exercise 12.1

1	а	1:2	b	2:3	С	3:2
2	а	1:4	b	3:2	с	4:3
	d	3:1	е	6:1	f	1:20
3	а	18	b	15	с	25

4

Equivalent to 2 : 3		Equiva 3	lent to : 4	Equivalent to 4 : 5	
18:27	4:6	12:16	24:32	28:35	16:20
14:21	8:12	18:24	21:28	1:28 36:45 32:4	

36:27 cannot be placed in the table

- 5 36 onions а
  - 84 carrots and onions b
- 6 70 boys and girls
- b 16 6 9 7 а С

## Think like a mathematician

Example method using trial and improvement:

Number of white beads	Cost of white beads	Number of coloured beads	Cost of coloured beads	Total cost
3	30c	1	20c	50c
24	240c	8	160c	400c
				or \$4

24 white beads and 8 coloured beads

# Exercise 12.2

- 1 \$10
- 2 4 pizzas
- 200 ml cream, 250 ml milk,  $\frac{1}{2}$  kg (or 500 g) 3 raspberries and 125g sugar
- \$42

- **5** a 400 cm or 4 m
  - **b** 15 cm
  - **c** 42.5 cm

6	Scale 1 : 18	Scale 1 : 24	Scale 1 : 32
	Puma	Beetle, Embla	Delta, Modi

7	Ratio of rectangle sizes	Length in cm	Width in cm	Perimeter in cm
Α		5	2	14
В	A to B = 1 : 2	10	4	28
С	A to C = 1 : 4	20	8	56
D	A to D = 1 : 6	30	12	84

The width on one row becomes the height on the row below.

A6 paper will be 148 mm high.

 $1189 \div 841 = 1.41$ 

 $841 \div 594 = 1.41$ 

And so on. They are all 1.41.

#### Check your progress

1	а	3:4	b	1:3	
	с	1:5	d	4:1	

- **2 a** 8 boys **b** 18 girls
- **3** 4 mangoes
  - 1 litre of apple juice
  - 500 ml yogurt
  - 2 bananas
- **4** 100 cm

# Unit 13 Angles

#### Getting started

- 1 A and iii, B and iv, C and i, D and ii
- **2** a right **b** obtuse
  - c acute d reflex

180° and 360°

h

- **3 a** 0° and 90°
  - **c** 90° and 180°

**4 a**  $a=120^{\circ}$  **b**  $b=38^{\circ}$ **c**  $c=70^{\circ}$ 

#### Exercise 13.1

- 1 Learners' own estimates  $a=20^{\circ}$   $b=45^{\circ}$   $c=72^{\circ}$
- 2 Learners' own estimates  $d=100^{\circ}$   $e=125^{\circ}$   $f=168^{\circ}$
- 3 Learners' own estimates  $g=200^{\circ}$   $h=255^{\circ}$   $i=302^{\circ}$

## Think like a mathematician

 $x = 40^{\circ} y = 320^{\circ}$ 

- 4 a Learners' own answers accurate drawings of the following angles:
  - i 30° ii 145°
  - iii 245° iv 350°
  - **b**, **c** Learners' own answers
- **5 a** Yes. Learners' own answers, for example: If she measures one of the angles, she can work out the other one by subtracting the measured one from 180°.
  - **b**  $x=62^{\circ}$  and  $y=118^{\circ}$ , including learners' own answers.
- **6 a**  $v = 303^{\circ}$  and  $w = 57^{\circ}$ 
  - **b** Calculation to check that *v* and *w* add up to 360°
- 7 a No. Angle *r* is 23° which is greater than 20°, not less than.
  - **b** Learners' drawings of a wheelchair ramp with an angle, r, of between 7° and 15°
- 8 a  $x=42^{\circ}, y=75^{\circ} \text{ and } z=63^{\circ}$ 
  - **b** Correct check, for example,  $42^{\circ} + 75^{\circ} + 63^{\circ} = 180^{\circ}$
  - **c**  $x = 42^{\circ}, y = 75^{\circ} \text{ and } z = 63^{\circ}$
  - d Learners' own answers. For example: The angles in the triangle are the same as the angles on the straight line. The angles in the triangle add up to 180°.

5

# Exercise 13.2

#### Think like a mathematician

Learners' own answers. For example: The three angles fit together exactly on the straight line. The sum of the angles in a triangle is the same as the sum of the angles on a straight line, which is 180°.

- **1** a  $x=60^{\circ}$  b  $x=50^{\circ}$  c  $x=20^{\circ}$ **2** a  $y=50^{\circ}$  b  $y=35^{\circ}$
- 3 a Learners' own answers. For example: In an isosceles triangle, two of the angles are equal. a and 50° are the same size, so  $a = 50^{\circ}$ .
  - **b** Learners' own answers. For example: Yes, because he has shown every step in his working.
  - c Learners' own answers. For example: 50°+50°=100°, 180°-100°=80°, or 180°-2×50°=80°

**4 a**  $z=124^{\circ}$  **b**  $z=66^{\circ}$ 

- 5 Learners' own answers. For example:  $180^{\circ} 126^{\circ} = 54^{\circ}$  and  $54^{\circ} \div 2 = 27^{\circ}$
- 6 Yes. Learners' own answers. For example:  $180^{\circ} - 146^{\circ} = 34^{\circ}$  and  $34^{\circ} \div 2 = 17^{\circ}$ . Angle  $p = 17^{\circ}$ , which is greater than 15°
- 7 a Marcus
  - **b** Learners' own answers. For example:

Marcus is correct because  $180^{\circ} \div 3 = 60^{\circ}$ (or  $60^{\circ} \times 3 = 180^{\circ}$ )

Arun is incorrect because  $80^{\circ} \times 3 = 240^{\circ}$ , which is not  $180^{\circ}$  (or  $180^{\circ} \div 3 = 60^{\circ}$ not  $80^{\circ}$ )

- 8 a Group 1 (scalene triangles): A, E, F, H
   Group 2 (isosceles triangles): B, C and G
   Group 3 (equilateral triangles): D, I
  - **b** G
- **9** a Angles on a straight line add to 180°.
  - **b**  $a = 53^{\circ}$
  - c  $b=43^\circ$ ; rule used: Angles in a triangle add to  $180^\circ$ .

## Check your progress

- **1**  $a=25^{\circ}$   $b=130^{\circ}$   $c=275^{\circ}$
- 2 Learners' own answers. Accurate drawings of the following angles:
  - **a** 80° **b** 175° **c** 315°
- **3 a**  $x = 75^{\circ}$  **b**  $x = 25^{\circ}$
- **4** a  $y=110^{\circ}$  b  $y=30^{\circ}$

# Unit 14 Multiplication and division (2)

#### Getting started

- **1** a  $\frac{1}{3}$  of 21=7 b  $\frac{1}{4}$  of 24=6 c  $\frac{1}{5}$  of 40=8 **2** a 3 b 4 c 6 **3** 36536
- **3** 36 536
- **4** \$35

#### Exercise 14.1

$$\frac{4}{6} + \frac{4}{6} + \frac{4}{6} = \frac{12}{6} = 2$$
  
$$3 \times \frac{4}{6} = \frac{12}{6} = 2 \text{ or } \frac{4}{6} \times 3 = \frac{12}{6} = 2$$

**2** 
$$5 \times \frac{2}{8} = \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4}$$
 or  $\frac{2}{8} \times 5 = \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4}$ 

**3** a 
$$\frac{6}{5} = 1\frac{1}{5}$$
  
c  $\frac{20}{6} = 3\frac{2}{6} = 3\frac{1}{3}$   
**b**  $\frac{35}{8} = 4\frac{3}{8}$ 

- 4
   Answer=1
   Answer=2
   Answer=3

   A, D, F
   B, E, H
   C, G
- **5** C

6 Diagram showing the correct fractions of the pie, for example:



# Think like a mathematician

$\frac{5}{12} \div 2$	$\frac{5}{8} \div 3$	$\frac{5}{6} \div 4$	$\frac{5}{4} \div 6$	$\frac{5}{3} \div 8$
$\frac{5}{2} \div 12$	$\frac{5}{1} \div 24$			

## Exercise 14.2

1 a 225.5 b	<b>266.84</b>	360.81
-------------	---------------	--------

4481.92

- **2** 207.36
- **3** 105.24
- **4** a 1115.4

**c** 1915.64

5 Not correct. The answer should be:

h

	1	7	0	5
×	1	5		
	8	5	2	5
1	7	0	5	0
2	5	5	7	5
1				

 $17.05 \times 5$  should be 85.25 and not 85.75 because  $5 \times 0 = 0$ , not 5

To avoid similar errors, Parveen should remember that if any number is multiplied by zero, the answer is zero.

- **6** 6.47 × 5
- **7** \$183
- **8** \$0.78 or 78 cents (35.28 34.50 = 0.78)

# Think like a mathematician $3.25 \times 64 = 208$

# Exercise 14.3

1	а	9.3	b	0.4
	с	0.09	d	28.01
2	а	3.07	b	5.05

- 3 8
- **4** 6.2
- **5**  $12.32 \div 8 = 1.54$ , all the other answers are 1.55
- **6** \$9.84
- 7 Shop A, as shop A charges \$1.72 for a pot and shop B charges \$1.74 for a pot. Learners will need to think about how many pots of paint they need. The cost of 1 pot in shop A is cheaper, but they must buy 4 pots at a time. If you only needed 3 pots, you would go to shop B.
- **8** 5.25 m

# Think like a mathematician

 $329.68 \div 52 = 6.34$ 

# Check your progress

- **1 a**  $\frac{12}{5} = 2\frac{2}{5}$  **b**  $\frac{35}{6} = 5\frac{5}{6}$  **c**  $\frac{18}{3} = 6$
- 2 Both equal to  $\frac{2}{15}$
- **3** \$5.25
- 4  $8.6 \div 5 = 1.72$  is the odd one out. All the other answers are 1.75.
- **5**  $6 \times \frac{7}{8} = 5\frac{1}{4}$   $6 \times \frac{3}{4} = 4\frac{1}{2}$   $6 \times \frac{5}{8} = 3\frac{3}{4}$  $8 \times \frac{7}{8} = 7$   $8 \times \frac{3}{4} = 6$   $8 \times \frac{5}{8} = 5$

$$10 \times \frac{7}{8} = 8\frac{3}{4}$$
  $10 \times \frac{3}{4} = 7\frac{1}{2}$   $10 \times \frac{5}{8} = 6\frac{1}{4}$ 

- a Smallest answer is  $6 \times \frac{5}{8} = 3\frac{3}{4}$
- **b** Largest answer is  $10 \times \frac{7}{8} = 8\frac{3}{4}$

# Unit 15 Data

# Getting started

- 1 a
   Weather
   Tally
   Total

   Cloudy
   ### ### IIII
   14

   Rainy
   ### I
   6

   Sunny
   ### ###
   10
  - **b** Learners' own waffle diagrams showing the correct tally results, for example:





- **2** a 10 minutes or more, but less than 20 minutes
  - **b** 3
  - **c** 32
  - d Learners' own answers. For example: The children in Group 1 might be younger and attend a small local school. The children in Group 2 might be older and attend a regional school.

34

# Exercise 15.1

- **1** a 9 b
  - **c** 43 **d** 10
- **2** a 11 b 12
  - **c** They both played 44 matches.
  - **d** Ken scores more goals and scores goals more often. Ken might be in a goalscoring position and Ben might be a defender.
- **3 a** 4–6 roses
  - **b** Both 1–3 and 10–12 roses
  - **c** 12

- **d** 10
- **e** 9
- **f** 4
- **g** 49
- **a** 20

4

**b**, **c** Answer depends on group size chosen. For example: 1–4 peas = 6, 5–8 peas = 20, 9–12 peas = 23, 13–16 peas = 19, 17–20 peas = 4

Number of peas	Tally	Total
1–4	++++ 1	6
5–8	++++ ++++ ++++	20
9–12	++++ ++++ ++++	23
13–16	++++ ++++ ++++	19
17–20	1111	4





d Answer depends on group size chosen. For example: The farmer would have found out that the most common number of peas found in a pod is between 9 and 12.

<b>5</b> a :	football	b	volleyball
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C	25%	d	5
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**e** 70% **f** 14

6

а	Sport	Frequency	Percentage
	Football	5	25%
	Basketball	9	45%
	Table tennis	3	15%
	Volleyball	1	5%
	Cricket	2	10%



- c Learners' own answers. For example: I would choose basketball because 12 children chose basketball altogether, which makes it the most popular out of the 40 children.
- d Learners' own answers.

7 a	а	i	$\frac{1}{5}$	ii	$\frac{2}{5}$	iii	$\frac{3}{10}$
	b	i	10%	ii	20%	iii	40%

- c Learners' own answers. For example: The groups are similar because 10% of each group prefer chalk.
- d Learners' own answers. For example: The groups are different because in group B pastel is the most popular, but in group A pastel, pencil and ink are all equally popular.
- 8 Pie chart showing how Asif's friends travelled to school



- **9** a Use a pie chart as it will be clear if a candidate has 50% or more votes by whether more than half of the pie chart is shaded.
  - **b** Use a bar chart as it will be clearer who has the most votes.
- **10** Learners' own answers
- **11** More than one possible answer, for example:

- a We need to choose a sport for our class to demonstrate at an open day. What sport should we choose?
- **b** The parents' association are buying some dance shoes for our class. What sizes should they buy?
- c We want to find out if the planting around our school is good for encouraging bees. What plants do we have, and how many of them?
- d The school is buying some scissors for right-handed and left-handed learners. How many should they buy of each?

Learners' own answers.

#### Exercise 15.2

- **1 a** 11 **b** 8 **c** 21
- 2 Learners' own answers
- **3** a Learners' own answers, for example: 15–19, 20–24, 25–29, 30–34, 35–39. All groups should be the same size
  - **b** Learners' own answers, for example:

Vertical jumps (cm)	Tally	Total
15–19	II	2
20–24	<del>    </del>	6
25–29	++++ ++++	16
30–34	<del>    </del>	6
35–39		1

c Learners' own answers. Frequency diagram depends on groupings chosen, for example:



- d Learners' own answers. For example: The most common height to jump was between 25 cm and 29 cm. One child jumped 35 cm or higher.
- **4** a 19°C **b** 10:30 a.m.
  - c Thermometer 1: 18.5 °C Thermometer 2: 30 °C
  - d Thermometer 1: The line goes up a little then stays flat.

Thermometer 2: The line goes up more steeply, then comes back down.

e Learners' own answers. For example: Thermometer 2 was put in or near a source of heat that was removed at about 12 o'clock, such as a radiator that was turned off or a sunny window that went into shadow.



- **a** 30 minutes
- **b** Dee's pulse rate increased by 24 beats per minute from 106 to 130.
- **c** The line increases from 66 to 118, decreases to 106, increases to 130 and decreases to 68.
- d i 102 beats per minute
  - ii 112 beats per minute
  - iii 78 beats per minute

**6 a** 21 cm **b** 21 cm

**c** 18 cm **d** 24 cm

7 a, c



- **b** The more leaves the plant has, the taller it is.
- d A plant that was 14 cm tall would have approximately 7 leaves.
- e Learners' own answers
- 8 a line graph
  - **b** frequency diagram
  - c scatter graph

# Think like a mathematician

Learners' own answers

#### Check your progress

- a comedy
- **b** 20%
  - **c** 5 (25% of 20)
- 2 a, b



- c approximately 18 visitors
- 3 Learners' own answers

# Unit 16 The laws of arithmetic

# Getting started

Learners' own answers, showing that the order of multiplication can be changed to give the products of 7×8 and 5×2, for example: 7×8 = 56 and the other numbers are 5×2 which is 10.



- 4 No. She is incorrect as the multiplication should be done first. The answer should be 51.
- **5** a  $3 \times 7 + 9 = 30$ b  $6 \times 8 - 18 = 30$

#### Exercise 16.1

1 a  $1 \times 10 - 7 = 3$ . Tariq is thinking of the number 3.



**b**  $6 \times 2 - 5 = 7$ . Sonja is thinking of the number 7.



c  $(4+2) \div 3=2$ . Pierre is thinking of the number 2.



d  $(14-11) \times 3=9$ . Lan is thinking of the number 9.



2	а	21	b	22	С	9
	d	8	е	1	f	6

Calculation b is the same with the brackets removed.

- 3 a true
  - **b** true
  - **c** false  $(6+3) \times 4 = 36$  or  $6+3 \times 4 = 36$
- **4 a**  $(6+2) \times 5 = 40$ 
  - **b**  $(3+4) \times (2+4) = 42$
  - **c**  $3 \times (4+2) = 18$
  - **d**  $(4+3+2) \times 2 = 18$
- **5** Example answers:
  - **a**  $(2+5) \times 5 = 35$
  - **b**  $(7-5) \times 10 = 20$
  - **c**  $2 \times (14-5) = 18$
- 6 Learners' own answers. Any correct way to calculate  $42 \times 24$  using two factors of 24.
- 7 a  $(5 \times 70) + (5 \times 1) = 350 + 5 = 355$ 
  - **b**  $(6 \times 60) (6 \times 3) = 360 18 = 342$
  - **c**  $(7 \times 90) + (7 \times 2) = 630 + 14 = 644$
  - **d**  $(8 \times 40) (8 \times 3) = 320 24 = 296$
- 8 Working should be shown for all parts (see example in part a).

**d** 711

a 
$$3 \times (60 + 7)$$
  
=  $(3 \times 60) + (3 \times 7)$   
=  $180 + 21$   
=  $201$   
or  
 $3 \times (70 - 3)$   
=  $(3 \times 70) - (3 \times 3)$   
=  $210 - 9$   
=  $201$   
b  $744$  c  $336$ 

- 9 a False, the = sign should be < because 8+5-7=6 and 8+7-5=10
  - **b** False, the = sign should be > because  $2 \times (3+4) = 14$  and  $2 \times 3+4=10$
  - **c** True,  $(10 \times 5) \div 2 = 25$  and  $10 \times (5 \div 2) = 25$

# Think like a mathematician

Learners' own answers. There are several possible answers including:

 $11 = (3 \times 4) - 1$   $12 = 3 \times 4$   $13 = (3 \times 4) + 1$   $14 = (3 \times 4) + 2$   $15 = (4 + 1) \times 3$   $16 = (3 + 1) \times 4$   $17 = 3 \times (4 + 1) + 2$   $18 = (4 + 2) \times 3$   $19 = 4 \times (3 + 2) - 1$  $20 = (3 + 2) \times 4$ 

# Check your progress

- 1 2000 2 а 18 b 12 **c** 15 d 2 32 **f** 12 е b < 3 а > Example answers: 4  $3 \times (4 - 2) = 6$ b  $4 \times (3+7) = 40$ а
  - **c**  $4 \times (15 12) = 12$  **d**  $(18 3) \div 5 = 3$
- **5**  $(4+5+1) \times 5 = 50$

# Unit 17 Transformations

#### Getting started

- **1** (4, 1)
- **2** (5, 1), (2, 2), (0, 3), (4, 5)
- 3 All points of the triangle move one square left and two squares up.



**5** (5, 6)

## Exercise 17.1

1 A and ii, B and iv, C and i, D and iii

3 a, b



- a P'(0, 2), Q'(1, 4), R'(4, 4), S'(5, 2)
- b P"(-4, -4), Q"(-3, -2), R"(0, -2), S"(1, -4)

- a Yes. Learners' explanations. For example: The *x*-coordinate is -2. The *y*-coordinate is  $2\frac{1}{2}$ , which is the same as  $\frac{5}{2}$ , which can also be written as 2.5.
- **b** B is at  $\left(1\frac{1}{2}, -2\right)$  or  $\left(\frac{3}{2}, -2\right)$  or (1.5, -2)C is at  $\left(3\frac{1}{2}, 1\frac{1}{2}\right)$  or  $\left(\frac{7}{2}, \frac{3}{2}\right)$  or (3.5, 1.5)



- **b** (-1, 1), (0, 0) or any point using decimals or fractions between J and L such as (0.5, -0.5) or (-0.5, 0.5)
- **c** (-5, 2), (1, -4)
- **d** Two from: (2, 3), (3, 4), (4, 5), (5, 6), etc.
- e Parts b and d. Learners' own answers. For example:
  - **b** There are two coordinates with whole numbers, but you could also use fractions, e.g. (0.5, -0.5).
  - **d** J, K and L are the fixed vertices of the 'top' of the kite, but the 4th vertex can be any point along the diagonal KM after the point (1, 2).



## Think like a mathematician 2

a Learners' own answers. For example:

Group 1: Translation three squares right and two squares up. E to G, C to D, I to H

Group 2: Translation six squares left. F to G, A to C

Group 3: Translation one square left and six squares down. C to E, B to H

Group 4: Translation 11 squares right and two squares up. E to H, C to B

**b** Learners' own answers. For example:

Group 5: Translation eight squares right. D to B, G to H

#### Think like a mathematician 3

a 2 squares right and 1 square down



Kite	1st	2nd	3rd	4th
Coordinates	(1, 7)	(3, 6)	(5, 5)	(7, 4)

- d Learners' own answers. For example: It is going up by two every time. It is the odd numbers starting from 1.
- e Learners' own answers. For example: It is going down by one every time. Start at 7, and subtract 1 each time.
- f 5th is (7+2, 4-1) = (9, 3)6th is (9+2, 3-1) = (11, 2)
- g Learners' own answers



vertical

Learners' own answers

# Exercise 17.3



# Think like a mathematician 1



Learners' own answers. For example: A 90  $^{\circ}$  anticlockwise turn is in the direction of this

arrow so A must be on the

right and B must be on the left.

**b** Learners' own answers. For example: A clockwise turn is in the same direction as the





An anticlockwise turn is in the opposite direction to the hands of a clock like this:





3 a Example of groups: Group 1: A to B 90° rotation clockwise, i, iii, vi

Group 2: A to B 90° rotation anticlockwise, ii, iv, v

# Think like a mathematician 2

а





- **c** Learners' own answers. For example:
  - i The lines that join the corresponding vertices of the triangles after a translation are parallel.
  - ii The lines that join the corresponding vertices of the triangles after a reflection are parallel.
  - iii The lines that join the corresponding vertices of the triangles after a rotation are not parallel.
- d When you translate or reflect a triangle, the lines joining the corresponding vertices will always be <u>parallel</u>, but when you rotate a triangle the lines joining the corresponding vertices will never be <u>parallel</u>.

e The rule works for any 2D shape. Learners' own answers. For example: In a rotation the shape is turned, but in a translation or reflection it isn't.





# Check your progress

**1** a A (-3, 1) b B (-4, -3)

**c** C (2.5, 3) or 
$$\left(2\frac{1}{2}, 3\right)$$
 or  $\left(\frac{5}{2}, 3\right)$ 

**d** D (2, -2.5) or 
$$\left(2, -2\frac{1}{2}\right)$$
 or  $\left(2, -\frac{5}{2}\right)$ 

- **2** a (4, -2)
  - **b** Any point on the line segment EF, including fractions and decimals. Examples: (-1, 0), (-1, -1)
  - **c** (4, 4), (-6, -2)





