

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 \div b \times c \times
d \times e \div f \div

- 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 683.6157731
b i 700 ii 680
iii 684 iv 683.6
v 683.62 vi 683.616
- 8 96000
- 9 0.4g
- 10 298000000 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.

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 12453000
- 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: $-0.273, -0.272, -0.271, -0.270$

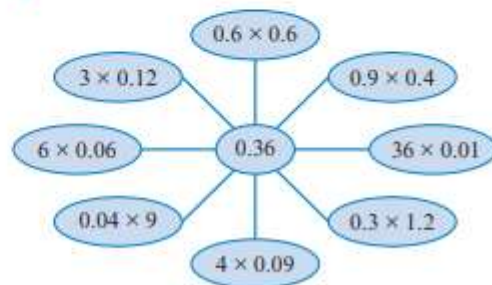
Exercise 4.2

- 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

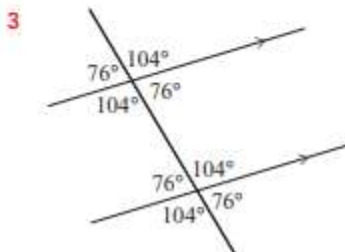
- 1 a $\frac{24}{4} = 6$ b $\frac{72}{9} = 8$
 c $-\frac{420}{6} = -70$ d $-\frac{450}{5} = -90$
- 2 D because the answer is 8. All the others have an answer of 7.
- 3 learners' answers
- 4 a 2.3 b 8.2
 c -860 d -960
- 5 \$1.35 per metre
- 6 learners' answers
- 7 a Estimate: $30 \div 0.3 = 100$
 Accurate: $27.6 \div 0.3 = 92$
 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 $\$23.56 \approx 20$ and $20 \times 2.5 = 50$
- 12 14.75 m

- 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

Unit 5

Getting started

- 1 a 55° b isosceles
2 a 141° b 58



- 4 a learners' diagrams
b 7.5 or 7.6cm

Exercise 5.1

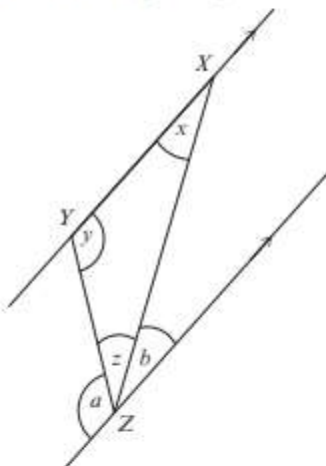
- 1 a p and t , q and u , s and w , r and v
b q and w , r and t
- 2 a i b ii d
b a and c or b and d
- 3 a q , r , u b p , s , t
- 4 a corresponding b alternate
c CQX d BPY e YQD
- 5 $a = 136^\circ$, alternate angles; $b = 136^\circ$, corresponding angles or vertically opposite angles; $c = 44^\circ$, angles on a straight line; $d = 44^\circ$, alternate angles or angles on a straight line
- 6 If AB and CD were parallel, then the angles marked 50° and 40° would be equal. This is not the case.
- 7 a b, f, j
b & c c and e ; c and i

- 8 a neither b corresponding
c corresponding d alternate
e neither

- 9 a $h = b$ because they are vertically opposite angles; $b = d$ because they are corresponding angles; therefore $h = d$
b There are several possible answers. Here is one: $h = b$ because they are vertically opposite angles; $b = f$ because they are alternate angles; $f = d$ because they are vertically opposite angles; therefore $h = d$

- 10 a They are alternate angles.
b They are alternate angles.
c $d + c + e = 180^\circ$ because they are angles on a straight line. But $a = d$ and $b = e$ and so $a + c + b = 180^\circ$

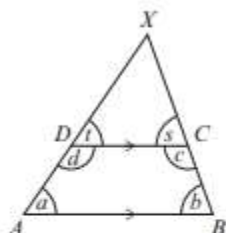
- 11 A labelled diagram, e.g.



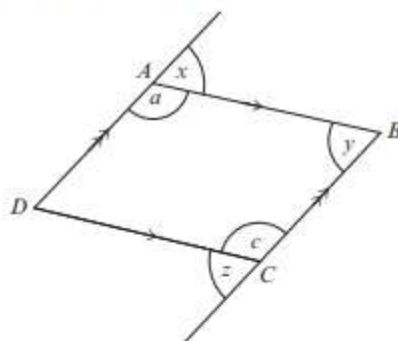
$a + z + b = 180^\circ$ because they are angles on a straight line.

But $a = y$ because they are alternate angles and $b = x$ because they are alternate angles so therefore $y + z + x = 180^\circ$

- 12 The easiest way is to label the angles like this:



- a $a = t$ because they are corresponding angles.
 $b = s$ because they are corresponding angles.
 The angle at X is common to both triangles.
 This shows that the angles of the two triangles are the same.
- b $d + t = 180^\circ$ because they are angles on a straight line. But $t = a$ and so $d + a = 180^\circ$.
- c A similar proof shows that $b + c = 180^\circ$.
- 13 a Example answer:



$a = 180 - x$ because they are angles on a straight line.

$x = y$ because they are alternate angles.

$y = z$ because they are corresponding angles.

$c = 180 - z$ because they are angles on a straight line.

So $c = 180 - z = 180 - x = a$

A similar argument shows that the angles at B and D are equal.

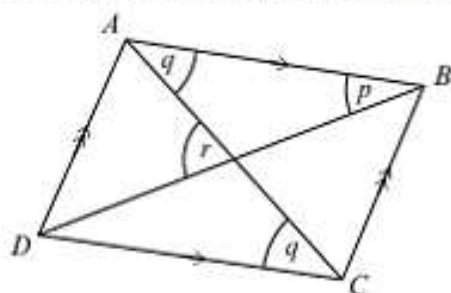
- b learners' conclusions

Exercise 5.2

Because of the nature of proofs, alternative explanations are possible in some questions.

- 1 $a = 125^\circ$ $b = 40^\circ$ $c = 48^\circ$
- 2 a $a = 137^\circ$ $b = 113^\circ$ $c = 110^\circ$
 b 55°
- 3 a 68° and 72° b 140° and 112°
- 4 a alternate angles
 b alternate angles
 c $x = a + y = a + c$
- 5 a alternate angles
 b corresponding angles
 c angle $CBD =$ angle XDY , corresponding angles; angle $BCD =$ angle CDX , alternate angles. The six angles round D add up to 360° . The result follows from this.
- 6 Because 30° and 20° are opposite angles and must be equal / because 150° and 160° are opposite angles and must be equal.
- 7 a exterior angle of the triangle
 b $e = a + b$; $f = b + c$
 c $d + e + f = a + c + a + b + b + c = 2a + 2b + 2c = 2(a + b + c) = 2 \times 180^\circ$ (angle sum of a triangle) $= 360^\circ$
- 8 angle $BAC = 180 - (2 \times 68) = 44^\circ$, isosceles triangle; angle $EDC = 44^\circ$, corresponding angle
- 9 a Show that the angles of the triangle and the quadrilateral together make the angles of the pentagon. The sum of the angles is $180^\circ + 360^\circ$.
 b learners' answers
- 10 a alternate angles
 b 61°

- 11** Angle $BAC = q$, alternate angles; $r =$ angle $BAC + p$, exterior angle. The result follows.



- 12 a** $w = a + c$, exterior angle of a triangle;
 $y = b + d$, exterior angle of a triangle.
- b** $w + y =$ the sum of two angles of the quadrilateral; $x + z =$ the sum of the other two angles of the quadrilateral;
 $w + x + y + z =$ the angle sum of the quadrilateral $= 360^\circ$
- 13** $a = 120^\circ$; $b = 55^\circ$; $c = 25^\circ$
- 14 a** exterior angle of a triangle
- b** exterior angle of a triangle
- c** $a + x + y = 180^\circ$, angle sum of a triangle;
 hence $a + (b + d) + (c + e) = a + b + c + d + e = 180^\circ$.

Exercise 5.3

For the constructions, accept answers for lengths within 0.2 cm, and answers for angles within 2° , to allow for slight drawing errors.

- 1 a** construction
- b** $AC = 4.2$ cm and $BC = 5.7$ cm
- 2 a** construction
- b** $XY = 7.1$ cm and $XZ = 4.2$ cm
- 3 a** construction **b** 86°
- 4 a** construction **b** 40°

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	$0.1\dot{6}$	$0.\dot{1}4285\dot{7}$	0.125	$0.\dot{1}$	0.1	$0.\dot{0}\dot{9}$	$0.08\dot{3}$
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 $\frac{11}{14} = 0.785714\dot{2}$

- 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 $\frac{45}{11} = 4.0\dot{9}$

Exercise 7.2

1 a $\frac{11}{4} \neq 2\frac{16}{20}$

c $-\frac{15}{8} \neq -2\frac{1}{8}$

b $\frac{45}{6} = 7\frac{1}{2}$

d $-8\frac{4}{5} = -\frac{132}{15}$

2 a $\frac{13}{2} < 6\frac{5}{8}$

c $5\frac{3}{5} > \frac{82}{15}$

e $-\frac{17}{4} > -4\frac{5}{12}$

g $-\frac{21}{5} < -4\frac{2}{15}$

b $\frac{17}{3} < 6\frac{7}{12}$

d $\frac{19}{4} < 4\frac{4}{5}$

f $-\frac{7}{3} > -2\frac{5}{9}$

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 $\frac{15}{4} > \frac{15}{7}$

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

4

(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

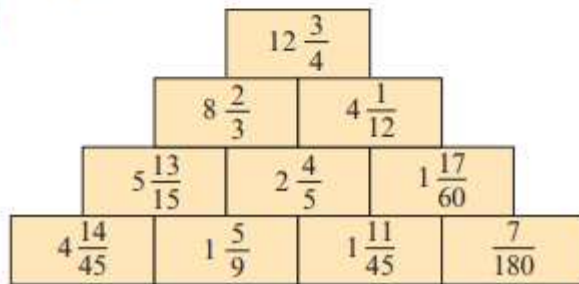
11 $2\frac{13}{30}$ kg

12 a learners' answers

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

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

13



Workbook

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
-

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
-

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 $< 4 \text{ km}$

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
-

Exercise 4.3

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

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

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

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

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

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

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

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

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

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.)

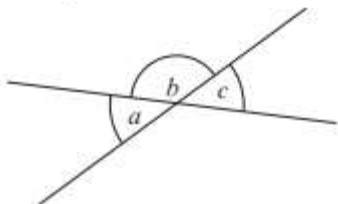
13 a learners' own proof, e.g. $0.5 \times 5.2 \times 3.64 = 2.6 \times 3.64 = 9.464 \text{ m}^2$ and $9.464 \text{ m}^2 \neq 8.84 \text{ m}^2$

b height = 3.4 m

14 2.4 m

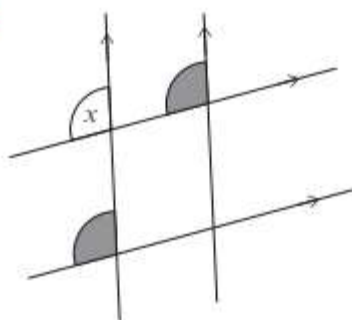
Exercise 5.1

- 1 $a + b = 180^\circ$, angles on a straight line, so $a = 180 - b$; $b + c = 180^\circ$, angles on a straight line, so $c = 180 - b$; hence a and c are equal.

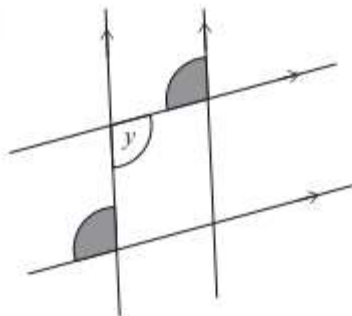


- 2 a They are vertically opposite angles

b



c



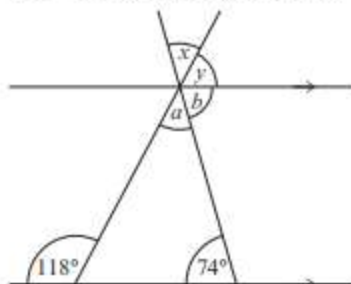
- 3 $a = 75^\circ$, vertically opposite angles; $b = 75^\circ$, corresponding to the given angle; $c = 105^\circ$, angles on a straight line; $d = 105^\circ$, alternate angle to c

- 4 a g and i b c and e

- 5 a i BEF ii DEB
iii EBC

- b No. Alternate angles must be between the parallel lines AC and DF . Sofia's angles are not.
- 6 Lines l and n are parallel because corresponding angles (80° and 100°) are equal. These angles are not the same for line m so that is not parallel to the other two.

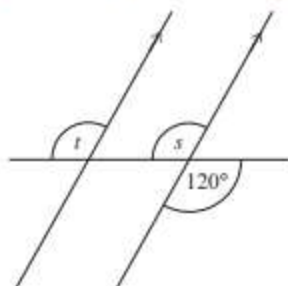
- 7 $a = 118 - 74 = 44^\circ$, exterior angle;
so $x = 44^\circ$, vertically opposite angle



$b = 74^\circ$, alternate angle;

$y = 180 - 44 - 74 = 62^\circ$, angles on a straight line

- 8 $s = 120^\circ$, vertically opposite angles;

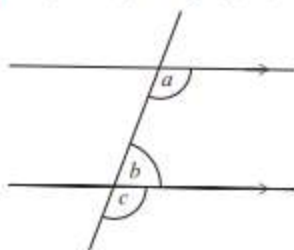


$s = t$, corresponding angles;

hence $t = 120^\circ$; other explanations are possible

- 9 Yes. The angle vertically opposite 50° is also 50° . That angle and the 75° add up to 125° and that makes an angle alternate to the 125° marked. Other explanations are possible.

- 10 $a = c$, corresponding angles;



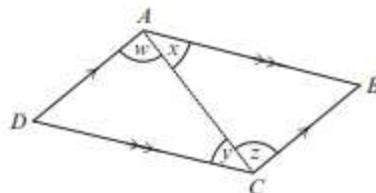
$b + c = 180^\circ$, angles on a straight line;

hence $a + b = 180^\circ$

- 11 Angle $WXV = \text{angle } Y$, corresponding angles;
angle $VXZ = \text{angle } Z$, alternate angles;
 $WXV + VXZ + ZXY = 180^\circ$, angles on a straight line; hence $X + Y + Z = 180^\circ$.

- 12 alternate angles; alternate angles; angles on a straight line

- 13 a $x = y$, alternate angles;



$w = z$, alternate angles;

hence $x + w = y + z$ or $A = C$

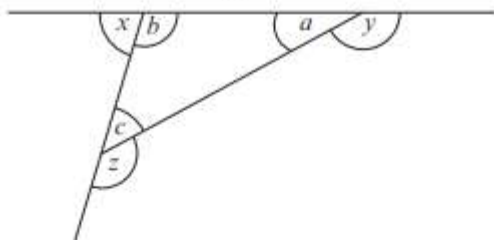
- b Draw diagonal BD and prove $B = D$ using similar arguments to those in part a.

Exercise 5.2

Example explanations are given for some of the proofs in this exercise. There may be other acceptable proofs.

- 1 120°
- 2 Each one is 165°
- 3 $x = 75^\circ$ and $y = 40^\circ$
- 4 $a = 110^\circ$ and $b = 70^\circ$
- 5 Divide the shape into two triangles. Show the angles of the two triangles are the same as the four angles of the quadrilateral.
- 6 $a = c + d$, exterior angle; $e = g + h$, exterior angle; $a + e + f + b = 360^\circ$, angles at a point; hence $c + d + g + h + f + b = 360^\circ$ and these are the angles of $PQRS$.
- 7 a The six angles of the two triangles add up to $2 \times 180 = 360^\circ$. The four angles A , B , C and D must be less than this.
b The 120° angle is the exterior angle of both triangles. A and D add up to 120° and so do B and C . Hence $A + B + C + D = 240^\circ$.

- 8 $x = a + c$, exterior angle;



$y = b + c$, exterior angle;

$z = b + a$, exterior angle;

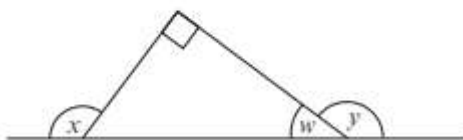
$$x + y + z = a + c + b + c + b + a =$$

$$2(a + b + c) = 2 \times 180 = 360^\circ$$

- 9 $a = 110 - 40 = 70^\circ$, exterior angle of a triangle;
 $b = 110 - 55 = 55^\circ$, exterior angle;
 $c = 110 - 70 = 40^\circ$, exterior angle

- 10 a 115°

b



External angle $x = 90^\circ + w$ so $w = x - 90^\circ$

$w + y = 180^\circ$ because they are angles on a straight line, so $x - 90^\circ + y = 180^\circ$

Hence $x + y = 270^\circ$

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. $0.\dot{7}\dot{2}$

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 $\frac{5}{27} = 0.18\dot{5}$

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

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 $-\frac{17}{7} = -2.4285 \dots$
 ii $-\frac{22}{9} = -2.4444 \dots$
 iii $-\frac{27}{11} = -2.4545 \dots$
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 $\frac{7}{4} = 1\frac{3}{4}$

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

③ $\frac{15}{8} = 1\frac{7}{8}$

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

③ $\frac{33}{10} = 3\frac{3}{10}$

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

③ $\frac{25}{6} = 4\frac{1}{6}$

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

c $1\frac{1}{2}$ **d** $2\frac{5}{6}$

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

A gives the different answer

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

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

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

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

③ $\frac{87}{20} = 4\frac{7}{20}$

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

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

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

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

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

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

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

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

