

> Learner's Book

answers

Unit 1

Getting started

- 1 **a** 2, 3, 5, 7, 11, 13, 17, 19
b The even numbers 22, 24, 26, 28 are not prime. 21 and 27 are multiples of 3. 25 is a multiple of 5. That just leaves 23 and 29 as prime numbers.
- 2 **a** 1, 2, 3, 6, 9, 18
b 18, 36, 54, 72, 90
c 6
d 36
- 3 **a** -3 **b** -9 **c** -18
d -2 **e** -2 **f** 4
- 4 **a** square **b** cube
c cube **d** both square and cube
e square **f** square
- 5 **a** 10 **b** 5 **c** 9

Exercise 1.1

- 1 **a, b, c** and **d** Many different trees are possible. They all end with 2, 2, 2, 3, 5.
- 2 **a** and **b** Different trees are possible but they should end with 2, 2, 3, 3, 3.
c $108 = 2^2 \times 3^3$
d peer discussion
- 3 **a** Different trees are possible.
b $200 = 2^3 \times 5^2$
c peer discussion
d There are two different possible trees.
- 4 **a** Many trees are possible.
b $330 = 2 \times 3 \times 5 \times 11$

- 5 **a** 20 → **i** $2^2 \times 5$
b 24 → **ii** $2 \times 3 \times 7$
c 42 → **iii** $2^2 \times 3^2 \times 5$
d 50 → **iv** 2×5^2
e 180 → **v** $2^3 \times 3$

- 6 **a** 315 **b** 1000 **c** 396
d 784 **e** 867
- 7 **a** $2^2 \times 7$ **b** $2^2 \times 3 \times 5$ **c** $2^3 \times 3^2$
d $3^2 \times 17$ **e** $2 \times 5 \times 19$ **f** $5^2 \times 11$
- 8 **a** and **b**

Number	Product of primes
35	5×7
70	$2 \times 5 \times 7$
140	$2^2 \times 5 \times 7$
280	$2^3 \times 5 \times 7$
560	$2^4 \times 5 \times 7$
1120	$2^5 \times 5 \times 7$
...	...

- 9 **a** $7 \times 11 \times 13$ **b** $2^2 \times 7 \times 11 \times 13$
c $2 \times 3 \times 7 \times 11 \times 13$
- 10 **a** $132 = 2^2 \times 3 \times 11$ **b** $150 = 2 \times 3 \times 5^2$
c $2^3 \times 3^2 \times 5^2 \times 11$
- 11 **a** **i** 3×5 **ii** $3^2 \times 5^2$
iii $2^2 \times 7$ **iv** $2^4 \times 7^2$
v $2^2 \times 3^2$ **vi** $2^4 \times 3^4$
- b** The indices for n^2 are double the indices for n .
- c** $96^2 = 2^5 \times 3 \times 2^5 \times 3 = 2^{10} \times 3^2$. Double the indices for each factor. This method will work for all numbers.

- 12 a 4 b 280
 13 a 30 b 900
 14 a 18 b 540
 15 a $3^2 \times 5$ b 3×5^2
 c 225 d 15
 16 a 1260, many trees are possible.
 b peer discussion
 17 a $2^2 \times 3^2 \times 11$ b $2^3 \times 3 \times 7$
 c 12 d 5544
 18 a 2 b 986
 19 $63 = 3^2 \times 7$ and $110 = 2 \times 5 \times 11$; they have no common prime factors so the HCF is 1.
 20 a 1 b 1739
 c If x and y are different prime numbers, the HCF is 1 and the LCM is xy
 d peer discussion

Exercise 1.2

- 1 a $-3 \times 4 = -12$; $-3 \times 3 = -9$;
 $-3 \times 2 = -6$; $-3 \times 1 = -3$;
 $-3 \times 0 = 0$; $-3 \times -1 = 3$; $-3 \times -2 = 6$;
 $-3 \times -3 = 9$; $-3 \times -4 = 12$ and so on.
 b The first number is always -3 . The second number goes down by 1 each time. The answer goes up by 3 each time.
 c $-5 \times 4 = -20$; $-5 \times 3 = -15$;
 $-5 \times 2 = -10$; $-5 \times 1 = -5$;
 $-5 \times 0 = 0$; $-5 \times -1 = 5$; $-5 \times -2 = 10$;
 $-5 \times -3 = 15$; $-5 \times -4 = 20$ and so on. The first number is always -5 . The second number goes down by 1 each time. The answer goes up by 5 each time.
 d The product of two negative numbers is the same as the product of the corresponding positive numbers. For example, $-6 \times -4 = 6 \times 4 = 24$. You could write this as $-a \times -b = a \times b$.
 e learners' own sequence
 f peer discussion
 2 a -10 b -10
 c 10 d 10

- 3 a 24 b 49
 c 60 d 88

4

$\times$	-5	3	-8
4	-20	12	-32
-3	15	-9	24
-6	30	-18	48

- 5 a -32 b 48
 c 12 d -30
 6 a -28 b -33
 c 36 d 25
 7 a $3 \times -4 = 2 \times -6 = -12$ and
 $-6 \times -2 = 12 \times 1 = -4 \times -3 = -12 \times -1 = 12$
 b There are many possible answers.

8

a	b	c
-96 -8 12 2 -4 -3	75 -15 -5 -3 5 -1	200 20 10 -4 -5 -2

- 9 a

90

-6

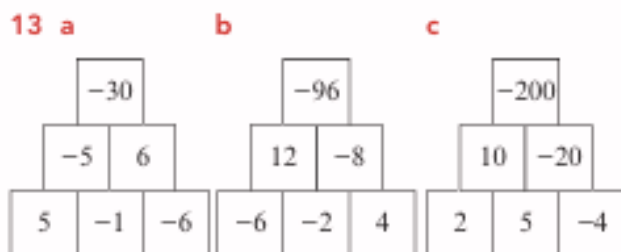
-15

-2

3

-5

 b Zara is incorrect. One possible statement is that the top number is 90, -150 or -60 .
 10 a 4 b -9
 c -4 d -8
 11 a $-24 \div 6 = -4$ or $-24 \div -4 = 6$
 b learners' examples
 c $14 \div -2 = -7$ or $14 \div -7 = -2$
 d learners' examples
 e learners' own conjectures
 f peer discussion
 12 a -3 b 7
 c -5 d 3
 e -7 f 6
 g -12 h 5



- 14 a** 6 **b** 6
c -3 **d** -3
15 a $x = -32$ **b** $x = 45$
c $x = -8$ **d** $x = -5$
16 a -3 **b** -3
c 7 **d** 5
17 a 1500 **b** -1200
c 7 **d** -5

Exercise 1.3

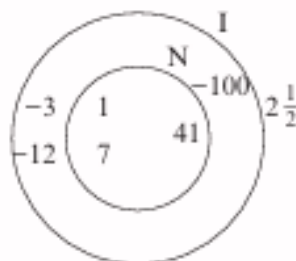
- 1 a** 49 **b** 49
c 343 **d** -343
2 a 5 **b** -3
c -1 **d** -2
3 a $x = 10$ or -10 **b** $x = 12$ or -12
c $x = 1$ or -1 **d** $x = 0$
e no solution
4 a $x = 6$ **b** $x = -3$
c $x = -1$ **d** $x = -5$
5 a 27 **b** no solution
c 9 **d** -9
6 a $\sqrt{8^2} = \sqrt{64} = 8$ as the calculator only gives the positive square root, and $\sqrt{(-8)^2} = \sqrt{-8 \times -8} = \sqrt{64} = 8$, so the difference is 0.
b $\sqrt[3]{4^3} - \sqrt[3]{(-4)^3} = 4 - (-4) = 4 + 4 = 8$
7 The integer is 10 or -10 so the cube is $10^3 = 1000$ or $(-10)^3 = -1000$
8 a $3 \times 13 = 39$ **b** $x = 39$ or -39
9 a $-5^2 = -25$ but $(-5)^2 = +25$
b There is no difference: $-5^3 = -(5 \times 5 \times 5) = -125$ and $(-5)^3 = -5 \times -5 \times -5 = -125$

- 10 a** $3^2 + 4^2 = 9 + 16 = 25 = 5^2$
b i True: $(-3)^2 + (-4)^2 = 9 + 16 = 25 = (-5)^2$
ii True: $12^2 + (-5)^2 = 144 + 25 = 169 = (-13)^2$
iii False: $8^2 = 64$ but $-10^2 - 6^2 = -100 - 36 = -136$ which is not the same.
c peer discussion
11 a i $2^2 + 2 = 4 + 2 = 6$
ii $(-3)^2 + (-3) = 9 - 3 = 6$
b i $3^2 + 3 = 9 + 3 = 12$
ii $x = -4$
c $x = 4$ or -5
d One solution is a positive integer n and another is $-(n+1)$.
 Another equation like this is $x^2 + x = 30$ which has the solution $x = 5$ or -6
e peer discussion

12 a

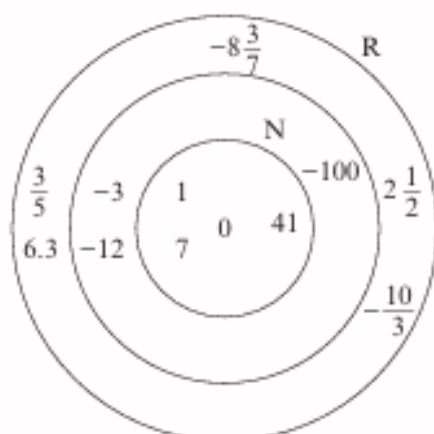
x	$x-1$	x^3-1	x^2+x+1
2	1	7	7
3	2	26	13
4	3	63	21
5	4	124	31

- b** The third column divided by the fourth column = the second column.
 That is $(x^3 + x + 1) \div (x^2 + x + 1) = x - 1$
c The next row is 6, 5, 215, 43 and $215 \div 43 = 5$
d The result is the same for negative values of x .
e peer discussion
13 a 5, -500, 16 **b** 5, 16
c all six numbers: 5, $-\frac{1}{5}$, -500, 16, -4.8, $99\frac{1}{2}$
14 a and b



Learners may omit $2\frac{1}{2}$ from the Venn diagram.

c and d



- e Peer discussion may lead to argument about 6.3 which is rational because it can be written as $6\frac{3}{10}$.

Exercise 1.4

1

Power	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9	2^{10}
Number	1	2	4	8	16	32	64	128	256	512	1024

2

Power	3^0	3^1	3^2	3^3	3^4	3^5	3^6	3^7	3^8
Number	1	3	9	27	81	243	729	2187	6561

- 3 a i $2^3 \times 2^2 = 2^5$ ii $2^4 \times 2^3 = 2^7$
 iii $2^2 \times 2^5 = 2^7$ iv $2^1 \times 2^7 = 2^8$
 v $2^4 \times 2^5 = 2^9$

- b Add the indices to get the index of the answer. Learners' own examples.
 c The same rule applies. Learners' own examples.
 d The rule works for powers of any positive integer.

4 a 6^5 b 6^5 c 6^7 d 6^6

5 a 10^5 b 20^6 c 15^6 d 5^8

6 a $6561 \times 3 = 19683$ b $15625 \times 5 = 78125$

7 a 3^2 b 9^5 c 12^2 d 15^7

- 8 The first part is correct because $4^2 = 16 = 2 \times 2 \times 2 \times 2 = 2^4$.
 The second part is not correct because $4^3 = 4 \times 4 \times 4 = 64$ but $3^4 = 3 \times 3 \times 3 \times 3 = 81$

9 a 10^8

b 10^{12}

10 a 2^6 b 3^9 c 5^7 d 10^9

11 a 3^6

b i 2^6 ii 5^6 iii 4^6

iv 15^8 v 10^{12}

c i N^6 ii N^8 iii N^{15}

d To find a power of a power you multiply the indices $(N^a)^b = N^{ab}$

12 a i $2^6 \div 2^2 = 2^4$ ii $3^4 \div 3^1 = 3^3$

iii $2^9 \div 2^4 = 2^5$ iv $3^6 \div 3^2 = 3^4$

v $3^2 \div 3^2 = 3^0$

b learners' own examples

c When you divide powers you subtract the indices.

d peer discussion

13 a 2^2 b 10^3 c 15^2

d 8^1 or 8 e 2^4 f 2^0 or 1

14 a 9^7 b 9^3 c 9^{10}

d 5^9 e 12^5 f 7^9

g 10^0 or 1

15 a Yes: $(5^2)^3 = 5^2 \times 5^2 \times 5^2 = 5 \times 5 \times 5 \times 5 \times 5 \times 5$
 $= (5 \times 5 \times 5) \times (5 \times 5 \times 5) = (5^3)^2$

b Yes

16 a $3^2 \times 5^2$ b $3^3 \times 5^3$

c $3^5 \times 5^5$ d $3^8 \times 5^8$

17 a 5^2 b 5^0

c You might suggest 5^{-2} .

Check your progress

- 1 a Different trees are possible. They all end with 2, 5, 5, 7

b $350 = 2 \times 5^2 \times 7$

c $112 = 2^4 \times 7$

d 14

e 2800

2	$\times$	-6	-5	7
-10		60	50	-70
3		-18	-15	21
-7		42	35	-49

3 a No: $(-5)^2 = 25$

b No: $-9 \times -11 = 99$

c No: $45 \div -9 = -5$

d Yes

4 a -8

b 6

c -20

d -10

5 a $x = 6$ or -6

b No solution

c $x = 2$

d $x = -3$

6 a 3

b 0

7 a 36

b -18

8 a 8^5 b 8^4

c 8^0 d 8^9

9 a 2^{12}

b 3^8

Unit 2

Getting started

1 a $2n$

b $n + 5$

2 12

3 a $7c + 7d$

b $2xy + 8yz$

4 a $4x + 12$

b $12 - 18y$

5 a $n = 3$

b $m = 9$

c $p = 9$

d $r = 6$

6 $x \geq 3$

Exercise 2.1

1 In the expression $4x + 9$, x is a variable, $4x$ and 9 are terms of the expression. 4 is the coefficient of x . 9 is a constant. The expression is not equal to anything so cannot be solved.

2 a i $x - 2$

ii $x + 2$

iii $\frac{x}{2}$

iv $2x$

b i 10

ii 14

iii 6

iv 24

3 a i $6n + 1$

ii $\frac{n}{4} + 5$

iii $2n - 3$

iv $\frac{n}{10} - 7$

b i 121

ii 10

iii 37

iv -5

4 a and iv, b and i,

c and v, d and ii,

e and vii, f and iii

vi: subtract n from 4, then multiply by 5

5 learners' answers including Sofia is correct

6 a $\frac{x}{3} + 1$

b $\frac{x+1}{3}$

c $\frac{x-1}{3}$

d $\frac{x}{3} - 1$

7 Learners' answers including they are all correct. The usual convention is to write the expression without a multiplication sign (i.e. like Zara and Arun, not like Sofia).

8 a Equivalent to $\frac{3x}{4}$ are: A, E, F and H

Equivalent to $\frac{4x}{3}$ are: C, D and I

Equivalent to $\frac{x+3}{4}$ are: B and J

b G: $\frac{3}{4} + x$

9 a correct

b incorrect, should be $5 - \frac{2y}{5}$ or $5 - \frac{2}{5}y$

10 a i $\frac{x}{2} + 8$ or $\frac{1}{2}x + 8$

ii $\frac{3x}{4} - 12$ or $\frac{3}{4}x - 12$

iii $7 + \frac{4x}{5}$ or $7 + \frac{4}{5}x$

iv $20 - \frac{5x}{9}$ or $20 - \frac{5}{9}x$

b i one-sixth of x add 2

ii five-sevenths of x subtract 4

iii eight subtract two-thirds of x

iv three add seven-eighths of x

11 a perimeter is $a + 12bc$ cm area is $3ab$ cm²

b perimeter is $14c + \frac{6}{5}d$ cm area is $\frac{21}{5}cd$ cm²

12 $4y + 9$

13 a $c + 3s$

b $3c + 4g + 6s$

14 a $a + \frac{b}{2}$ b $2b + \frac{3c}{4}$
 c $3a + \frac{b}{4} + \frac{4c}{5}$
 15 a $6\left(\frac{y}{2} + 5\right)$ b $2\left(\frac{y}{5} + 6\right)$
 c $5\left(\frac{5y}{6} + 2\right)$ d $6\left(\frac{2y}{5} + 5\right)$

Exercise 2.2

1 a 2 b -2
 c -18 d -5
 e 3 f -7
 2 a -21 b 4
 c 23 d -7
 e -3 f 2
 3 a 21 b -15
 c 45 d -15
 e 16 f 3
 g 54 h 3
 i -44 j 8
 4 a $-3 \times -3 = 9$ not -9
 b 1 c 29
 5 a She must work out $(-2)^3$ first before multiplying by 5.
 b -40 c -54
 6 a i months = years $\times 12$
 ii $m = 12y$
 b $m = 96$
 7 a i cost = 6 + kilometres $\times 2$
 ii $c = 6 + 2k$
 b $c = 76$
 8 a $v = 125$
 b $v = 158$
 c $v = 200$
 9 a $F = 12$
 b $F = 54$
 c $F = -32$

10 a 145 cm b 157.5 cm
 c 132.5 cm d 175 cm
 e 160 cm f 120 cm
 11 a 60 m or 57 m b 59.7 m
 12 Prism A $V = 360 \text{ cm}^3$, Prism B $V = 378 \text{ cm}^3$.
 No, Xavier is wrong. Prism B has the larger volume by 18 cm^3 .

13 a B b C
 c A d B
 e A
 14 a $T = 45$ b $m = \frac{T}{g}$
 c $m = 32$
 15 a $h = 35$ b $k = h + d$
 c $k = 2.25$
 16 a $f = 5$ b $w = fp$
 c $w = 13$
 17 a learners' answers
 b learners' answers
 c i $p = 9$ ii $m = 6$

Exercise 2.3

1 a $3x + 12$ b $8y - 16$
 c $27q - 36$
 2 a $4x + 24$ b $7z - 14$
 c $2a + 16$ d $18 - 24e$
 e $4p + 6q$ f $54t - 18s$
 g $42xy - 14z$ h $10x + 5y + 20$
 3 a $xy + 3x$ b $y^2 - 2y$
 c $3p + 4p^2$ d $6q^2 - 15q$
 4 a $y^2 + 8y$ b $2wz - z$
 c $m^2 - 4m$ d $2n^2 + 5n$
 e $9n - 8n^2$ f $a - 3ab$
 g $2e^2 + 7ef$ h $3gh + 7g^2$
 i $2h^2 - 5hk$ j $3cd - 5de$

5 learners' answers

Both Zara and Arun are correct but convention is that we write the letters in alphabetical order like Zara.

6 a learners' answers

b learners' answers

$$\begin{array}{ll} \text{c i} & 2x^2 + 6xy \\ \text{ii} & 15y^2 + 18y \\ \text{iii} & 24b^2 - 8ab \\ \text{iv} & 4f^2 + 2fg - 6f \end{array}$$

7 $16x^3 + 12x^2$: A, E, I

$$30x^3 + 20x: \text{B, D, G}$$

$$24x^3 + 18x^2: \text{C, F, H}$$

$$8 \text{ a } x(2x+5) - 3x(2x+4) = 2x^2 + 5x - 6x^2 - 12x$$

$$\text{b } x(2x+5) - 3x(2x-4) = 2x^2 + 5x - 6x^2 + 12x$$

$$\begin{array}{l} \text{c } \odot(\otimes + \otimes) + \bigcirc(\star + \blacklozenge) = \odot\otimes + \odot\otimes + \bigcirc\star + \bigcirc\blacklozenge \\ \odot(\otimes + \otimes) + \bigcirc(\star - \blacklozenge) = \odot\otimes + \odot\otimes + \bigcirc\star - \bigcirc\blacklozenge \\ \odot(\otimes + \otimes) - \bigcirc(\star + \blacklozenge) = \odot\otimes + \odot\otimes - \bigcirc\star - \bigcirc\blacklozenge \\ \odot(\otimes + \otimes) - \bigcirc(\star - \blacklozenge) = \odot\otimes + \odot\otimes - \bigcirc\star + \bigcirc\blacklozenge \end{array}$$

$$9 \text{ a } 2x^2 + 7x \quad \text{b } 6z^2 + 6z$$

$$\text{c } u^2 + 2u \quad \text{d } 2w^2 + 20wx$$

10 a Q1: the +21 should be -21

Q2: up to $ac + 3bc$ is correct, but this cannot be simplified as they are not like terms

$$\text{Q3: the } 9x^2 \text{ should be } 3x^2$$

$$\text{b } \text{Q1: } 2x + 19$$

$$\text{Q2: } ac + 3bc$$

$$\text{Q3: } 3x^2 + 2y^2 + 14xy$$

Activity 2.3

Correct expansions are:

$$\text{A } 17x^2 + 5x$$

$$\text{B } 7y^3 + 48y^2 + 4y$$

$$\text{C } 14p^3 + 49p^2 + 2p$$

$$\text{D } 15k^3 - 6k + 18$$

$$\text{E } 3n^3 - 4n^2 - 20n$$

$$\text{F } 30m$$

Exercise 2.4

$$1 \text{ a } 3(x+5) \quad \text{b } 5(2y-3)$$

$$\text{c } 7(2-4x) \quad \text{d } 3(4-3y)$$

$$2 \text{ a } x(4x+5) \quad \text{b } 6y(x+2)$$

$$\text{c } 7y(1-y) \quad \text{d } 3x(7-4y)$$

3 peer discussion, e.g.

Arun has fully factorised $6x+18$ to get $6(x+3)$.

Marcus has only partially factorised $6x+18$ to get $3(2x+6)$.

Marcus has used a common factor, but Arun has used the highest common factor.

$$4 \text{ a } 2(x+2) \quad \text{b } 2(2b-3)$$

$$\text{c } 2(4+5y) \quad \text{d } 2(9-10m)$$

$$5 \text{ a } 3(6+7p) \quad \text{b } 3(y-6)$$

$$\text{c } 3(3+5m) \quad \text{d } 3(4-9x)$$

$$6 \text{ a } 5(2z+1) \quad \text{b } 4(2a-1)$$

$$\text{c } 7(2+3x) \quad \text{d } 6(3-4z)$$

7 a peer discussion; Sofia is correct.

$$\text{b i } 4y$$

$$\text{ii } 3p$$

$$\text{iii } a$$

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

$$9 \text{ a } x(3x+1) \quad \text{b } 6y(y-2)$$

$$\text{c } 3b(1+3b) \quad \text{d } 3n(4-5n)$$

$$\text{e } 9(2y-x) \quad \text{f } 3(4y+3x)$$

$$\text{g } 4y(2x-1) \quad \text{h } 5z(3+2y)$$

$$10 \text{ a } 2(x+3y+4) \quad \text{b } 4(y-2+x)$$

$$\text{c } 3(3xy+4y-5) \quad \text{d } x(5x+2+y)$$

$$\text{e } y(9-y-x) \quad \text{f } 3y(y-3+2x)$$

$$\begin{aligned} 11 \quad 5(2x+6) + 2(3x-5) &= 10x + 30 + 6x - 10 \\ &= 16x + 20 \\ &= 4(4x+5) \end{aligned}$$

12 Correct expansion is:

$$\begin{aligned} 6(3y+2)-4(y-2) &= 18y+12-4y+8 \\ &= 14y+20 \\ &= 2(7y+10) \end{aligned}$$

Marcus has used -8 instead of $+8$ in the first line of the expansion like this:

$$\begin{aligned} 6(3y+2)-4(y-2) &= 18y+12-4y-8 \\ &= 14y+4 \\ &= 2(7y+2) \end{aligned}$$

13 A length = $a+9$ **B** length = $4d-5c$

Exercise 2.5

1 a equation **b** expression

c formula **d** expression

2 a $x=7$ **b** $x=9$

c $y=44$ **d** $y=8$

3 a $\frac{x}{2}-3=15$
 $\frac{x}{2}-3+3=15+3$
 $\frac{x}{2}=18$
 $x=18 \times 2$
 $x=36$

b $\frac{x}{3}+1=12$
 $\frac{x}{3}+1-1=12-1$
 $\frac{x}{3}=11$
 $x=11 \times 3$
 $x=33$

c $\frac{x}{4}+9=30$
 $\frac{x}{4}+9-9=30-9$
 $\frac{x}{4}=21$
 $x=21 \times 4$
 $x=84$

4 learners' answers

Example: It doesn't matter as you will get the same answer, but it is easier to have the greater number of 'y's on the left hand side of the equation.

5 a $x=2\text{ cm}$ **b** $x=14\text{ cm}$

c $x=12\text{ cm}$

6 learners' answers

Example: Substitute the value for x into the expression for each side length of the triangles and the answers should be equal.

7 a $y=7\text{ cm}$ and side lengths = 16 cm

b $y=4\text{ cm}$ and side lengths = 27 cm

c $y=12\text{ cm}$ and side lengths = 36 cm

8 a $x=8, y=7$ **b** $x=9, y=5$

c $x=7, y=4$ **d** $x=32, y=3$

To check answers, substitute values of x and y into expressions for side lengths.

9 a $3x+8=23, x=5$

b $\frac{x}{4}-8=5, x=52$

c $5x-4=2x+20, x=8$

d $2(x+5)=5x-14, x=8$

10 a $6n+2n+5+n-5=180$ or $9n=180$

b $n=20$

c $6n=120^\circ, 2n+5=45^\circ, n-5=15^\circ$

11 a $4x-6=2x+18$

b $x=12$

c $4x-6$ and $2x+18$ both equal 42° ,
3rd angle = 96°

12 a $x=2$ **b** $x=3$

c $y=12$ **d** $y=30$

13 a $a=-4$ **b** $c=3.5$

c $d=5$

14 a $\frac{y}{4}-18=4, y=88$

b $2y+14=-20, y=-17$

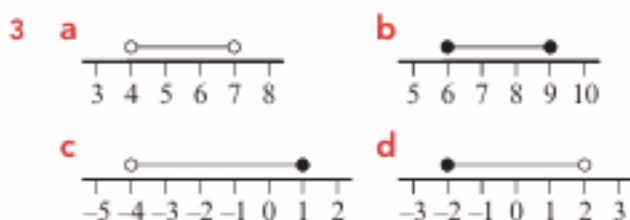
Table shows all possible values for y .

	4	-2	-20
$2y+14$	$y=-5$	$y=-8$	$y=-17$
$8(y-12)$	$y=12.5$	$y=11.75$	$y=9.5$
$\frac{y}{4}-18$	$y=88$	$y=64$	$y=-8$

Exercise 2.6

- 1 a x is greater than 6 and less than 11
 b x is greater than or equal to 12 and less than or equal to 18
 c x is greater than 0 and less than or equal to 20
 d x is greater than or equal to -9 and less than -1

- 2 a $3 \leq y < 17$ b $15 < y < 25$
 c $-2 < y \leq 5$ d $-9 \leq y \leq -3$



- 4 a $12 < x < 16$ b $1 < x \leq 5$
 c $-3 \leq x < 1$ d $2 \leq x \leq 8$

- 5 a Sofia: $x > 5$, $2 \times x > 2 \times 5$, $2x > 10$
 Zara: $x > 5$, $x - 2 > 5 - 2$, $x - 2 > 3$
 b learners' answers
 Examples: $3x > 15$, $4x > 20$, $10x > 50$,
 $x - 3 > 2$, $x - 5 > 0$, $x + 5 > 10$
 c learners' answers
 Example: It is not possible to say as there is an infinite number of possibilities.

- 6 a $x > 8$ is equivalent to $3x > 24$
 b $x < 3$ is equivalent to $5x < 15$
 c $y \geq 7$ is equivalent to $y + 3 \geq 10$
 d $y \leq 2$ is equivalent to $y - 4 \leq -2$

- 7 a Ryan has misunderstood the symbols: he has interpreted $\leq$ as 'greater than' and $<$ as 'less than or equal to'.

- i smallest integer is 12
 ii largest integer is 17
 iii x could be 12, 13, 14, 15, 16, 17

- b peer discussion

- 8 a i 4 ii 7
 iii 4, 5, 6, 7
 b i 5 ii 7
 iii 5, 6, 7
 c i 0 ii 5
 iii 0, 1, 2, 3, 4, 5

- d i -10 ii -6
 iii $-10, -9, -8, -7, -6$

- 9 peer discussion, including Arun is correct.

Convention is that we would write $2 < y < 9$ rather than $9 > y > 2$.

- 10 a T b F c T d F

- 11 a i $8 \leq m < 15$ ii $7 < m \leq 10$
 iii $0 < m < 6$

- b No – if you show these inequalities on a number line they are two separate sections that cannot be combined.

- 12 a smallest integer is 3 not 2; m could be 3, 4, 5, 6, 7 (but not 2)

- b A i 6 ii 9 iii 6, 7, 8, 9
 B i -6 ii -3 iii $-6, -5, -4, -3$

- 13 a learners' answers

- b answers arranged into rows

Inequality	Smallest integer	Largest integer	List of integers
$1.5 \leq x \leq 4$	2	4	2, 3, 4
$0.8 < x < 5.9$	1	5	1, 2, 3, 4, 5
$3 < x \leq 6.1$	4	6	4, 5, 6
$2.2 \leq x < 3.9$	3	3	3
$-4.5 < x < 1.1$	-4	1	$-4, -3, -2, -1, 0, 1$
$-5.01 < x \leq 0$	-5	0	$-5, -4, -3, -2, -1, 0$

Check your progress

1 $\frac{x}{2} + 5$

2 a $K = 48$

b $m = \frac{K}{8}$

c $m = 7.5$

3 a $x^2 + 3x$

b $35y^2 - 20wy$

4 a $3(2x + 3)$

b $2y(y - 6)$

5 $x = 5, y = 12$

6 $5 < x \leq 20$

Unit 3

Getting started

- 1 a 45 b 180
c 8200 d 460
- 2 a 7 b 34.2
c 1.4 d 31.2
- 3 a A 7.2 b B 12.5 c B 0.8
- 4 a 4.59 b 0.6723
c 54.789 d 12.050 30

Exercise 3.1

- 1 a 2 b 20 c 200 d 0.2
- 2 a 4 b 400 c 0.4 d 40
- 3 a learners' answers
b **Sofia:** When I multiply 56 by 0.01, I move the digits 5 and 6 two places to the right in the place value table. This gives me an answer of 0.56
Arun: When I multiply 56 by 0.01, I move the decimal point two places to the left. This gives me an answer of 0.56
- 4 a 6.2 b 5.5 c 12.5
d 0.32 e 0.37 f 6.55
g 7.5 h 0.04
- 5 a 20 b 200
c 2000 d 2
- 6 a 400 b 4000
c 40 000 d 40
- 7 a learners' answers
b $0.45 \div 0.1 = 4.5$ and $78 \div 0.01 = 7800$
- 8 a 70 b 45 c 5220
d 6.7 e 200 f 850
g 32 h 722.5
- 9 a 1.8 b 0.236
c 6 d 450
- 10 a + b $\times$ c $\times$
d $\times$ e + f +

- 11 a 0.01 b 0.1 c 0.01
d 0.1 e 0.1 f 0.1

- 12 a 12.5 g b 0.8 g
c Yes, multiplying by 0.1 is the same as finding 10%.
d 1%. Multiplying by 0.01 is the same as finding 1%.
- 13 a A, F and J all equal 2.4, B, E and H all equal 24, C, G and I all equal 240
b D is left over and equals 2400. Any two calculations that give 2400, e.g. $240 \div 0.1$, 24000×0.1 or 240000×0.01

- 14 125

- 15 a learners' answers
Example: $-4 \times 0.1 = -0.4$, which is not greater than zero
b learners' answers
Example: $0.4 \div 0.01 = 40$, which is not greater than 100

Exercise 3.2

- 1 a C b A
c B d C
- 2 a 240 b 0.24 c 24
d 0.0024 e 2400 f 2.4
- 3 a learners' answers
Example: In **a** he has forgotten the zeros. It should be 45 000. In **b** he has rounded to 2 d.p. not 2 s.f. It should be 0.033.
b learners' answers
Example: Fill in the gaps between the significant figures and the decimal point with zeros.
c learners' answers
Example: Fill in the gaps between the decimal point and the significant figures with zeros.
- 4 a 100 b 46 000 c 18.7
d 0.09 e 0.79 f 1.409
g 1000 h 0.70 i 8.60

- 5 a D b C
c B d D
e C
- 6 a 200 b 210 c 209
d 209.1 e 209.10 f 209.095
- 7 a 683.615 77 31
b i 700 ii 680
iii 684 iv 683.6
v 683.62 vi 683.616
- 8 96 000
- 9 0.4 g
- 10 298 000 000 metres per second
- 11 learners' answers, but convention is that answers are usually given to the same accuracy as the numbers in the question. So Sofia is correct.
- 12 $12\,600 \times \$26.80 = \$337\,680$ which is $\$338\,000$ to 3 s.f.
- 13 $a = 2.1$ to 2 s.f.
- 14 a i 16 ii 16.1 (3 s.f.)
b i 700 ii 713 (3 s.f.)
c i 40 ii 42.6 (3 s.f.)
d i 80 ii 67.2 (3 s.f.)

Check your progress

- 1 a 9 b 55.2 c 1.35
d 0.08 e 60 f 235
g 520 h 68
- 2 B is a different answer from the others.
 $A = 0.52$, $B = 520$, $C = 0.52$, $D = 0.52$
- 3 a 78 b 0.0679
c 1.550 d 12 453 000
- 4 0.0041

Unit 4

Getting started

- 1 a $4.5 > 4.1$ b $6.57 < 6.68$
c $10.52 < 10.59$ d $2.784 > 2.781$

- 2 0.756, 0.759, 0.761, 0.763
- 3 a T b F
c F d T
- 4 $12 \times 1.8 = 21.6$, $19 \times 1.2 = 22.8$, $9 \times 2.5 = 22.5$,
 $25 \times 0.87 = 21.75$, $320 \times 0.07 = 22.4$
- 5 a 4.1 b 6.3
c 25.48 d 2.405

Exercise 4.1

- 1 a 2.06, 5.49, 5.91, 7.99
b 2.55, 2.87, 3.09, 3.11
c 11.82, 11.88, 12.01, 12.1
d 8.9, 9.09, 9.4, 9.53
- 2 a $4.23 < 4.54$ b $6.71 > 6.03$
c $0.27 > 0.03$ d $27.9 > 27.85$
e $8.55 > 8.508$ f $5.055 < 5.505$
- 3 learners' answers
- 4 a 23.592, 23.6, 23.605, 23.66
b 0.009, 0.08, 0.1, 0.107
c 6.007, 6.71, 6.725, 6.78
d 11.002, 11.02, 11.032, 11.1
- 5 a $6.71 \neq 670$ ml
b $4.05 \text{ t} \neq 4500$ kg
c $0.85 \text{ km} = 850$ m
d $0.985 \text{ m} \neq 985$ cm
e $14.5 \text{ cm} = 145$ mm
f $2300 \text{ g} \neq 0.23$ kg
- 6 a $4.51 > 2700$ ml
b $0.45 \text{ t} < 547$ kg
c $3.5 \text{ cm} < 345$ mm
d $0.06 \text{ kg} < 550$ g
e $7800 \text{ m} > 0.8$ km
f $0.065 \text{ m} < 6.7$ cm
- 7 a 780 g, 1950 g, 2.18 kg, 2.3 kg
b 0.8 cm, 9 mm, 12 mm, 5.4 cm
c 0.5 m, 53 cm, 650 cm, 12 m

- d** 95 ml, 450 ml, 0.55 l, 0.9 l
e 780 m, 1450 m, 6.4 km, 6.55 km
f 50 kg, 0.08 t, 0.15 t, 920 kg
- 8 a** No, his list starts with the largest and ends with the smallest.
 It should be $-4.52, -4.38, -4.31, -4.05$
b learners' answers
- 9 a** $-4.27 > -4.38$ **b** $-6.75 < -6.25$
c $-0.2 < -0.03$ **d** $-8.05 > -8.9$
- 10 a** $-4.76, -4.67, -4.5, -4.05$
b $-11.91, -11.6, -11.525, -11.08,$
- 11 a** 25 km. It is much further than the other distances.
b Mia is correct.
 $1.64 \text{ km} = \text{longest}, 0.2 \text{ km} = \text{shortest},$
 $8 \times 0.2 \text{ km} = 1.6 \text{ km}$ and $1.64 \text{ km} > 1.6 \text{ km}$
c Shen swims in the 25 m pool as all his distances are multiples of 25 m.
 Mia swims in the 20 m pool as all her distances are multiples of 20 m.
- 12 a** A 2.5, B 2.4, C 2.3, D 2.1, E 2.25, F 2.45
b 2.1, 2.25, 2.3, 2.4, 2.45, 2.5
- 13** No, there are 7 numbers not 8. x could be: 3.27, 3.28, 3.29, 3.30, 3.31, 3.32, 3.33
- 14** y could be: $-0.273, -0.272, -0.271, -0.270$

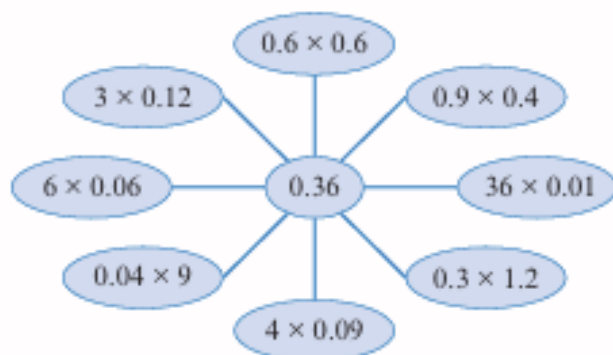
Exercise 4.2

- 1 a** -0.8 **b** 0.6 **c** -2.1
d 5.6 **e** -3.6
- 2 a** -0.18 **b** -1.8
c -0.018 **d** -18
- 3** C -7.65 , E -7.28 , A -7.2 , D -7.04 , B -7.02
- 4** learners' answers
- 5 a i** $2 \times 4 = 8$
 $0.2 \times 4 = 0.8$
 $0.2 \times 0.4 = 0.08$
 $0.2 \times 0.04 = 0.008$
 $0.2 \times 0.004 = 0.0008$

- ii** $3 \times 5 = 15$
 $0.3 \times 5 = 1.5$
 $0.3 \times 0.5 = 0.15$
 $0.3 \times 0.05 = 0.015$
 $0.3 \times 0.005 = 0.0015$

- b i** 0.009 **ii** 0.48
iii 0.028 **iv** 0.0015
v 0.036 **vi** 0.0066

6



- 7 a i** 365.4 **ii** 36.54
iii 365.4 **iv** 36.54
b, c learners' answers
- 8 a** $158 \times 46 = 7268$
b i 726.8 **ii** 726.8
iii 72.68 **iv** 7.268
v 7.268 **vi** 0.07268

9 learners' answers

- 10 a** 62.98 Estimate: $7 \times 9 = 63$
b 4.648 Estimate: $0.6 \times 8 = 4.8$
c 1.8745 Estimate: $0.2 \times 8 = 1.6$
d 0.17526 Estimate: $0.7 \times 0.3 = 0.21$
- 11 a** Estimate: $0.5 \times 3 = 1.5$. Her answer of 12.6 must be wrong.
b Estimate: $8 \times 0.009 = 0.072$. Her answer of 0.07254 could be correct.
c Estimate: $0.07 \times 0.04 = 0.0028$. Her answer of 0.02795 must be wrong.
- 12 a** $6 \times 7 = 42 \text{ mg}$ **b** 42.34 mg
- 13 a** $1 \times 4 = 4 \text{ g}$ **b** 3.255 g

Exercise 4.3

- 1 **a** $\frac{24}{4} = 6$ **b** $\frac{72}{9} = 8$
c $-\frac{420}{6} = -70$ **d** $-\frac{450}{5} = -90$
- 2 D because the answer is 8. All the others have an answer of 7.
- 3 learners' answers
- 4 **a** 2.3 **b** 8.2
c -860 **d** -960
- 5 \$1.35 per metre
- 6 learners' answers
- 7 **a** Estimate: $30 \div 0.3 = 100$
 Accurate: $27.6 \div 0.3 = 92$
b Estimate: $-200 \div 0.4 = -500$
 Accurate: $-232 \div 0.4 = -580$
c Estimate: $300 \div 1 = 300$
 Accurate: $306 \div 0.9 = 340$
d Estimate: $-490 \div 0.7 = -700$
 Accurate: $-483 \div 0.7 = 690$
e Estimate: $40 \div 0.8 = 50$
 Accurate: $43.76 \div 0.8 = 54.7$
f Estimate: $-30\,000 \div 0.6 = -50\,000$
 Accurate: $-33\,972 \div 0.6 = -56\,620$
- 8 **a** She hasn't written down the 0 above the 6.
b 42.05
- 9 **a** Carried on the division by writing a decimal point after the 7, then carrying the remainder of 9 onto the zero in the tenths column.
b 256.5

10 **a**

1	2	3	4	5	6	7	8	9
19	38	57	76	95	114	133	152	171

- b** 31.25 **c** $30 \times 2 = 60$

11 **a**

1	2	3	4	5	6	7	8	9
25	50	75	100	125	150	175	200	225

- b** \$23.56
c $\$23.56 \times 20$ and $20 \times 2.5 = 50$
- 12 14.75m

- 13 **a** **i** 425 **ii** 27
iii 4250 **iv** 270
b learners' answers
c **i** 425 **ii** 42.5
iii 4.25 **iv** 0.425
d learners' answers
e peer discussion

- 14 **a** 6.3 **b** 74.86 **c** -2473.5

Exercise 4.4

- 1 **a** 0.14 **b** 0.12
- 2 **a** 0.48 **b** 0.6
c 0.24 **d** 0.33
- 3 **a** 46.8 **b** 7.47
- 4 **a** 25.2 **b** 15.3 **c** 4.41
- 5 **a, b** learners' answers
c **i** $26 \times 9.9 = 257.4$
ii $26 \times 0.99 = 25.74$
- 6 59.4 m^2
- 7 3168
- 8 **a** 327 **b** 4.6 **c** 546
d 26.4 **e** 42
- 9 **a** 8.4 **b** 14.4
- 10 **a** 12 **b** 29
- 11 **a** 25.2 **b** 19.2
c 45 **d** 108
- 12 learners' answers
- 13 **a** Abdul gets \$4410, Zhi get \$3150, Paula gets \$2772, Yola gets \$2268
b $4410 + 3150 + 2772 + 2268 = 12\,600$

- 14 Sofia is correct. The missing number is 0.3.

Check your progress

- 1 **a** > **b** < **c** >
- 2 -3.6, -3.482, -3.449, -3.44, -3.06
- 3 **a** 0.08 **b** 0.21
- 4 2.6334
- 5 **a** 876 **b** 87.6 **c** 0.876
d 365 **e** 3650 **f** 365

6 6

7 a

1	2	3	4	5	6	7	8	9
15	30	45	60	75	90	105	120	135

b 25.47

c $25.47 \times 1.5 = 38.205$

8 a 0.036 **b** 24.3 **c** 4.9

Unit 7

Getting started

1 a $\frac{5}{3} \neq 1\frac{1}{3}$ **b** $2\frac{1}{2} = \frac{10}{4}$ **c** $3\frac{5}{6} \neq \frac{21}{4}$

2 a $\frac{2}{3} < \frac{5}{3}$ **b** $2\frac{1}{2} > \frac{9}{4}$ **c** $\frac{2}{5} < \frac{3}{7}$

3 a $5\frac{2}{3}$ **b** $7\frac{5}{12}$

4 a $\frac{7}{12}$ **b** $\frac{16}{21}$

5 a 75 **b** 128 **c** 3800

Exercise 7.1

1 a $\frac{1}{2} = 0.5$ Terminating decimal

b $\frac{1}{3} = 0.\dot{3}$ Recurring decimal

c $\frac{1}{4} = 0.25$ Terminating decimal

d $\frac{1}{5} = 0.2$ Terminating decimal

e $\frac{1}{6} = 0.1\dot{6}$ Recurring decimal

f $\frac{1}{7} = 0.\dot{1}4285\dot{7}$ Recurring decimal

g $\frac{1}{8} = 0.125$ Terminating decimal

h $\frac{1}{9} = 0.\dot{1}$ Recurring decimal

i $\frac{1}{10} = 0.1$ Terminating decimal

j $\frac{1}{11} = 0.\dot{0}\dot{9}$ Recurring decimal

k $\frac{1}{12} = 0.08\dot{3}$ Recurring decimal

2 a

Unit fraction	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{9}$	$\frac{1}{10}$	$\frac{1}{11}$	$\frac{1}{12}$
Decimal	0.5	$0.\dot{3}$	0.25	0.2	$0.1\dot{6}$	$0.14285\dot{7}$	0.125	$0.\dot{1}$	0.1	$0.0\dot{9}$	$0.08\dot{3}$
Terminating (T) or recurring (R)	T	R	T	T	R	R	T	R	T	R	R

- b i Zara is correct. $\frac{1}{16} = 0.0625$ and $\frac{1}{32} = 0.03125$.

Half of 0.5 is 0.25. From now on every halving means halving a decimal number with 25 on the end. Half of 25 is 12.5, so the final two digits of each fraction after 0.5 will always end in 25.

ii learners' answers

For example: All the fractions with a denominator which is a multiple of 3 are recurring decimals.

For example: The fractions with denominator 5, 10, 20, 40 (i.e. doubling each time) are terminating decimals. $\frac{1}{5} = 0.2$, $\frac{1}{10} = 0.1$, $\frac{1}{20} = 0.05$, $\frac{1}{40} = 0.025$, $\frac{1}{80} = 0.0125$

iii peer discussion

3 a learners' answers

For example: Terminating, because all the denominators are factors of 100.

- b A $\frac{5}{8} = 0.625$, B $\frac{3}{4} = 0.75$,
C $\frac{7}{10} = 0.7$, D $\frac{11}{20} = 0.55$,
E $\frac{3}{5} = 0.6$

- c D, E, A, C, B

4 a learners' answers

For example, recurring, because all the denominators are multiples of 3.

- b A $\frac{5}{6} = 0.8\dot{3}$, B $\frac{2}{3} = 0.\dot{6}$,
C $\frac{7}{12} = 0.58\dot{3}$, D $\frac{5}{9} = 0.\dot{5}$,
E $\frac{3}{11} = 0.2\dot{7}$

- c E, D, C, B, A

5 a learners' answers

For example: It's rounded the last 8 on the screen to a 9.

- b $\frac{8}{9} = 0.88888889$ $\frac{1}{9} = 0.11111111$
 $\frac{11}{15} = 0.73333333$ $\frac{7}{18} = 0.38888889$

c learners' answers

For example: Changes the fraction to a decimal.

learners' answers

For example: Changes the decimal back to a fraction.

- d i $\frac{7}{15} = 0.4\dot{6}$ ii $\frac{8}{11} = 0.7\dot{2}$

- 6 a $\frac{7}{9} = 0.\dot{7}$ b $\frac{13}{20} = 0.65$

- c $\frac{2}{15} = 0.1\dot{3}$ d $\frac{9}{40} = 0.225$

7 learners' answers

For example: The last two the digits are the same as the first two, so it must be repeating.

- 8 a $\frac{2}{7} = 0.28571\dot{4}$ b $\frac{9}{13} = 0.69230\dot{7}$

- c $\frac{11}{14} = 0.78571\dot{4}2$

- 9 a, b i $\frac{5}{12} = 0.41\dot{6}$ is correct

- ii $\frac{10}{11} = 0.9\dot{0}$ is wrong as the recurring dot should be over the 9 and the 0, so $0.9\dot{0}$

- iii $\frac{6}{7} = 0.8\dot{5}714\dot{2}$ is wrong as the recurring dot should be over the 8 at the start, not the 5, so $0.85714\dot{2}$

- iv $\frac{1}{37} = 0.02\dot{7}$ is wrong as the recurring dot should be over the 0 at the start, not the 2, so $0.0\dot{2}7$

- 10 a $\frac{4}{3} = 1.\dot{3}$ b $\frac{13}{6} = 2.1\dot{6}$

- c $\frac{19}{9} = 2.\dot{1}$ d $\frac{45}{11} = 4.0\dot{9}$

- 11 a $4.\dot{3}$ b $1.\dot{6}$
 c $6.1\dot{6}$ d $3.8\dot{3}$
- 12 $\frac{8}{52} = 0.\dot{1}5384\dot{6}$
- 13 Yes. Both $\frac{1}{15}$ and $\frac{4}{15}$ have one number that is recurring and both $\frac{1}{22}$ and $\frac{7}{22}$ have two recurring decimals.

Exercise 7.2

- 1 a $\frac{11}{4} \neq 2\frac{16}{20}$ b $\frac{45}{6} = 7\frac{1}{2}$
 c $-\frac{15}{8} \neq -2\frac{1}{8}$ d $-8\frac{4}{5} = -\frac{132}{15}$
- 2 a $\frac{13}{2} < 6\frac{5}{8}$ b $\frac{17}{3} < 6\frac{7}{12}$
 c $5\frac{3}{5} > \frac{82}{15}$ d $\frac{19}{4} < 4\frac{4}{5}$
 e $-\frac{17}{4} > -4\frac{5}{12}$ f $-\frac{7}{3} > -2\frac{5}{9}$
 g $-\frac{21}{5} < -4\frac{2}{15}$ h $-\frac{8}{5} > -1\frac{5}{7}$
- 3 learners' answers
- 4 a $-\frac{7}{4}$ b $-\frac{83}{20}$ c $-\frac{37}{6}$
- 5 a i $\frac{3}{5}$ ii $\frac{7}{9}$ iii $\frac{19}{11}$
 b When the denominators are the same, the larger the numerator the larger the fraction.
 c i $\frac{1}{5}$ ii $\frac{2}{3}$ iii $\frac{13}{4}$
 d When the numerators are the same, the larger the denominator the smaller the fraction.
- 6 a $\frac{3}{11} < \frac{5}{11}$ b $\frac{7}{18} > \frac{5}{18}$ c $\frac{12}{7} > \frac{10}{7}$
 d $\frac{8}{17} > \frac{8}{19}$ e $\frac{9}{13} < \frac{9}{10}$ f $\frac{15}{4} > \frac{15}{7}$
- 7 $-3\frac{1}{4}, -\frac{13}{6}, -\frac{17}{8}, -\frac{7}{13}$ and learners' answers
- 8 $-4\frac{2}{5}, -\frac{19}{5}, -3\frac{1}{6}, -\frac{9}{11}$
- 9 Belle [Adele scored $\frac{16}{25} = 64\%$, Belle scored $\frac{13}{20} = 65\%$, and Catrina scored 63%]
- 10 Irena [Steffan has $\frac{34}{40} = 85\%$, Irena has 87%]
- 11 a i $\frac{4}{7} = 0.5714 \dots$ $-1\frac{4}{7} = -1.5714 \dots$
 ii $\frac{5}{9} = 0.5555 \dots$ $-1\frac{5}{9} = -1.5555 \dots$
 iii $\frac{7}{12} = 0.5833 \dots$ $-1\frac{7}{12} = -1.5833 \dots$
 b $-\frac{19}{12}, -\frac{11}{7}, -\frac{14}{9}$

12 a $-\frac{37}{9} = -4.11 \dots, -\frac{25}{6} = -4.16 \dots,$
 $-\frac{209}{50} = -4.18, -\frac{47}{11} = -4.27 \dots$

- b $-\frac{47}{11}, -\frac{209}{50}, -\frac{25}{6}, -\frac{37}{9}$
- 13 $-\frac{82}{15}, -5\frac{3}{8}, -\frac{107}{20}, -\frac{37}{7}$
- 14 The first day = 92% [Second day = $90.3 \dots \%$]

- 15 a First: $\frac{1235}{1368}$ Second: $\frac{1260}{1368}$
 b First: $0.902\dot{7}$ Second: $0.921 \dots$
 c learners' answers
 d Second

- 16 Group A [group A, $0.891 \dots$, group B, $0.859 \dots$]

- 17 First card: any two fractions such that
 $-\frac{180}{63} < x < -\frac{175}{63}$
 Second card: any two fractions such that
 $-\frac{125}{45} < y < -\frac{117}{45}$

Exercise 7.3

- 1 a $5\frac{1}{3} - 2\frac{2}{3}$ ① $\frac{16}{3} - \frac{8}{3}$ ② $\frac{16}{3} - \frac{8}{3} = \frac{8}{3}$ ③ $\frac{8}{3} = 2\frac{2}{3}$
 b $9\frac{1}{6} - 3\frac{5}{12}$ ① $\frac{55}{6} - \frac{41}{12}$ ② $\frac{55}{6} - \frac{41}{12} = \frac{110}{12} - \frac{41}{12} = \frac{69}{12}$
 ③ $\frac{69}{12} = \frac{23}{4} = 5\frac{3}{4}$
 c $5\frac{3}{4} - 3\frac{5}{6}$ ① $\frac{23}{4} - \frac{23}{6}$ ② $\frac{23}{4} - \frac{23}{6} = \frac{69}{12} - \frac{46}{12} = \frac{23}{12}$
 ③ $\frac{23}{12} = 1\frac{11}{12}$
 d $4\frac{1}{4} - 1\frac{3}{5}$ ① $\frac{17}{4} - \frac{8}{5}$ ② $\frac{17}{4} - \frac{8}{5} = \frac{85}{20} - \frac{32}{20} = \frac{53}{20}$
 ③ $\frac{53}{20} = 2\frac{13}{20}$
- 2 a $\frac{3}{4}$ b $1\frac{9}{10}$ c $2\frac{3}{4}$ d $2\frac{5}{12}$
- 3 learners' answers
- 4 a $1\frac{9}{14}$ b $4\frac{3}{4}$ c $4\frac{5}{12}$ d $1\frac{23}{36}$
- 5 a Yes. $9 - 3 = 6$, then the answer could be within $6 + 1$ and $6 - 1$.
 b learners' answers
 c Subtract the whole numbers then work out $+1$ and -1 from this answer.
 d Subtract the whole numbers then work out:
 (for 3 mixed numbers) $+2$ and -2 from this answer

(for 4 mixed numbers) +3 and -3 from this answer

(for 5 mixed numbers) +4 and -4 from this answer, etc.

6 a Answer between 0 and 2 b $\frac{5}{8}$

7 $\frac{3}{4}$ m

8 a Answer between 3 and 5 b $4\frac{1}{12}$

9 learners' answers

10 $5\frac{9}{40}$ km

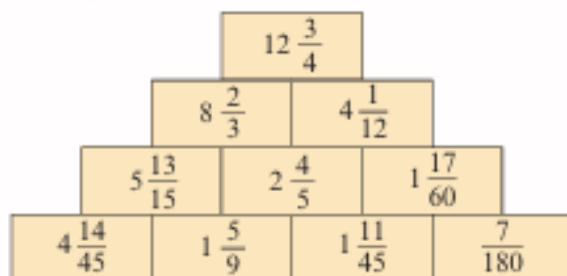
11 $2\frac{13}{30}$ kg

12 a learners' answers

For example: He has worked out $4\frac{9}{10} - \frac{6}{10}$

b $3\frac{7}{10}$

13



14 $11\frac{3}{4}$ m

Exercise 7.4

1 a $3\frac{1}{2} \times 8 = 3 \times 8 + \frac{1}{2} \times 8$
 $= 24 + 4$
 $= 28$

b $2\frac{1}{4} \times 12 = 2 \times 12 + \frac{1}{4} \times 12$
 $= 24 + 3$
 $= 27$

c $4\frac{2}{3} \times 9 = 4 \times 9 + \frac{2}{3} \times 9$
 $= 36 + 6$
 $= 42$

d $8\frac{3}{5} \times 10 = 8 \times 10 + \frac{3}{5} \times 10$
 $= 80 + 6$
 $= 86$

2 a $15 \times 2 = 30 \text{ m}^2$ b 35 m^2

3 No, it's 48 litres not 46 litres.

4 a $4\frac{1}{2} \times 9 = 4 \times 9 + \frac{1}{2} \times 9$
 $= 36 + \frac{9}{2}$
 $= 36 + 4\frac{1}{2}$
 $= 40\frac{1}{2}$

estimate: $5 \times 9 = 45$

b $3\frac{3}{4} \times 11 = 3 \times 11 + \frac{3}{4} \times 11$
 $= 33 + \frac{33}{4}$
 $= 33 + 8\frac{1}{4}$
 $= 41\frac{1}{4}$

estimate: $4 \times 11 = 44$

c $5\frac{2}{3} \times 7 = 5 \times 7 + \frac{2}{3} \times 7$
 $= 35 + \frac{14}{3}$
 $= 35 + 4\frac{2}{3}$
 $= 39\frac{2}{3}$

estimate: $6 \times 7 = 42$

d $2\frac{2}{5} \times 6 = 2 \times 6 + \frac{2}{5} \times 6$
 $= 12 + \frac{12}{5}$
 $= 12 + 2\frac{2}{5}$
 $= 14\frac{2}{5}$

estimate: $2 \times 6 = 12$

5 a $5 \times (12 + 5) = 85 \text{ cm}^2$ b $87\frac{2}{9} \text{ cm}^2$

6 a learners' answers b $7\frac{1}{5} \text{ m}^2$

c No, they will cost \$336. She needs to round $7\frac{1}{5} \text{ m}^2$ up to 8 m^2 then $8 \times 42 = \$336$.
 She has rounded $7\frac{1}{5} \text{ m}^2$ down to 7 m^2 then $7 \times 42 = \$294$.

7 a learners' answers

b i $14\frac{4}{7}$ ii $78\frac{2}{3}$

c learners' answers

8 a learners' answers

b i $33\frac{3}{4}$ ii $66\frac{1}{2}$ iii $32\frac{2}{5}$

9 $262\frac{1}{2} \text{ minutes} = 4 \text{ hours } 22\frac{1}{2} \text{ minutes}$

10 a i $6\frac{2}{5}$ ii $9\frac{3}{5}$

b $3\frac{1}{5} \times 5 = \text{a whole number answer}$

c $3\frac{2}{5} \times 5 = \text{a whole number answer}$

$3\frac{3}{5} \times 5 = \text{a whole number answer}$

$3\frac{4}{5} \times 5 = \text{a whole number answer}$

d They are the same.

e $3\frac{1}{7}, 3\frac{2}{7}, 3\frac{3}{7}, 3\frac{4}{7}, 3\frac{5}{7}$ and $3\frac{6}{7}$, all $\times 7 = \text{a whole number answer}$

f learners' answers

11 a $2 \times (13 - 5) = 16 \text{ m}^2$

b $15\frac{13}{15} \text{ m}^2$

Exercise 7.5

1 a 6 **b** 8 **c** 12 **d** 25

2 a, b learners' answers

c i 36 **ii** 100 **iii** 72

3 80 m

4 a 120 km/h

b 90 km/h

c 96 km/h

5 peer discussion

6 a 6 **b** 8 **c** 10 **d** 14

7 a learners' answers

b $5\frac{1}{3}$

c $4 \div \frac{3}{4} = 4 \times \frac{4}{3} = \frac{16}{3} = 5\frac{1}{3}$

d peer discussion

e peer discussion

8 a $11 \div \frac{3}{4} = 11 \times \frac{4}{3} = \frac{44}{3} = 14\frac{2}{3}$

b $9 \div \frac{5}{6} = 9 \times \frac{6}{5} = \frac{54}{5} = 10\frac{4}{5}$

c $8\frac{3}{4}$ **d** $17\frac{1}{7}$ **e** $27\frac{1}{2}$

9 a learners' answers

b i $10\frac{1}{2}$ **ii** $7\frac{1}{3}$

iii $13\frac{1}{3}$ **iv** $9\frac{3}{4}$

10 ① is correct. Learners' answers. For example, when you divide an integer by 1, you get the same integer. When you divide an integer by a fraction smaller than 1 you are finding how

many smaller parts go into that integer, so the answer is going to be more than the integer.

② is incorrect. Learners' answers. For example, a bigger fraction will go into an integer fewer times than a smaller fraction.

11 a i 6, 12, 18, 24, ...

ii 30, 36

iii 6 times table

b i 3, 6, 9, 12, ...

ii 15, 18

iii 3 times table

c learners' answers

For example, the terms in the sequence in **b** are half the terms in the sequence in **a**. This is because when you divide by a fraction that is doubled, all your answers are halved.

d 2, 4, 6, 8, ...

learners' answers

For example, divide the terms in the sequence in **a** by 3.

e 3, 6, 9, 12, ...

learners' answers

For example, divide the terms in the first sequence by 5.

Exercise 7.6

1 a $\frac{1}{2}$ **b** $\frac{3}{8}$ **c** $\frac{7}{10}$ **d** $\frac{1}{2}$

2 a $\frac{2}{3}$ **b** $\frac{7}{8}$ **c** $\frac{7}{10}$ **d** $\frac{7}{8}$

e $1\frac{1}{6}$ **f** $1\frac{4}{15}$ **g** $\frac{2}{9}$ **h** $\frac{1}{8}$

i $\frac{2}{15}$ **j** $\frac{1}{2}$ **k** $\frac{7}{10}$ **l** $\frac{3}{20}$

3 a $\frac{8}{15}$ **b** $\frac{11}{28}$ **c** $\frac{19}{45}$ **d** $1\frac{5}{12}$

e $\frac{33}{40}$ **f** $1\frac{1}{12}$ **g** $\frac{1}{6}$ **h** $\frac{11}{20}$

i $\frac{3}{14}$ **j** $\frac{13}{28}$ **k** $\frac{5}{24}$ **l** $\frac{5}{36}$

4 a $\frac{3}{10}$

b learners' answers

5 $\frac{5}{12}$

6 $\frac{13}{30}$

7 a 6 **b** 10 **c** 18

d 15 **e** 12 **f** 12

8 $18 \div \frac{5}{7} = \frac{126}{5} = 25\frac{1}{5}$

9 a i $11\frac{1}{4}$ **ii** $11\frac{2}{3}$
iii $16\frac{1}{2}$ **iv** $11\frac{1}{5}$

b, c learners' answers

10 $13\frac{1}{3}$ m

11 a learners' answers

For example, when working out the subtraction he has not found a common denominator but just subtracted the numerators and subtracted the denominators.

b $\frac{1}{9}$

12 a 4 **b** 6 **c** $\frac{2}{3}$
d $\frac{1}{12}$ **e** $\frac{1}{4}$ **f** 20

13 1st sequence is: B $1\frac{1}{2}$, D 3, A $4\frac{1}{2}$, C 6

First term is $1\frac{1}{2}$. Term to term rule is 'add $1\frac{1}{2}$ '.

2nd sequence is: C 6, A $4\frac{1}{2}$, D 3, B $1\frac{1}{2}$

First term is 6. Term to term rule is 'subtract $1\frac{1}{2}$ '.

Check your progress

1 a $\frac{3}{8} = 0.375$ terminating

b $\frac{4}{9} = 0.\dot{4}$ recurring

2 $-\frac{17}{6}, -\frac{27}{10}, -\frac{38}{15}, -\frac{12}{5}$

3 a $3\frac{11}{12}$ **b** $43\frac{1}{2}$

4 a 24 **b** $13\frac{1}{3}$

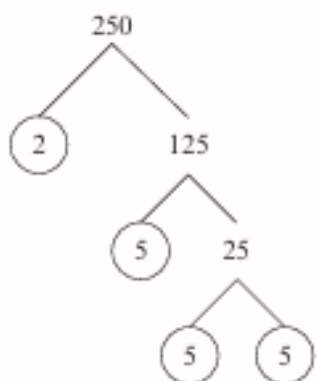
5 a $\frac{7}{10}$ **b** $\frac{4}{21}$

c 14 **d** $3\frac{3}{4}$

> Workbook answers

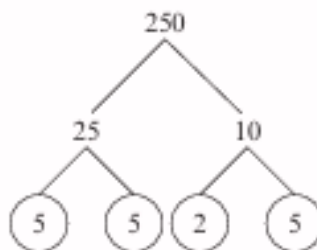
Exercise 1.1

1 a



b No. The 125 can only become 5×25 and 25 as a factor of primes must be 5×5 .

c



d $250 = 2 \times 5^3$

2 a & b Many trees are possible but all end with 2, 2, 3, 5, 5.

c $300 = 2^2 \times 3 \times 5^2$

3 a i 2×3 ii $2 \times 3 \times 5$

iii $2 \times 3 \times 5 \times 7$

b $2 \times 3 \times 5 \times 7 \times 11 = 2310$; multiply the last number by the next prime

4 a 42

b 1764

c 74088

5 a Many trees are possible

b $8712 = 2^3 \times 3^2 \times 11^2$

6 a $96 = 2^5 \times 3$

b 97 is a prime number

c $98 = 2 \times 7^2$

d $99 = 3^2 \times 11$

7 a $70 = 2 \times 5 \times 7$

b $70^2 = 2^2 \times 5^2 \times 7^2$

c $70^3 = 2^3 \times 5^3 \times 7^3$

8 a i 3^2 ii $2^2 \times 3^2$

iii 3^4 iv $2^4 \times 3^2$

v $3^2 \times 5^2$ vi $2^6 \times 3^2$

vii 5^4 viii 7^4

b There is an even number of each prime factor.

c Using the result of part b, it is the square of $2^2 \times 3 \times 5 \times 7$.

9 a $3^2 \times 7 = 63$

b $3 \times 5 = 15$

c $2^2 \times 3 = 12$

10 a 360 b 300 c 1800

11 a $104 = 2^3 \times 13$

b $130 = 2 \times 5 \times 13$

c 26

d 520

12 a $135 = 3^3 \times 5$

b $180 = 2^2 \times 3^2 \times 5$

c 45

d 540

13 a $343 = 7^3$

b $546 = 2 \times 3 \times 7 \times 13$

c 7

d 26754

14 630

15 a 24 b 1848

16 a $48 = 2^4 \times 3$ and $25 = 5^2$; there are no common prime factors, therefore the HCF is 1.

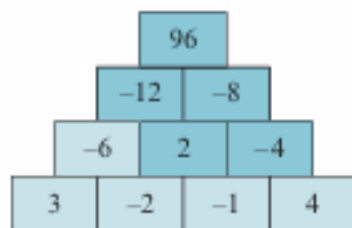
b 1200

17 18 and 24

Exercise 1.2

- 1 $-1 \times -4 = 4$; $-3 \times -4 = 12$; $-5 \times -4 = 20$
- 2 a -40 b 40 c 99 d 120
- 3 A, B, D, F in one group and C, E in the other
- 4
- | | | | |
|----------|-----|-----|-----|
| $\times$ | 2 | -4 | -9 |
| -6 | -12 | 24 | 54 |
| 5 | 10 | -20 | -45 |
| -8 | -16 | 32 | 72 |
- 5 a 35 b -5 c 35 d 5
- 6 a 24 b -66 c 81 d 16
- 7 $(-6)^2 + (-8)^2 - (-10)^2 = 36 + 64 - 100 = 0$

8 a



- b If 3 and -2 are swapped and -1 and 4 are swapped, then the top number will be 3456.
- 9 a 1×-6 or -1×6 or 2×-3 or -2×3
b 1×6 or -1×-6 or 2×3 or -2×-3
- 10 a $63 \div -9 = -7$ or $63 \div -7 = -9$
b $-84 \div 12 = -7$ or $-84 \div -7 = 12$
- 11 a -6 b 5 c -9 d 13
e -12
- 12 a -3 b 2 c -8 d -4
- 13



- 14 a -6 b 12 c -12 d 8
- 15 a 32 b -40 c -4 d -5
- 16 a True. $-3 \times (-6 \times -4) = -3 \times 24 = -72$ and $(-3 \times -6) \times -4 = 18 \times -4 = -72$
b False. $-24 \div (-4 \div -2) = -24 \div 2 = -12$ and $(-24 \div -4) \div -2 = 6 \div -2 = -3$

Exercise 1.3

- 1 a 196 b 196 c 400 d 900
- 2 a 64 b -216 c -1000 d 0
- 3 a impossible b -4
c -5 d -9
- 4 a $x = 5$ or -5 b $x = 15$ or -15
c $x = 9$ or -9 d no solution
- 5 a $x = 6$ b $x = -6$
c $x = -10$ d $x = -20$
- 6 a $x = 23$ or -23 b no solution
c $x = 23$ d $x = -23$

- 7 a true b false c true
d true e true

8 a

x	-3	-2	-1	0	1	2
$x^2 + x$	6	2	0	0	2	6
$x^3 + x$	-30	-10	-2	0	2	10

- b i $x = -2$ or 1
ii $x = 1$
- 9 a Yes. If $x = 5$ then $x^3 - x = 5^3 - 5 = 125 - 5 = 120$
b No. If $x = -5$ then $x^3 - x = -125 - (-5) = -120$
- 10 a $64 = 2^6$
b $2^6 = (2^3)^2 = 8^2$ and $(2^2)^3 = 4^3$
c $729 = 3^6$
d $3^6 = (3^3)^2 = 27^2$ and $(3^2)^3 = 9^3$
e 1 is both a square number and a cube number. So is $4^6 = 4096$ or $5^6 = 15625$; other answers are possible.
- 11 $x^6 = 64$
So $(x^3)^2 = 64$
So $x^3 = 8$ or -8
If $x^3 = 8$ then $x = 2$
If $x^3 = -8$ then $x = -2$
There are two possible answers, $x = 2$ or -2

Exercise 1.4

1 a 3^3 b 7^4 c 12^6 d 15^5

2 a 6^6 b 10^7 c 3^9 d 14^7

3 a $2^0 + 2^1 + 2^2 + 2^3 = 1 + 2 + 4 + 8 = 15 = 16 - 1 = 2^4 - 1$

b $2^6 - 1$

c No. $3^0 + 3^1 + 3^2 + 3^3 = 1 + 3 + 9 + 27 = 40$ and $3^4 - 1 = 81 - 1 = 80$ so they are not equal.

4 a 5^6 b 15^6 c 7^9 d 3^{20}

5 a 2^2 b 2^6 c 3^6

6 a 5^8 b 5^{12} c 5^{16}

7 a 4^3 b 7^2
c 15^3 d 15^0 or 1

8 a 8^2 b 5^4 c 2^8 d 3^3
e 12^0 or 1

9 a 6^3 b 6^4 c 6^8 d 6^6

10 a 2^7 b 3^3
c 2^4 or 4^2 d 3^0 or 1

11 a 5^3 b 5^6 c 5^{12}

12 a 12^8 b 12^{12} c 12^2

13 No, Marcus is not correct.

$2^4 = 2 \times 2 \times 2 \times 2 = 16$ and $4^2 = 4 \times 4 = 16$ so these are equal.

However $3^4 = 3 \times 3 \times 3 \times 3 = 81$ and $4^3 = 4 \times 4 \times 4 = 64$ and these are not equal.

Exercise 2.1

1 A and ii, B and vi, C and v, D and iii, E and iv, F and i

2 a 3 books: $3 \times 2 = 6$

b 5 books: $5 \times 2 = 10$

c 8 books: $8 \times 2 = 16$

d x books: $x \times 2 = 2x$

e y books: $y \times 2 = 2y$

f b books: $b \times 2 = 2b$

3 a 4 sweets: $4 \div 2 = 2$

b 10 sweets: $10 \div 2 = 5$

c 12 sweets: $12 \div 2 = 6$

d x sweets: $x \div 2 = \frac{x}{2}$

e y sweets: $y \div 2 = \frac{y}{2}$

f s sweets: $s \div 2 = \frac{s}{2}$

4 a $c - 2$ b $c + 2$

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

5 A and v, B and i, C and vi, D and ii, E and iv, F and iii

6 a $7n + 4$ b $\frac{n}{6} - 8$

c $\frac{n+4}{5}$ d $\frac{n-4}{5}$

7 a Equivalent to $\frac{7x}{8}$ are: A, E, F, G, J

Equivalent to $\frac{x+7}{8}$ are: D, I

Equivalent to $x + \frac{7}{8}$ are: C, H

b B $\frac{x-7}{8}$

8 The answer to a is incorrect. It should be $\frac{x}{5} + 7$
The answer to b is correct

9 a i $\frac{x}{4} + 5$ or $\frac{1}{4}x + 5$ ii $\frac{3x}{5} - 2$ or $\frac{3}{5}x - 2$

iii $1 + \frac{x}{2}$ or $1 + \frac{1}{2}x$ iv $11 - \frac{5x}{6}$ or $11 - \frac{5}{6}x$

b i half of x subtract 9

ii two-thirds of x add 10

iii 25 subtract two-ninths of x

iv 12 add seven-tenths of x

10 a perimeter = $16w + 2v + 6$ cm
area = $8vw + 24w$ cm²

b perimeter = $18x + \frac{5}{4}y$ cm
area = $\frac{45}{8}xy$ cm²

11 $\frac{5}{2}a - \frac{3}{2}b$

12 a $\$p + 3l + 2r$

b $\$3p + \frac{r}{4}$ or $\$3p + \frac{1}{4}r$

c $\$ \frac{r}{5}$ or $\$ \frac{1}{5}r$

d $\$ \frac{3r}{5} + \frac{3l}{4}$ or $\$ \frac{3}{5}r + \frac{3}{4}l$

13 a $8\left(\frac{y}{4} + 3\right)$ b $4\left(\frac{y}{3} + 8\right)$

c $8\left(\frac{3y}{4} + 4\right)$ d $4\left(\frac{3y}{8} + 3\right)$

Exercise 2.2

1 A and iii, B and vi, C and i, D and ii, E and iv, F and v

2 a 7 b 1 c 9

3 a 13 b 17 c 72

d 8 e 20

4 a 10 b 2 c -9

d -7 e -2 f 7

g 25 h -22 i -22

j 30 k -5 l 12

5 a 27 b -16

6 a 10 b -6 c 25

d -11 e 48 f 501

g 8 h 640 i 6

j 100 k 38 l 10

7 a i number of seconds =
60 × number of minutes

ii $S = 60M$

b 1800 seconds

8 $d = 70$

9 a She has added 6 and 12 instead of multiplying.

b $V = 24$

10 $A = 24$

11 Neither, their volumes are the same. Pyramid A: $V = 32 \text{ cm}^3$, pyramid B: $V = 32 \text{ cm}^3$

12 a B $x = y + 8$ b B $x = \frac{y}{k}$

c A $x = y - w$ d C $x = ry$

e C $x = \frac{y-t}{2}$

13 $x - 5$ has a value of -9. All the others have a value of 9.

14 a $x = 0, 1$

b $x = 4$

c $x = 0$

d $x = 0$

15 a $D = 19$

b $p = \frac{D-4}{w}$

c $p = 8$

16 a $s = 75$

b $s = 100$

Exercise 2.3

1 a 4×18

×	10	8
4	40	32

$4 \times 18 = 40 + 32 = 72$

b 3×21

×	20	1
3	60	3

$3 \times 21 = 60 + 3 = 63$

2 a $6 \times 58 = 6 \times (50 + 8)$

×	50	8
6	300	48

$6 \times 58 = 300 + 48 = 348$

b $6 \times 58 = 6 \times (60 - 2)$

×	60	-2
6	360	-12

$6 \times 58 = 360 + -12 = 348$

3 a $3(x + 5)$

×	x	5
3	$3x$	15

$3(x + 5) = 3x + 15$

b $2(x + 9)$

×	x	9
2	$2x$	18

$2(x + 9) = 2x + 18$

c $5(y-1)$

$\times$	y	-1
5	$5y$	-5

$$5(y-1) = 5y - 5$$

d $4(y-8)$

$\times$	y	-8
4	$4y$	-32

$$4(y-8) = 4y - 32$$

4 a $3(2x+1)$

$\times$	$2x$	1
3	$6x$	3

$$3(2x+1) = 6x + 3$$

b $5(4x+9)$

$\times$	$4x$	9
5	$20x$	45

$$5(4x+9) = 20x + 45$$

c $2(3y-7)$

$\times$	$3y$	-7
2	$6y$	-14

$$2(3y-7) = 6y - 14$$

d $5(8y-5)$

$\times$	$8y$	-5
5	$40y$	-25

$$5(8y-5) = 40y - 25$$

5 a $6a+36$ **b** $5b+35$

c $7c-56$ **d** $6d-54$

e $40+5e$ **f** $49+7f$

g $36-6g$ **h** $35-5h$

6 a $56i+63$ **b** $48+42j$

c $30k-35$ **d** $56-63l$

e $54a+48m$ **f** $35b+30n$

g $49c-56x$ **h** $54px+48y$

7 No, $4a-28$ is not the same as $28-4a$

8 a $14a+114$ **b** $38b+92$

c $70c+128$ **d** $48d+7$

e $-20e-33$ **f** $108f+33g$

9 a a^2+a **b** b^2-5b

c $3c^2+6c$ **d** $4e^2+9e$

e $3i^2+7ix$ **f** $3aj-7j^2$

g $3k^2-6kx$ **h** $3m^2+9mx$

i $9r^2-3rx-9r$ **j** $6a+4a^2+2ab$

k $-3xz-3xy-3x^2$

10 Equivalent to $40y+48y^2$ are: **A, C, E, H**

Equivalent to $20y^2+24y^3$ are: **B, D, F, G**

11 a $8x+4\text{cm}^2$ **b** $6y^2-4y\text{cm}^2$

12 a $2a^2+7a$ **b** $5b^2+8b$

c $8c^2+10c$ **d** $2d^2-d$

e $9e-e^2$ **f** $39fg-27f^2$

13 a Q1. The expansion $3a+15-9a-15$ is correct, but he has not collected like terms correctly.

Q2. The expansion $4pq+pr+2qr-4pq$ is correct, but he has not collected like terms correctly.

Q3. The expansion $5b^2+15ab+4a^2+6ab$ is correct, but he has not collected like terms correctly.

b Q1. $-6a$, Q2. $pr+2qr$,
Q3. $4a^2+5b^2+21ab$

14 Area $= 3x(3x+4)+2x(2x-1)$
 $= 9x^2+12x+4x^2-2x$
 $= 13x^2+10x$

15 a $4(3x+7)=12x+28$

b $3x(2x-1)=6x^2-3x$

c $6(5x-3)=30x-18$

d $5x(9-x)=45x-5x^2$

e $2(2x+4)+3(4x-8)=16x-16$

f $x(4x+1)-2x(x-5)=2x^2+11x$

Exercise 2.4

1 a

$\times$	x	6
2	$2x$	12

$$2(x+6) = 2x + 12$$

b

$\times$	x	5
3	$3x$	15

$$3(x+5) = 3x + 15$$

c

$\times$	y	-3
5	$5y$	-15

$$5(y-3) = 5y - 15$$

d

$\times$	y	-7
4	$4y$	-28

$$4(y-7) = 4y - 28$$

2 a $2x + 12 = 2(x + 6)$

b $3x + 15 = 3(x + 5)$

c $5y - 15 = 5(y - 3)$

d $4y - 28 = 4(y - 7)$

3 a $2x + 8 = 2(x + 4)$ **b** $3x + 9 = 3(x + 3)$

c $5y - 25 = 5(y - 5)$ **d** $7y - 14 = 7(y - 2)$

4 a $3(2x + 1) = 6x + 3$

b $4(3x + 1) = 12x + 4$

c $2(5y - 1) = 10y - 2$

d $6(4y - 1) = 24y - 6$

5 a $6x + 3 = 3(2x + 1)$

b $12x + 4 = 4(3x + 1)$

c $10y - 2 = 2(5y - 1)$

d $24y - 6 = 6(4y - 1)$

6 a $4x + 6 = 2(2x + 3)$

b $6x - 15 = 3(2x - 5)$

c $35y + 10 = 5(7y + 2)$

d $28y - 63 = 7(4y - 9)$

7 a $5(z + 3)$ **b** $2(y - 7)$

c $4(5x + 1)$ **d** $3(3w - 1)$

e $2(3v + 4)$ **f** $7(2a - 3)$

g $6(2 - b)$ **h** $7(2 + 3d)$

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

9 a $m(7m + 1)$ **b** $5a(a - 3)$

c $t(t + 9)$ **d** $4h(2 - h)$

e $3y(1 + 4y)$ **f** $4y(3 - 4y)$

g $8e(2e + 1)$ **h** $3(5e + 2i)$

10 a $14cd - 7c = 7c(2d - 1)$

b $12a + 8ab = 4a(3 + 2b)$

c $21g + 15gh = 3g(7 + 5h)$

d $30w - 15tw = 15w(2 - t)$

11 a $2a + 4h + 8 = 2(a + 2h + 4)$

b $5b - 25 + 5j = 5(b - 5 + j)$

c $12tu + 16u - 20 = 4(3tu + 4u - 5)$

d $3e^2 + 4e + ef = e(3e + 4 + f)$

e $7k - k^2 - ak = k(7 - k - a)$

f $6n^2 - 9n + 3mn = 3n(2n - 3 + m)$

12 a Top left: $4x(6 + 8x)$
Top right: $2(12x + 16x^2)$

Bottom left: $x(24 + 32x)$

Bottom right: $8x(3 + 4x)$

b Bottom right: $8x(3 + 4x)$

13 a $7x + 7$ **b** $7(x + 1)$

14 Correct solution:

$$\begin{aligned} 5(3x - 2) - 5(2 + x) &= 15x - 10 - 10 - 5x \\ &= 10x - 20 \\ &= 10(x - 2) \end{aligned}$$

She has made a mistake on the first line of the expansion. Her last term is $+5x$ and it should be $-5x$.

She has done:

$$\begin{aligned} 5(3x - 2) - 5(2 + x) &= 15x - 10 - 10 + 5x \\ &= 20x - 20 \\ &= 20(x - 1) \end{aligned}$$

15 $2a(3a + 4) - 4(a^2 + 4) + 6a(a - 8) = 8(a^2 - 5a - 2)$

16 a length $= 2b - 5$

b perimeter $= 16b - 10$

Exercise 2.5

1 a expression

b formula

c expression

d equation

2 a $x \rightarrow \times 2$

$2x \rightarrow +1$ 11

$5 \rightarrow \div 2$

10 $\rightarrow -1$ 11

$x = 5$

b $x \rightarrow \times 5$

$\rightarrow -2$ 18

4 $\rightarrow \div 5$

20 $\rightarrow +2$ 18

$x = 4$

c $x \rightarrow +4$

$\rightarrow \times 3$ 21

3 $\rightarrow -4$

7 $\rightarrow \div 3$ 21

$x = 3$

d $x \rightarrow \div 4$

$\rightarrow -1$ 5

24 $\rightarrow \times 4$

6 $\rightarrow +1$ 5

$x = 24$

3 $x \rightarrow \times 3$

$\rightarrow +2$ 26

8 $\rightarrow \div 3$

24 $\rightarrow -2$ 26

$y \rightarrow \div 2$

$\rightarrow +5$ 15

20 $\rightarrow \times 2$

10 $\rightarrow -5$ 15

$x = 8, y = 20$

4 $x \rightarrow +2$

$\rightarrow \times 4$ 40

8 $\rightarrow -2$

10 $\rightarrow \div 4$ 40

$y \rightarrow +3$

$\rightarrow \times 6$ 30

2 $\rightarrow -3$

5 $\rightarrow \div 6$ 30

$x = 8, y = 2$

5 a $3x + 5 = 17$

$x \rightarrow \times 3$

$\rightarrow +5$ 17

$x = 4 \rightarrow \div 3$

12 $\rightarrow -5$ 17

b $5x + 2 = 27$

$x \rightarrow \times 5$

$\rightarrow +2$ 27

$x = 5 \rightarrow \div 5$

25 $\rightarrow -2$ 27

c $2x - 4 = 12$

$x \rightarrow \times 2$

$\rightarrow -4$ 12

$x = 8 \rightarrow \div 2$

16 $\rightarrow +4$ 12

6 a $\frac{x}{2} + 1 = 20$

$\frac{x}{2} + 1 - 1 = 20 - 1$

$\frac{x}{2} = 19$

$x = 19 \times 2$

$x = 38$

b $\frac{x}{3} - 2 = 9$

$\frac{x}{3} - 2 + 2 = 9 + 2$

$\frac{x}{3} = 11$

$x = 11 \times 3$

$x = 33$

$$c \quad \frac{x}{4} - 8 = 16$$

$$\frac{x}{4} - 8 + 8 = 16 + 8$$

$$\frac{x}{4} = 24$$

$$x = 24 \times 4$$

$$x = 96$$

$$7 \quad a \quad a = 8 \text{ cm} \quad b \quad b = 50 \text{ cm}$$

$$c \quad c = 6 \text{ cm} \quad d \quad d = 8 \text{ cm}$$

$$8 \quad a \quad x = 5 \text{ cm} \quad b \quad x = 4 \text{ cm}$$

$$c \quad x = 3 \text{ cm}$$

$$9 \quad a \quad c = 2 \text{ cm}, d = 50 \text{ cm}$$

$$b \quad e = 7 \text{ cm}, f = 50 \text{ cm}$$

$$c \quad i = 5 \text{ cm}, j = 4 \text{ cm}$$

$$10 \quad a \quad \frac{x}{2} - 9 = 5, x = 28$$

$$b \quad 4x - 1 = 3x + 6, x = 7$$

$$c \quad 8(x - 2) = 16(x - 5), x = 8$$

$$11 \quad a \quad 4(2y + 7) = 52 \text{ or } 8y + 28 = 52$$

$$b \quad y = 3$$

$$c \quad 4(2y + 7) = 4(2 \times 3 + 7) = 52$$

$$12 \quad y = 104$$

$$13 \quad a \quad x = 14$$

$$b \quad i \quad x = -30 \quad ii \quad x = 5$$

$$14 \quad a \quad y = 40 \quad b \quad z = 14$$

$$c \quad n = 2 \quad d \quad m = 12$$

$$15 \quad \begin{array}{|c|c|c|c|c|c|c|c|c|} \hline B & O & B & S & L & E & I & G & H \\ \hline 8 & 11 & 8 & 3 & 7 & 4 & 5 & 2 & 9 \\ \hline \end{array}$$

Exercise 2.6

$$1 \quad a \quad \text{True} \quad b \quad \text{False}$$

$$c \quad \text{True} \quad d \quad \text{False}$$

$$2 \quad A \text{ and } iii, B \text{ and } i, C \text{ and } iv, D \text{ and } ii$$

$$3 \quad a \quad 8 \leq x < 12 \quad b \quad 1 < y < 7$$

$$c \quad 0 \leq m \leq 5 \quad d \quad 0 < n \leq 5$$

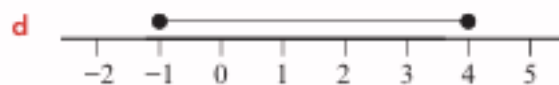
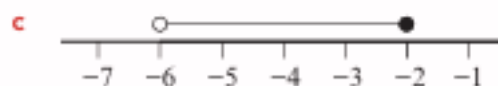
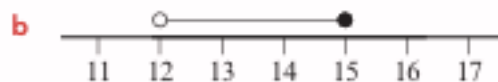
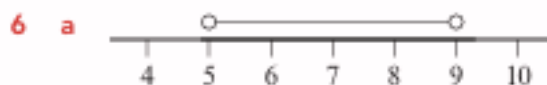
$$4 \quad a \quad x \text{ is greater than } 7 \text{ and less than or equal to } 15$$

$$b \quad y \text{ is greater than } 10 \text{ and less than } 20$$

$$c \quad x \text{ is greater than or equal to } 0 \text{ and less than or equal to } 5$$

$$d \quad y \text{ is greater than or equal to } 50 \text{ and less than } 100$$

$$5 \quad A \text{ and } iii, B \text{ and } iv, C \text{ and } ii, D \text{ and } i$$



$$7 \quad a \quad 25 \leq x \leq 28 \quad b \quad 30 < x < 34$$

$$c \quad -15 < x \leq -10 \quad d \quad -3 \leq x < 1$$

$$8 \quad a \quad x > 4 \text{ is equivalent to } 2x > 8$$

$$b \quad x < 9 \text{ is equivalent to } 7x < 63$$

$$c \quad y \geq 1 \text{ is equivalent to } y + 9 \geq 10$$

$$d \quad y \leq 1 \text{ is equivalent to } y - 5 \leq -4$$

$$9 \quad i \quad \text{smallest integer is } -2 \text{ and not } -3$$

$$ii \quad \text{largest integer is } 2 \text{ not } 3$$

$$iii \quad x \text{ could be } -2, -1, 0, 1, 2$$

$$10 \quad a \quad i \quad 33 \quad ii \quad 37$$

$$iii \quad 33, 34, 35, 36, 37$$

$$b \quad i \quad 25 \quad ii \quad 27$$

$$iii \quad 25, 26, 27$$

$$c \quad i \quad 40 \quad ii \quad 43$$

$$iii \quad 40, 41, 42, 43$$

$$d \quad i \quad -12 \quad ii \quad -9$$

$$iii \quad -12, -11, -10, -9$$

$$11 \quad a \quad T \quad b \quad T \quad c \quad F \quad d \quad F$$

$$12 \quad a \quad i \quad \text{smallest integer is } 6 \text{ not } 5$$

$$ii \quad \text{largest integer is } 8 \text{ not } 9$$

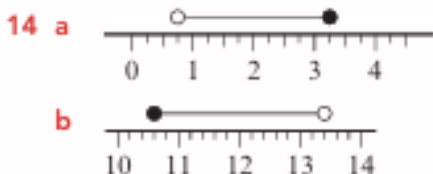
$$iii \quad n \text{ could be } 6, 7, 8$$

$$b \quad A \quad i \quad 7 \quad ii \quad 10 \quad iii \quad 7, 8, 9, 10$$

$$B \quad i \quad -7 \quad ii \quad -4 \quad iii \quad -7, -6, -5, -4$$

13 answers are in rows

Inequality	Smallest integer	Largest integer	List of integers
$1.9 \leq x \leq 5.5$	2	5	2, 3, 4, 5
$0.2 < x < 6.1$	1	6	1, 2, 3, 4, 5, 6
$-0.5 < x \leq 4.9$	0	4	0, 1, 2, 3, 4
$2.95 \leq x < 7.85$	3	7	3, 4, 5, 6, 7



15 a $22.5 \leq y \leq 25.75$ b $0.75 < y < 3.25$

16 a i $12 < y < 18$ ii $18 > y > 12$

b i $0 \leq y \leq 4$ ii $4 \geq y \geq 0$

c i $7 < x \leq 25$ ii $25 \geq x > 7$

d i $10 \leq x < 38$ ii $38 > x \geq 10$

Exercise 3.1

- 1 a 2 b 7 c 8 d 7.5
- 2 a 3 b 5 c 8 d 6.5
- 3 a 12 b 1.2 c 120 d 0.12
- 4 a 40 b 70 c 200 d 250
- 5 a 200 b 500 c 3000 d 1200
- 6 a 160 b 1.6 c 16 d 1600
- 7 a 3.3 b 99.9 c 3
- d 0.87 e 0.77 f 0.7
- g 7 h 0.07
- 8 a 50 b 56 c 556
- d 5.5 e 500 f 560
- g 5560 h 55
- 9 a 2.7 b 0.279 c 2 d 270
- 10 a $\div$ b $\times$ c $\div$ d $\times$
- e $\div$ f $\times$

- 11 a 0.1 b 0.1 c 0.01 d 0.1
- e 0.01 f 0.01

12 D is the odd one out as it equals 9600. A, B and C all equal 0.96

13 a 0.12 m^2 b \$1.95

14 a $b = \frac{2A}{h}$ b 23.2 m

15 2.34

16 a $0.1 + 0.1 = 1$ which is not bigger than 1

b learners' examples; any number smaller than 1.00

Exercise 3.2

- 1 a 200 b 5000
- c 20 000 d 200 000
- 2 a 210 b 4800
- c 24 000 d 190 000
- 3 a 4730 b 66 500 c 2 360 000
- 4 a 0.02 b 0.006
- c 0.000 04 d 0.7
- 5 a 0.023 b 0.0057
- c 0.000 038 d 0.69
- 6 a C 500 b B 9
- c A 6 000 d C 0.004
- 7 a 360 b 0.36 c 3600
- d 0.0036 e 36 f 3.6
- 8 a Part a: he has forgotten to add the extra zeros. Part b: he has rounded to 3 d.p. not 3 s.f.
- b Part a: 2 370 000 Part b: 0.002 06
- 9 a 2000 b 760 c 5.37
- d 0.08 e 0.20 f 6.04
- g 1000 h 0.90 i 20.0
- 10 a D 600 b A 15 c C 0.0789
- d D 0.007 778 e A 0.040
- 11 a 762.204 903
- b i 800 ii 760 iii 762
- iv 762.2 v 762.20 vi 762.205

12 2700 km

13 a 500 b 530 c 530
d 530.4 e 530.40 f 530.404

14 0.0259 g

15 200 000

16 1 100 000 (2 s.f.)

17 0.053 (2 s.f.)

18 a i 120 ii 119
b i 400 ii 401
c i 12 000 ii 12 600
d i 80 ii 83.6
e i 1000 ii 962
f i 3 ii 2.89
g i 25 ii 18.6
h i 4 ii 5.19
i i 20 ii 17.2

Exercise 4.1

1 51, 08, 21, 17
08, 17, 21, 51
5.08, 5.17, 5.21, 5.51

2 a 29 16 95 91
16 29 91 95
4.16 4.29 4.91 4.95
b 94 49 95 47
47 49 94 95
8.47 8.49 8.94 8.95
c 19 15 13 01
01 13 15 19
0.01 0.13 0.15 0.19

3 a $7.27 > 7.23$ b $9.71 < 9.83$
c $20.17 > 20.09$ d $3.9 > 3.65$

4 a $-5.2 > -5.7$ b $-6.5 < -6.2$
c $-7.2 > -7.5$ d $-8.8 > -8.9$

5 a $3.5 \text{ g} > 380 \text{ mg}$
b $0.4 \text{ t} < 845 \text{ kg}$
c $2.5 \text{ cm} < 48 \text{ mm}$
d $950 \text{ g} > 0.08 \text{ kg}$
e $2500 \text{ m} > 1.9 \text{ km}$
f $250 \text{ cm} < 6.5 \text{ m}$

6 a 45.399, 45.454, 45.545, 45.933
b 5.009, 5.044, 5.077, 5.183
c 31.14, 31.148, 31.41, 31.425
d 7.02, 7.052, 7.2, 7.502

7 a $205.5 \text{ cm} \neq 255 \text{ mm}$ b $0.125 \text{ g} = 125 \text{ mg}$
c $500 \text{ g} \neq 0.05 \text{ kg}$ d $10.5 \text{ t} \neq 1050 \text{ kg}$
e $0.22 \text{ kg} = 220 \text{ g}$ f $1.75 \text{ km} \neq 175 \text{ m}$

8 a $9.1 > 9.03$
b $56.4 > 56.35$
c $0.66 > 0.606$
d $3.505 < 3.7$

e $0.77 \text{ t} < 806 \text{ kg}$
f $7800 \text{ m} > 0.8 \text{ km}$
g $3.5 \text{ kg} > 375 \text{ g}$
h $156.3 \text{ cm} > 1234 \text{ mm}$

9 a 0.2 cm, 7 mm, 27 mm, 4.3 cm
b 19.5 mm, 29 cm, 34.5 cm, 500 mm
c 2000 g, 3 kg, 5550 g, 75.75 kg
d 0.9 kg, 1.75 kg, 1800 g, 1975 g
e 100 mg, 0.125 g, 150 mg, 0.2 g
f 0.05 km, 999 m, 2750 m, 25 km

10 a $-2.3 > -2.4$ b $-7.23 > -7.29$
c $-0.15 < -0.08$ d $-11.02 > -11.5$

11 a $-8.8, -8.34, -8.28, -8.06$
b $-1.78, -1.5, -1.425, -1.03$

12 a 32 km as it is a lot more than the other numbers.
b Sarina is wrong. Longest distance = 4 km, shortest distance = 0.5 km
 $0.5 \times 10 = 5 \text{ km}$ which is $> 4 \text{ km}$, not $< 4 \text{ km}$

c Sarina runs in the 250m park as her distances are all multiples of 250m.

Frank runs in the 400m park as his distances are all multiples of 400m.

13 a **A** -6.9, **B** -6.84, **C** -6.95

b **C** -6.95, **A** -6.9, **B** -6.84

14 -1.43, -1.42, -1.41, -1.40, -1.39

15 a $F = -37.48$ when $C = -38.6$

b -38.6°F is colder, because $-38.6^{\circ}\text{C} = -37.48^{\circ}\text{F}$ which is warmer than -38.6°F

Exercise 4.2

1 a $\times 0.4$ is the same as $\div 10$ and $\times 4$
OR $\times 4$ and $\div 10$

b $\times 0.6$ is the same as $\div 10$ and $\times 6$
OR $\times 6$ and $\div 10$

2 a $30 \div 10 = 3$ and $3 \times 2 = 6$

b $-40 \div 10 = -4$ and $-4 \times 2 = -8$

c $12 \times 2 = 24$ and $24 \div 10 = 2.4$

d $-8 \times 2 = -16$ and $-16 \div 10 = -1.6$

3 a $30 \div 10 = 3$ and $3 \times 3 = 9$

b $-50 \div 10 = -5$ and $-5 \times 3 = -15$

c $15 \times 3 = 45$ and $45 \div 10 = 4.5$

d $-9 \times 3 = -27$ and $-27 \div 10 = -2.7$

4 a $500 \div 100 = 5$ and $5 \times 2 = 10$

b $-600 \div 100 = -6$ and $-6 \times 2 = -12$

c $25 \times 2 = 50$ and $50 \div 100 = 0.5$

d $-4 \times 2 = -8$ and $-8 \div 100 = -0.08$

5 a $500 \div 100 = 5$ and $5 \times 3 = 15$

b $-700 \div 100 = -7$ and $-7 \times 3 = -21$

c $12 \times 3 = 36$ and $36 \div 100 = 0.36$

d $-3 \times 3 = -9$ and $-9 \div 100 = -0.09$

6 a -0.9 **b** 1.5 **c** -6 **d** 4.2
e -7.2

7 a -0.24 **b** -2.4
c -0.024 **d** -24

8 E -13.5, **D** -13, **C** -12.9, **B** -12.6, **A** -12.48

9 a i $3 \times 3 = 9$

$0.3 \times 3 = 0.9$

$0.3 \times 0.3 = 0.09$

$0.3 \times 0.03 = 0.009$

$0.3 \times 0.003 = 0.0009$

ii $4 \times 7 = 28$

$0.4 \times 7 = 2.8$

$0.4 \times 0.7 = 0.28$

$0.4 \times 0.07 = 0.028$

$0.4 \times 0.007 = 0.0028$

b i 0.005 **ii** 0.24 **iii** 0.024

iv 0.0016 **v** 0.048 **vi** 0.006

10 a Equal to 0.0012 are: **A, G, H**

Equal to 0.016 are: **B, E, I**

Equal to 0.0018 are: **C, D, J**

F is left over. $0.05 \times 0.4 = 0.02$

b Learners' answers. Any calculation that gives an answer of 0.02, e.g. 0.2×0.1

11 a 13 104

b i 1310.4 **ii** 1310.4

iii 131.04 **iv** 13.104

v 13.104 **vi** 0.13104

12 a Estimate: $7 \times 8 = 56$, Accurate: 59.76

b Estimate: $0.2 \times 5 = 1$, Accurate: 1.08

c Estimate: $0.9 \times 6 = 5.4$, Accurate: 5.5245

d Estimate: $0.6 \times 0.7 = 0.42$,
Accurate: 0.45262

13 a Estimate $= 0.2 \times 7 = 1.4$, so 1.587 could be correct

b Estimate: $80 \times 0.003 = 0.24$ so 0.0246 is incorrect

c Estimate: $0.08 \times 0.005 = 0.0004$, so 0.0039 is incorrect

14 a Estimate: $30 \times 2 = 60$ ml

b 75 ml

15 a Estimate: $33 \times 0.03 = 0.99$ litres

b 0.975 litres

16 a i $F = 5$ when $C = -15$

ii $F = -4$ when $C = -20$

b Marcus is not correct. When $C = -17$, $F = 1.4$. The closest to zero is when $C = -18$ and $F = -0.4$ because -0.4 is closer to zero than 1.4

Exercise 4.3

1 a $1.6 + 0.4 = \frac{1.6}{0.4}, \frac{1.6 \times 10}{0.4 \times 10} = \frac{16}{4} = 4$

b $4.5 + 0.9 = \frac{4.5}{0.9}, \frac{4.5 \times 10}{0.9 \times 10} = \frac{45}{9} = 5$

c $-24 + 0.3 = \frac{-24}{0.3}, \frac{-24 \times 10}{0.3 \times 10} = \frac{-240}{3} = -80$

d $-21 + 0.7 = \frac{-21}{0.7}, \frac{-21 \times 10}{0.7 \times 10} = \frac{-210}{7} = -30$

2 A and iii, B and i, C and v, D and ii, E and iv

3 a $2 + 0.4 = \frac{2}{0.4}, \frac{2 \times 10}{0.4 \times 10} = \frac{20}{4} = 5$

b $3 + 0.5 = \frac{3}{0.5}, \frac{3 \times 10}{0.5 \times 10} = \frac{30}{5} = 6$

c $-6 + 0.2 = \frac{-6}{0.2}, \frac{-6 \times 10}{0.2 \times 10} = \frac{-60}{2} = -30$

d $-4 + 0.8 = \frac{-4}{0.8}, \frac{-4 \times 10}{0.8 \times 10} = \frac{-40}{8} = -5$

4 a She has not multiplied the 40 by 10

b 80

5 C is the odd one out as the answer is 110. All the others have an answer of 120.

6 a 2.6 b 16.4 c -1230 d -270

7 \$4.30

8 a i Estimate: $51 \div 0.3 = 170$

ii Accurate: 165

b i Estimate: $-900 \div 0.4 = -2250$

ii Accurate: -2340

c i Estimate: $30 \div 0.5 = 60$

ii Accurate: 63

d i Estimate: $-360 \div 0.6 = -600$

ii Accurate: -585

e i Estimate: $56 \div 0.7 = 80$

ii Accurate: 84.2

f i Estimate: $-4000 \div 0.8 = -5000$

ii Accurate: -4760

9 a

1	2	3	4	5	6	7	8	9
13	26	39	52	65	78	91	104	117

b 58.1

c $60 \times 13 = 780$

10 a

1	2	3	4	5	6	7	8	9
19	38	57	76	95	114	133	152	171

b \$24.80

c $\$25 \times 2 = \50

11 a i 654 ii 32

iii 6540 iv 320

b learners' answers

c i 654 ii 65.4

iii 6.54 iv 0.654

d learners' answers

12 a 4.2 (1 d.p.) b 59.18 (2 d.p.)

c -3043.889 (3 d.p.)

13 a learners' own proof, e.g. $0.5 \times 5.2 \times 3.64 = 2.6 \times 3.64 = 9.464 \text{ m}^2$ and $9.464 \text{ m}^2 \neq 8.84 \text{ m}^2$

b height = 3.4 m

14 2.4 m

15 a No. Learners' explanations, e.g. $7.2 \times 0.8 = 5.76$ and $5.76 \neq 8.64$

b term-to-term rule is: multiply by 1.2, 1st term = 6, 4th term = 10.368; learners' explanations

Exercise 4.4

1 a $(0.2 + 0.1) \times 0.4 = 0.3 \times 0.4 = 0.12$ b $(0.9 - 0.7) \times 0.3 = 0.2 \times 0.3 = 0.06$

c $(0.4 + 0.5) \times 0.6 = 0.9 \times 0.6 = 0.54$ d $(0.8 - 0.6) \times 0.8 = 0.2 \times 0.8 = 0.16$

2 a $60 \times 0.9 = 60 \times (1 - 0.1) = 60 \times 1 - 60 \times 0.1 = 60 - 6 = 54$ b $42 \times 0.9 = 42 \times (1 - 0.1) = 42 \times 1 - 42 \times 0.1 = 42 - 4.2 = 37.8$

- c** 18×0.9
 $= 18 \times (1 - 0.1)$
 $= 18 \times 1 - 18 \times 0.1$
 $= 18 - 1.8$
 $= 16.2$
- d** 24×0.9
 $= 24 \times (1 - 0.1)$
 $= 24 \times 1 - 24 \times 0.1$
 $= 24 - 2.4$
 $= 21.6$
- 3 a** 57 **b** 241 **c** 24 **d** 3.9
e 48 **f** 35 **g** 24 **h** 12
- 4 a** 16×0.35
 $= 16 \times 0.5 \times 0.7$
 $= 8 \times 0.7$
 $= 8 \times 7 \div 10$
 $= 56 \div 10$
 $= 5.6$
- b** 12×0.45
 $= 12 \times 0.5 \times 0.9$
 $= 6 \times 0.9$
 $= 6 \times 9 \div 10$
 $= 54 \div 10$
 $= 5.4$
- c** 18×0.15
 $= 18 \times 0.5 \times 0.3$
 $= 9 \times 0.3$
 $= 9 \times 3 \div 10$
 $= 27 \div 10$
 $= 2.7$
- d** 26×0.35
 $= 26 \times 0.5 \times 0.7$
 $= 13 \times 0.7$
 $= 13 \times 7 \div 10$
 $= 91 \div 10$
 $= 9.1$
- 5 a** 0.24 **b** 0.56
c 0.66 **d** 0.48
- 6 a** 14.4 **b** 32.4 **c** 4.68
- 7** 7.83 m^2
- 8 a** 475.2 **b** 47.52
c 11.88 **d** 1.188
- 9** 3.96 m
- 10** 29.7 m
- 11 a** 265 **b** 1268
c 6.4 **d** 25.26
e 135 **f** 12
- 12 a** 10.5 **b** 43.4
- 13 a** $S = 14$ **b** $a = 7.2$
- 14 a** 39.6 m **b** 98.01 m^2
- 15 a** $F = 11.7$ **b** $m = 52$
- 16 a** 56 **b** 27.3
- 17** $a = 425, b = 51, c = 840, d = 378, e = 26.25$

Exercise 7.1

- 1 $\frac{1}{2} = 0.5$ terminating, $\frac{1}{3} = 0.\dot{3}$ recurring,
 $\frac{1}{4} = 0.25$ terminating, $\frac{1}{5} = 0.2$ terminating,
 $\frac{1}{6} = 0.1\dot{6}$ recurring, $\frac{1}{7} = 0.\dot{1}4285\dot{7}$ recurring,
 $\frac{1}{8} = 0.125$ terminating, $\frac{1}{9} = 0.\dot{1}$ recurring,
 $\frac{1}{10} = 0.1$ terminating
- 2 a $\frac{2}{5} = 0.4$ terminating
b $\frac{2}{3} = 0.\dot{6}$ recurring
c $\frac{3}{4} = 0.75$ terminating
d $\frac{3}{5} = 0.6$ terminating
e $\frac{5}{6} = 0.8\dot{3}$ recurring
f $\frac{2}{7} = 0.\dot{2}8571\dot{4}$ recurring
g $\frac{3}{8} = 0.375$ terminating
h $\frac{4}{9} = 0.\dot{4}$ recurring
i $\frac{7}{10} = 0.7$ terminating
j $\frac{2}{11} = 0.\dot{1}\dot{8}$ recurring
- 3 $\frac{2}{11}, \frac{3}{8}, \frac{4}{9}, \frac{3}{5}, \frac{7}{10}$

4 a terminating, with learners' explanations

b $\frac{7}{8} = 0.875$, $\frac{4}{5} = 0.8$, $\frac{3}{10} = 0.3$, $\frac{3}{20} = 0.15$,
 $\frac{8}{25} = 0.32$

c $\frac{3}{20}, \frac{3}{10}, \frac{8}{25}, \frac{4}{5}, \frac{7}{8}$

5 a recurring, with learners' explanations

b $\frac{5}{9} = 0.\dot{5}$, $\frac{1}{3} = 0.\dot{3}$, $\frac{5}{12} = 0.41\dot{6}$, $\frac{4}{11} = 0.\dot{3}\dot{6}$,
 $\frac{8}{15} = 0.5\dot{3}$

c $\frac{1}{3}, \frac{4}{11}, \frac{5}{12}, \frac{8}{15}, \frac{5}{9}$

6 Marcus is incorrect.

learners' explanations, e.g. $\frac{3}{6} = \frac{1}{2} = 0.5$
which is a terminating decimal

7 a $0.\dot{8}$ b 0.85

c $0.2\dot{6}$ d 0.675

8 a $0.\dot{8}5714\dot{2}$ b $0.\dot{8}4615\dot{3}$

c $0.\dot{2}3809\dot{5}$

9 i is correct

ii is incorrect: there should be a dot over the 7
as well as the 2, i.e. $0.7\dot{2}$

iii is incorrect: she has written the numbers in
the wrong order; the correct answer is $0.6\dot{1}$

iv is incorrect: the second dot should be over
the 5, not the 1, i.e. $0.\dot{1}2820\dot{5}$

10 learners' explanations, e.g. She is wrong.
It is a recurring decimal but the calculator
has rounded up the final digit on the screen.

$\frac{7}{9} = 0.\dot{7}$

11 $\frac{5}{27} = 0.1\dot{8}\dot{5}$

12 $0.5, \frac{7}{13}, 55\%, 0.56, \frac{4}{7}, 58.2\%, 0.6, \frac{18}{27}$

13 a $1.\dot{6}$ b 3.25

c $3.\dot{2}$ d 4.375

14 a i $3\frac{1}{2}$ hours ii 3.5 hours

b i $2\frac{3}{4}$ hours **ii** 2.75 hours

c i $1\frac{1}{6}$ hours **ii** 1.16 hours

d i $4\frac{1}{3}$ hours **ii** 4.3 hours

e i $9\frac{1}{5}$ hours **ii** 9.2 hours

f i $11\frac{5}{12}$ hours **ii** 11.416 hours

- 15** learners' explanations, e.g. Arun is wrong and his teacher is correct. The 6 in 0.006 has a recurring dot, so it is 0.0066666... not 0.006 which is what Arun has used. When you double 0.006 you get 0.012, but when you double 0.0066666... you do get 0.013333...

Exercise 7.2

1 a $\frac{13}{4} = 3\frac{2}{4}$ **b** $\frac{40}{9} \neq 4\frac{1}{3}$

c $-\frac{9}{6} = -1\frac{1}{2}$ **d** $-4\frac{3}{5} \neq -\frac{47}{10}$

2 a $\frac{7}{2} < 3\frac{3}{4}$ **b** $\frac{13}{3} > 4\frac{1}{6}$

c $8\frac{2}{5} > \frac{83}{10}$ **d** $\frac{22}{3} < 7\frac{2}{5}$

3 a $-\frac{5}{4} > -1\frac{1}{2}$ **b** $-\frac{8}{3} > -2\frac{5}{6}$

c $-\frac{27}{5} < -5\frac{4}{15}$ **d** $-\frac{17}{6} < -2\frac{3}{4}$

4 a $-2\frac{5}{8}$ **b** $-\frac{23}{10}$

c $-\frac{23}{3}$

5 a i $-\frac{17}{7} = -2.4285...$

ii $-\frac{22}{9} = -2.4444...$

iii $-\frac{27}{11} = -2.4545...$

b $-\frac{27}{11}, -\frac{22}{9}, -\frac{17}{7}$

- 6 a** When you compare two fractions with the same denominator, the larger the numerator the larger the fraction.

- b** When you compare two fractions with the same numerator, the larger the denominator the smaller the fraction.

7 a $\frac{2}{9} < \frac{7}{9}$ **b** $\frac{15}{8} < \frac{19}{8}$

c $\frac{7}{11} > \frac{7}{13}$ **d** $\frac{4}{5} < \frac{4}{3}$

8 $-\frac{14}{3}, -\frac{22}{5}, -4\frac{1}{3}, -4\frac{1}{5}$

9 Ben, 74%

10 Dolphins club, 70%

11 $-\frac{107}{12}, -8\frac{7}{8}, -\frac{61}{7}, -\frac{49}{6}$

12 On the second day, 88%

13 Drug A

14 a Yes. $-\frac{8}{9} = -\frac{32}{36}$ and $-\frac{13}{18} = -\frac{26}{36}$. Halfway

between 26 and 32 is 29, so $-\frac{29}{36}$ is exactly

halfway between $-\frac{32}{36}$ and $-\frac{23}{36}$.

b $-1\frac{19}{24}$

Exercise 7.3

1 a $4\frac{2}{3} - 3\frac{1}{3}$ ① $\frac{14}{3} - \frac{10}{3}$ ② $\frac{14}{3} - \frac{10}{3} = \frac{4}{3}$

③ $\frac{4}{3} = 1\frac{1}{3}$

b $3\frac{2}{9} - 1\frac{7}{9}$ ① $\frac{29}{9} - \frac{16}{9}$ ② $\frac{29}{9} - \frac{16}{9} = \frac{13}{9}$

③ $\frac{13}{9} = 1\frac{4}{9}$

c $7\frac{1}{5} - 5\frac{2}{5}$ ① $\frac{36}{5} - \frac{27}{5}$ ② $\frac{36}{5} - \frac{27}{5} = \frac{9}{5}$

③ $\frac{9}{5} = 1\frac{4}{5}$

d $5\frac{3}{7} - 2\frac{6}{7}$ ① $\frac{38}{7} - \frac{20}{7}$ ② $\frac{38}{7} - \frac{20}{7} = \frac{18}{7}$

③ $\frac{18}{7} = 2\frac{4}{7}$

2 a $1\frac{2}{5}$ **b** $1\frac{7}{11}$ **c** $1\frac{5}{7}$ **d** $2\frac{8}{9}$

3 a $4\frac{1}{2} - 2\frac{3}{4}$ ① $\frac{9}{2} - \frac{11}{4}$ ② $\frac{18}{4} - \frac{11}{4} = \frac{7}{4}$

③ $\frac{7}{4} = 1\frac{3}{4}$

$$\text{b } 3\frac{1}{8} - 1\frac{1}{4} \quad \textcircled{1} \frac{25}{8} - \frac{5}{4} \quad \textcircled{2} \frac{25}{8} - \frac{10}{8} = \frac{15}{8}$$

$$\textcircled{3} \frac{15}{8} = 1\frac{7}{8}$$

$$\text{c } 5\frac{3}{5} - 2\frac{3}{10} \quad \textcircled{1} \frac{28}{5} - \frac{23}{10} \quad \textcircled{2} \frac{56}{10} - \frac{23}{10} = \frac{33}{10}$$

$$\textcircled{3} \frac{33}{10} = 3\frac{3}{10}$$

$$\text{d } 6\frac{1}{3} - 2\frac{1}{6} \quad \textcircled{1} \frac{19}{3} - \frac{13}{6} \quad \textcircled{2} \frac{38}{6} - \frac{13}{6} = \frac{25}{6}$$

$$\textcircled{3} \frac{25}{6} = 4\frac{1}{6}$$

$$4 \text{ a } 4\frac{11}{12} \quad \text{b } 2\frac{13}{16}$$

$$\text{c } 1\frac{1}{2} \quad \text{d } 2\frac{5}{6}$$

$$5 \text{ A } 2\frac{1}{4} \quad \text{B } 2\frac{1}{3} \quad \text{C } 2\frac{1}{3}$$

A gives the different answer

$$6 \text{ a i } 2 \text{ km} \quad \text{ii } 2\frac{1}{8} \text{ km}$$

$$\text{b i } 20 \text{ km} \quad \text{ii } 19\frac{3}{8} \text{ km}$$

$$7 \frac{5}{8} \text{ m}$$

$$8 \quad 8\frac{1}{4} - 3\frac{9}{10} \quad \textcircled{1} \frac{33}{4} - \frac{39}{10} \quad \textcircled{2} \frac{33}{4} - \frac{39}{10} = \frac{165}{20} - \frac{78}{20} = \frac{87}{20}$$

$$\textcircled{3} \frac{87}{20} = 4\frac{7}{20}$$

$$9 \text{ a } 3\frac{9}{10} \quad \text{b } 1\frac{7}{18}$$

$$\text{c } 2\frac{11}{12} \quad \text{d } 4\frac{37}{40}$$

$$10 \text{ a i } 8 \text{ m} \quad \text{ii } 8\frac{3}{20} \text{ m}$$

$$\text{b } 2\frac{1}{10} \text{ m}$$

$$11 \text{ No, the range is } 187\frac{3}{4} - 95\frac{7}{10} = 92\frac{1}{20}$$

$$12 \text{ a } \text{ She has worked out } 3 - 1 = 2 \text{ and } \frac{27}{36} - \frac{16}{36}$$

instead of $\frac{16}{36} - \frac{27}{36}$

$$\text{b } 1\frac{25}{36}$$

$$13 \text{ a } \text{ B is taller [A is } 6\frac{5}{12} \text{ m, B is } 6\frac{23}{24} \text{ m]}$$

$$\text{b } \frac{13}{24} \text{ m}$$

$$14 \text{ a } 6 \text{ m}^2 \quad \text{b } 6\frac{2}{21} \text{ m}^2$$

$$15 \text{ Any two counter-examples, e.g. } 1\frac{3}{4} + 1\frac{1}{2} = 3\frac{1}{4}$$

and $1 + 1 + 1 = 3$ and $3\frac{1}{4} > 3$

$$\text{e.g. } 2\frac{8}{9} + 5\frac{7}{9} = 8\frac{2}{3} \text{ and } 2 + 5 + 1 = 8 \text{ and } 8\frac{2}{3} > 8$$

16 a learners' choices of fractions to add – all possible results in table below:

+	$2\frac{17}{36}$	$3\frac{17}{18}$	$4\frac{1}{9}$	$5\frac{11}{24}$
$2\frac{17}{36}$		$6\frac{5}{12}$	$6\frac{7}{12}$	$7\frac{67}{72}$
$3\frac{17}{18}$	$6\frac{5}{12}$		$8\frac{1}{18}$	$9\frac{29}{72}$
$4\frac{1}{9}$	$6\frac{7}{12}$	$8\frac{1}{18}$		$9\frac{41}{72}$
$5\frac{11}{24}$	$7\frac{67}{72}$	$9\frac{29}{72}$	$9\frac{41}{72}$	

$$\text{b } 5\frac{11}{24} + 4\frac{1}{9} = 9\frac{41}{72}. \text{ It's the two numbers with the greatest whole number parts.}$$

c learners' choices of fractions to subtract – all possible results in table below:

–	$2\frac{17}{36}$	$3\frac{17}{18}$	$4\frac{1}{9}$	$5\frac{11}{24}$
$2\frac{17}{36}$		$1\frac{17}{36}$	$1\frac{23}{36}$	$2\frac{71}{72}$
$3\frac{17}{18}$	$1\frac{17}{36}$		$\frac{1}{6}$	$1\frac{37}{72}$
$4\frac{1}{9}$	$1\frac{23}{36}$	$\frac{1}{6}$		$1\frac{25}{72}$
$5\frac{11}{24}$	$2\frac{71}{72}$	$1\frac{37}{72}$	$1\frac{25}{72}$	

- d** $4\frac{1}{9} - 3\frac{17}{18} = \frac{1}{6}$. $4\frac{1}{9}$ is just over 4 and $3\frac{17}{18}$ is just under 4 so these two numbers are the closest together. The difference is $\frac{1}{6}$.

Exercise 7.4

1 a $2\frac{1}{2} \times 6 = 2 \times 6 + \frac{1}{2} \times 6$
 $= 12 + 3$
 $= 15$

b $3\frac{1}{4} \times 8 = 3 \times 8 + \frac{1}{4} \times 8$
 $= 24 + 2$
 $= 26$

c $5\frac{1}{3} \times 9 = 5 \times 9 + \frac{1}{3} \times 9$
 $= 45 + 3$
 $= 48$

d $4\frac{1}{5} \times 15 = 4 \times 15 + \frac{1}{5} \times 15$
 $= 60 + 3$
 $= 63$

2 a $12 \times 2 = 24 \text{ m}^2$

b 27 m^2

3 a $3\frac{2}{3} \times 12 = 3 \times 12 + \frac{2}{3} \times 12$
 $= 36 + 8$
 $= 44$

b $2\frac{3}{4} \times 8 = 2 \times 8 + \frac{3}{4} \times 8$
 $= 16 + 6$
 $= 22$

c $3\frac{2}{5} \times 10 = 3 \times 10 + \frac{2}{5} \times 10$
 $= 30 + 4$
 $= 34$

d $1\frac{5}{6} \times 18 = 1 \times 18 + \frac{5}{6} \times 18$
 $= 18 + 15$
 $= 33$

4 a Estimate: $20 \times 4 = 80$

b i Archie could be correct as 80 is close to 77

ii He is correct. $21 \times 3\frac{2}{3} = 77$

5 a $3\frac{1}{2} \times 7 = 3 \times 7 + \frac{1}{2} \times 7$
 $= 21 + \frac{7}{2}$
 $= 21 + 3\frac{1}{2}$
 $= 24\frac{1}{2}$

b $4\frac{1}{4} \times 9 = 4 \times 9 + \frac{1}{4} \times 9$
 $= 36 + \frac{9}{4}$
 $= 36 + 2\frac{1}{4}$
 $= 38\frac{1}{4}$

c $6\frac{2}{3} \times 5 = 6 \times 5 + \frac{2}{3} \times 5$
 $= 30 + \frac{10}{3}$
 $= 30 + 3\frac{1}{3}$
 $= 33\frac{1}{3}$

d $4\frac{3}{5} \times 8 = 4 \times 8 + \frac{3}{5} \times 8$
 $= 32 + \frac{24}{5}$
 $= 32 + 4\frac{4}{5}$
 $= 36\frac{4}{5}$

6 Area $= 7 \times 7 + 7 \times 11\frac{3}{4} = 49 + 77 + 5\frac{1}{4}$
 $= 131\frac{1}{4} \text{ cm}^2$

OR Area $= 7 \times (7 + 11\frac{3}{4}) = 7 \times 18\frac{3}{4}$
 $= 126 + 5\frac{1}{4} = 131\frac{1}{4} \text{ cm}^2$

7 a No, $4\frac{5}{8}$ rounds to 5, so estimate is 15 m^2

b $13\frac{7}{8} \text{ m}^2$

c Yes, it will cost her $14 \times 15 = \$210$ which is more than \$200.

8 $4\frac{2}{5} \times 21$ is greater because $3\frac{2}{3} \times 25 = 91\frac{2}{3}$ and

$4\frac{2}{5} \times 21 = 92\frac{2}{5}$

9 B $12 \times 3\frac{1}{5} = 38\frac{2}{5}$, C $5 \times 7\frac{5}{7} = 38\frac{4}{7}$, A $8 \times 4\frac{5}{6} = 38\frac{2}{3}$

10 a i $3 \times 12 = 36$ ii $31\frac{1}{2}$

b i $7 \times 10 = 70$ ii $67\frac{1}{2}$

c i $3 \times 15 = 45$ ii $46\frac{1}{4}$

11 3 hours 45 minutes

12 a $2 \times (10 - 6) = 8\text{ m}^2$ b $6\frac{9}{20}\text{ m}^2$

13 a $9 \times 8\frac{5}{6} = 79\frac{1}{2}$, $6 \times 11\frac{3}{4} = 70\frac{1}{2}$, $12 \times 7\frac{4}{15} = 87\frac{1}{5}$

b $79\frac{1}{2}$ c $16\frac{7}{10}$

14 a 240 cm^3

b He is correct.

Volume $= 3\frac{3}{4} \times 12 \times 4\frac{2}{3} = 45 \times 4\frac{2}{3} = 210\text{ cm}^3$

OR Volume $= 3\frac{3}{4} \times 12 \times 4\frac{2}{3} = 3\frac{3}{4} \times 56 = 210\text{ cm}^3$

15 a $x = 12$ b $y = 13$

Exercise 7.5

1 a i 2 ii 4

iii 6 iv 8

b i 10 ii 12

iii 14 iv 16

2 a i 3 ii 6

iii 9 iv 12

b i 15 ii 18

iii 21 iv 24

3 a i 4 ii 8

b i 12 ii 16

iii 28 iv 40

4 a 5 b 18 c 16

5 a 22 b 100 c 108

6 a 3 b 5 c 4

7 a $13\frac{1}{3}$ b $9\frac{1}{3}$ c $15\frac{3}{4}$

d $19\frac{1}{5}$ e $7\frac{5}{7}$

8 a 14 b $3\frac{1}{3}$

c $12\frac{1}{2}$ d $8\frac{4}{7}$

9 $22\frac{1}{2}\text{ m}$

10 a $s = 7\frac{1}{5}$ b $t = 49\frac{1}{2}$

11 B gives the greater answer. A $25 + \frac{6}{7} = 29\frac{1}{6}$

B $25 + \frac{3}{8} = 66\frac{2}{3}$

12 A gives the smaller answer.

A $32 + \frac{13}{15} = 36\frac{12}{15}$, B $35 + \frac{13}{15} = 40\frac{5}{15}$

13 a $5\frac{1}{6}$

b add $\frac{1}{3}$ (or add $\frac{2}{6}$)

c $6\frac{1}{6}, 6\frac{1}{2}, 6\frac{5}{6}$

d $8\frac{1}{6}$

14 a

x	0	2	4	6	8
y	0	$1\frac{1}{2}$	3	$4\frac{1}{2}$	6

b Plotting the points from the table and

drawing the line $y = \frac{3}{4}x$ from $x = 0$

to $x = 8$

15 a $y = 84^\circ$ b $y = 48\frac{9}{10}^\circ$ or 48.9°

c If $x = 65^\circ$, $x \div \frac{5}{6} = 78^\circ$ and

$x + \frac{2}{3} + 15 = 112\frac{1}{2}$, $78 + 112\frac{1}{2} = 190\frac{1}{2}$

this is $> 180^\circ$ in a triangle, so is not possible.

Exercise 7.6

1 a $\frac{3}{10}$ b $\frac{4}{9}$

c $\frac{7}{8}$ d $\frac{1}{3}$

- 2 a $\frac{1}{6}$ b $\frac{1}{8}$
 c $\frac{5}{9}$ d $\frac{1}{2}$
- 3 a $\frac{7}{10}$ b $\frac{10}{21}$
 c $\frac{11}{12}$ d $\frac{23}{30}$
- 4 a $\frac{5}{14}$ b $\frac{7}{15}$
 c $\frac{11}{35}$ d $\frac{7}{30}$
- 5 $\frac{4}{15}$
- 6 a $\frac{3}{4}$ b $\frac{5}{8}$
 c $\frac{9}{10}$ d $\frac{7}{9}$
 e $\frac{5}{6}$ f $\frac{8}{15}$
 g $\frac{5}{9}$ h $\frac{5}{8}$
 i $\frac{3}{20}$ j $\frac{3}{10}$
 k $\frac{4}{9}$ l $\frac{2}{15}$
- 7 a $\frac{9}{20}$ b $\frac{11}{24}$
 c $\frac{14}{45}$ d $\frac{17}{36}$
 e $\frac{21}{22}$ f $\frac{35}{36}$
 g $\frac{3}{10}$ h $\frac{7}{20}$
 i $\frac{11}{21}$ j $\frac{7}{20}$
 k $\frac{13}{55}$ l $\frac{31}{63}$
- 8 $\frac{19}{56}$
- 9 a i 8 ii 15
 iii 14 iv 28
 v 20 vi 25

- b learners' checks
 c learners' answers

10 24m

- 11 a He has calculated $14 \times \frac{1}{5}$ not $14 \div \frac{1}{5}$
 b 70
- 12 a 6 b 9 c $\frac{2}{3}$ d 0
- 13 A $\left(\frac{1}{3} + \frac{1}{6}\right) \times \left(\frac{5}{8} - \frac{3}{8}\right) = \frac{1}{8}$
 B $\left(3\frac{1}{4} + 2\frac{3}{4}\right) + \left(\frac{2}{7} + \frac{3}{14}\right) = 12$
 B $\div$ A $= 12 \div \frac{1}{8} = 96$
 Sofia is correct.
- 14 $d = 5\frac{1}{4} [a = \frac{2}{3}, b = 27, c = 13\frac{1}{2}]$