**1. Representing data**

### Practise... 1.1 Pictograms, bar charts and pie charts

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>a</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>Tuesday</td>
</tr>
<tr>
<td>3</td>
<td>a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Colour</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Silver</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**Key:** 📱 = 2 mobiles
(Other answers are possible with a different key)

<table>
<thead>
<tr>
<th></th>
<th>Colour</th>
<th>Frequency</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Silver</td>
<td>14</td>
<td>$14 \times 10 = 140^\circ$</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>10</td>
<td>$10 \times 10 = 100^\circ$</td>
</tr>
<tr>
<td></td>
<td>Blue</td>
<td>3</td>
<td>$3 \times 10 = 30^\circ$</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>5</td>
<td>$5 \times 10 = 50^\circ$</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>$4 \times 10 = 40^\circ$</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>36</td>
<td>360°</td>
</tr>
</tbody>
</table>

**d** blue

<table>
<thead>
<tr>
<th></th>
<th>Fruit juice</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Orange</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apple</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cranberry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blackcurrant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**Key:** 🍊 = 2 juices

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>a</td>
<td>i</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>Mobile phone sales</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colour</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

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5 a

<table>
<thead>
<tr>
<th>Day</th>
<th>Emails</th>
<th>Faxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Tuesday</td>
<td>31</td>
<td>15</td>
</tr>
<tr>
<td>Wednesday</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>Thursday</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Friday</td>
<td>17</td>
<td>7</td>
</tr>
</tbody>
</table>

b There is no mode for that data.

c 15

d $31 - 17 = 14$

e Friday

6 a

b The dual bar chart shows clearly the comparative costs of gas and electricity separately each quarter.

The composite bar chart shows clearly the comparative total cost each quarter.

c The dual bar chart shows clearly the comparative costs of gas and electricity separately each quarter.

The composite bar chart shows clearly the comparative total cost each quarter.

d $\frac{8}{85 + 52 + 15 + 44} \times 100 = 43.36734\%$

e The highest bills for gas and electricity are in the first quarter.

The lowest bills for gas and electricity are in the third quarter.

The electricity bills are always higher than the gas bills.

Electricity and gas bills fall during the first three quarters.

Electricity and gas bills follow the same patterns from quarter to quarter.

The range for the gas bills is bigger than the range for the electricity bills.

The cost of the bills never exceeds £100.
Other diagrams are suitable such as pictograms or pie charts.

## Practise... 1.2 Stem-and-leaf diagrams

### 1

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Key: 2</td>
<td>1 represents 21p</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>8</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Key: 2</td>
<td>4 represents 24 marks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3

| a | 132, 113, 86, 146, 110, 106, 125, 103, 109, 130, 109, 130, 109, 115, 126, 117 |

### 4

There is no set answer but make sure the stem and leaf has minimum 23, maximum 65, median 44, mode of 42 and 55 (and no other) and a key.

### 5

- Mean for girls = \( \frac{113 + 112 + \ldots + 113}{15} = 20.9 \) minutes
- Mean for boys = \( \frac{364 + 365 + \ldots + 364}{15} = 24.3 \) minutes

The mean for girls is smaller than for the boys, so girls complete the task more quickly.

The range for girls and boys is both 25 minutes.

### 6

<table>
<thead>
<tr>
<th>a</th>
<th>Year 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9 9 6 5 4 0</td>
</tr>
<tr>
<td></td>
<td>9 8 8 5 4 1 0</td>
</tr>
<tr>
<td></td>
<td>8 8 7 2</td>
</tr>
<tr>
<td>Key: 5</td>
<td>1 represents 15 tenths of a second</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b</th>
<th>Year 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7 8 8 9 9</td>
</tr>
<tr>
<td>1</td>
<td>1 2 2 2 5 6 7 9</td>
</tr>
<tr>
<td>2</td>
<td>0 1</td>
</tr>
<tr>
<td>Key: 1</td>
<td>5 represents 15 tenths of a second</td>
</tr>
</tbody>
</table>
b Using the diagram alone it is clear that the Year 7s have the three fastest reaction times and also the three slowest reaction times, so there is very little evidence here one way or the other.

7 a 170 or 262
b 262 doesn’t but 170 does. 170 would change the median from 215 to 213.
c No, the mode would still be 209.

Practise... 1.3 Line graphs, frequency polygons and histograms

1

Runners’ fun run times

Time spent in shop by customers

2 a and b can be in either order (histogram/frequency polygon)

3 a

<table>
<thead>
<tr>
<th>Age y (years)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 ≤ y &lt; 30</td>
<td>25</td>
</tr>
<tr>
<td>30 ≤ y &lt; 40</td>
<td>30</td>
</tr>
<tr>
<td>40 ≤ y &lt; 50</td>
<td>17</td>
</tr>
<tr>
<td>50 ≤ y &lt; 60</td>
<td>9</td>
</tr>
</tbody>
</table>

b

Age of workers in a factory

c \( \frac{55}{81} \)
d \( \frac{55}{81} \times 100 = 45.45\ldots\% \)
4 a Air pressure at a resort

<table>
<thead>
<tr>
<th>Day</th>
<th>Monday</th>
<th>Thursday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure (mb)</td>
<td>1040</td>
<td>1050</td>
<td>1030</td>
<td>1020</td>
<td>1010</td>
</tr>
</tbody>
</table>

b The assumption is that readings are all taken at the same time of the day.

c Tuesday
d Thursday and Friday
e 10° C (on Tuesday)
f dependent upon data collected

5 Temperatures at a resort

<table>
<thead>
<tr>
<th>Day</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

Max temperatures
Min temperatures

Both the graph and the percentages seem to show clear evidence of worsening attendance at registration as the week progresses, supporting the head teacher’s thoughts.

6 a Student attendance

<table>
<thead>
<tr>
<th>Session</th>
<th>Mon am</th>
<th>Mon pm</th>
<th>Tue am</th>
<th>Tue pm</th>
<th>Wed am</th>
<th>Wed pm</th>
<th>Thu am</th>
<th>Thu pm</th>
<th>Fri am</th>
<th>Fri pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>84.61</td>
<td>80.77</td>
<td>93.46</td>
<td>82.69</td>
<td>97.69</td>
<td>83.85</td>
<td>96.54</td>
<td>77.31</td>
<td>71.15</td>
<td>58.46</td>
</tr>
<tr>
<td>% to nearest whole number</td>
<td>85</td>
<td>81</td>
<td>93</td>
<td>83</td>
<td>98</td>
<td>84</td>
<td>97</td>
<td>77</td>
<td>71</td>
<td>58</td>
</tr>
</tbody>
</table>

Both the graph and the percentages seem to show clear evidence of worsening attendance at registration as the week progresses, supporting the head teacher’s thoughts.

7 a Cost of electricity bills

<table>
<thead>
<tr>
<th>Time (year, quarter)</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (£)</td>
<td>250</td>
<td>200</td>
<td>150</td>
<td>100</td>
<td>250</td>
<td>200</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>
b The bill is highest in the first quarter and lowest in the third quarter. On a year-by-year basis, the bill seems to be falling in comparative quarters.

Assess 1

1 a Day | Number
---|---
Monday | 19
Tuesday | 13
Wednesday | 17
Thursday | 27
Friday | 33
Saturday | 41

b Sunday

c This is only data for noon; no information about the rest of the day is given.
This is only one set of data so no general conclusions can be drawn.

2 a 9am. If the shop opened any earlier you would expect sales before 9am. It cannot be any later as sales have occurred between 9 and 9.30am.

b 4

c \( \frac{5}{25} = \frac{1}{5} \) (simplest form not asked for but shown for completeness)

d \( 25 \times 2.56 = £64 \) taken in

Costs = 3 \( \times £12.04 = £36.12 \)

Yes, there is profit of \( £64 – £36.12 = £27.88 \)

3 a Winter: Bus 108 degrees, Car 162 degrees, Cycle 36 degrees, Walk 54 degrees

(Check: 108 + 162 + 36 + 54 = 360 degrees)

Summer: Bus 70.2 degrees, Car 50.4 degrees, Cycle 140.4 degrees, Walk 99 degrees

(Check: 70.2 + 50.4 + 140.4 + 99 = 360 degrees)

b Fewer people seem to use the bus or car in summer and more seem to walk or cycle.

c Sandy is wrong: this is only one day’s figures so nothing is ‘proved’.

4 a 16 males so median is the mean of the 8th and 9th.

8th height is 174, 9th height is 175, and the mean of these is 174.5 cm.

b Female median height is 167.5

Only 3 of the 16 males are shorter than that height.

\( \frac{3}{16} \times 100 = 18.75\% \), which is about 19% as required.

| Females | Males |
---|---|
| 9 14 | 15 |
| 9 8 2 | 16 | 4 7 9 9 |
| 9 8 7 6 6 4 4 3 1 | 17 | 2 2 4 5 5 8 |
| 8 7 5 3 3 2 2 1 | 18 | 3 3 6 9 |
| 2 | 19 | 1 |

5 Types of diagrams used may vary but must be appropriate.
Table B
Big Wing

Fly Maybe

Squeezyjet

Fly On Air

Key: ✈ = 2 Flights

Table C

<table>
<thead>
<tr>
<th>Number of fish</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>35</td>
<td>1</td>
</tr>
</tbody>
</table>

Fish caught

(6 × 12) − 3 − 17 − 31 − 19 = 2

6  a  13.00 (1pm)

b  10.00 (10am) as it seems unlikely that it would open earlier and there be no people in at all.

c  | Time | Number of workers in restaurant |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>11.00</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>12.00</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>13.00</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>14.00</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>15.00</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

d  Not really. It is a time series so the structure is appropriate but the context means that the chances of a smooth change between numbers each hour is unlikely. For example, a staff break at 10.30–10.45 would not be shown by this data.

e  Data should be displayed in a pictogram or bar chart.

7

<table>
<thead>
<tr>
<th>Number of fish</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

Driving alone

Driving with passengers

| 6 | 8 | 4 | 3 | 0 | 7 |
| 9 | 6 | 4 | 2 | 1 | 0 |
| 6 | 5 | 2 | 1 | 3 | 7 |
| 1 | 3 | 7 | 7 | 7 | 8 |

Key 3 | 0 represents 0 | 4 represents a person driving person with passengers alone for 3 miles for 4 miles

People driving alone travel mostly short distances.

People driving with passengers travel mostly longer distances.

Only 1 driver travelled more than 37 miles.

Examiner’s tip
Examination-style questions

1  a  19

b  18 + 11 = 29

c  18 + 15 + 23 + 11 + 21 men visited that week = 88

11 + 19 + 17 + 26 + ? women visited that week = 73 + x

73 + x = 88

x = 15

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2

Area and volume

Practise... 2.1 Volume of a cuboid

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>b</th>
<th>c</th>
<th></th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7 cm$^3$</td>
<td>30 cm$^3$</td>
<td>32 cm$^3$</td>
<td>20 cm$^3$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>840</td>
<td>230.4</td>
<td>4747.5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>20 cm$^3$</td>
<td>96 m$^3$</td>
<td>96 cm$^3$</td>
<td>2178 mm$^3$ or 2.178 cm$^3$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cuboid $V = 105$ cm$^3$, cube $V = 125$ cm$^3$. The cube has a larger volume.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 5 | a | 46 000 cm$^2$ | i | 90 000 cm$^2$ | i
|   |   | ii | 230 000 cm$^2$ | iv | 5000 cm$^2$ |
|   | b | 30 m$^2$ | i | 5.76 m$^2$ | i
|   |   | ii | 7.5 m$^2$ | iv | 0.85 m$^2$ |
| 6 | a | 28 cm$^3$ | b | 40 cm$^3$ |   |
| 7 | 6 m$^3$ |   |   |   |   |

Practise... 2.2 Volume of a prism

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>176 cm$^3$</td>
<td>145 cm$^3$</td>
<td></td>
<td>11.4 m$^3$</td>
</tr>
<tr>
<td>2</td>
<td>540 mm$^3$</td>
<td>165.76 cm$^2$</td>
<td>96 m$^3$</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1583.4 cm$^3$</td>
<td>7093.5 m$^3$</td>
<td>9621.1 mm$^3$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 5 | a | $A = 50$ cm$^2$ | i | $V = 350$ cm$^3$ | i
|   | b | $A = 96.25$ cm$^2$ | ii | $V = 770$ m$^3$ |
|   | c | $A = 79.8$ m$^2$ | i | $V = 319.2$ m$^3$ |
| 6 | 4.9 m$^2$ |   |   |   |

Practise... 2.3 Surface area of a prism

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>386 cm$^2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a</td>
<td>252 m$^2$</td>
<td>b</td>
</tr>
<tr>
<td>3</td>
<td>a</td>
<td>294 cm$^2$</td>
<td>b</td>
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| 4 | a | 136 cm$^2$ | ii | 1232 mm$^2$ | i
|   | b | 487.5 mm$^2$ (1 d.p.) | ii | 210.98 cm$^2$ (2 d.p.) |
|   |   |   |   |   |
| 5 | mm$^2$, m$^2$, km$^2$, cm$^2$ |   |   |   |
| 6 | a | 527.8 cm$^2$ | b | 1688.9 m$^2$ | c | 1099.6 mm$^2$ |
| 7 | Jack is not correct. His formula is for volume of a cuboid. |   |   |   |
| 8 | a | 791.7 cm$^2$ | b | 282.7 m$^2$ |
| 9 |   |   |   | £3.39 per box |
| 10 | volume = 60 cm$^3$ |   |   |   |
| 11 | 780 cm$^2$ needed. Yes. |   |   |   |
| 12 | $h = 3$ |   |   |   |
### Assess 2

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<td>b</td>
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<td></td>
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<tr>
<td></td>
<td>b</td>
<td>i  V = 9900 mm³</td>
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<td></td>
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<td>ii A = 3320 mm²</td>
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<td></td>
<td>c</td>
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### Examination-style questions

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Volume of water-butt = \( \pi r^2 \times h \)

\[
= \pi \times \left(\frac{55}{2}\right)^2 \times 82
= 194818 \text{ cm}^3
\]

Capacity is 194.8 litres, which is a little less than 200 litres so label is not quite accurate.
### 3 Fractions

#### Practise... 3.1 Positive and negative numbers

1. a Omsk, Scott Base, Tromsø, Punta Arenas, Victoria  
   b 30°C  
2. a −3  b −450  c 8.5  d 13  
3. 7  
4. a 10  b 13 m  c 7 m  
5. a 30 ways, all permutations of 2, 2, 0, 0, −1  
   b Any integer from −10 to 18 inclusive, 20  
6. an overdraft of £54.44  
7. an overdraft of £35  
8. £47.23 overdrawn

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<th>Date</th>
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<td>£25.00</td>
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<td>£ − 128.25</td>
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<td>Gas bill standing order</td>
<td>£73.25</td>
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10 $-15 - (-3), -6 + (-6), -6 \times 2, -4 \times 3, 24 \div -2$

#### Practise... 3.2 Fractions

1. a i $\frac{1}{5}$ ii $\frac{2}{3}$ iii $\frac{3}{4}$ iv $\frac{5}{8}$ v $\frac{1}{4}$  
   b $\frac{9}{36}$ is the only fraction that cannot be simplified to $\frac{1}{3}$  
2. e.g $\frac{21}{24} = \frac{28}{32}$  
3. a i $\frac{1}{2}$ ii $\frac{7}{2}$ iii $\frac{4}{4}$ iv $10\frac{1}{2}$ v $\frac{5}{2}$  
   b i $\frac{11}{4}$ ii $\frac{13}{3}$ iii $\frac{15}{8}$ iv $\frac{21}{2}$ v $\frac{35}{6}$  
4. a $\frac{1}{6}$ b $\frac{1}{6}$ c $\frac{1}{6}$ d $\frac{1}{9}$ e $\frac{1}{3}$  
5. a 5 b $\frac{5}{9}$ c $\frac{2}{9}$  

| 6 a | $\frac{1}{25}$ b | $\frac{1}{4}$ |
| 7 x ÷ 60y | $\frac{x}{60y}$ |
| 8 a | $\frac{3}{2}$ c | $-\frac{1}{3}$ e | $\frac{q}{p}$ g | $\frac{p \cdot q}{q}$ |
| b | $\frac{1}{3}$ d | $\frac{2}{3}$ f | $\frac{q \cdot p}{q}$ h | $\frac{p}{q}$ |
| 9 | $1\frac{7}{6}$ |
| 10 a | $\frac{1}{10}$ b | $\frac{9}{10}$ |
| 11 | $\frac{43}{80}$ |
3.3 Working with fractions and decimals

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Assess 3

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AQA Examination-style questions

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Practise... 4.1 Plotting points on a scatter graph

1  a  A = 5, B = 13, C = 27, D = 32, E = 40,  
    F = 47  
  b  A = 6, B = 30, C = 36, D = 46, E = 58,  
    F = 68, G = 84, H = 96  
  c  A = 120, B = 180, C = 250, D = 310,  
    E = 370, F = 420, G = 450, H = 490  
  d  A = 8, B = 36, C = 64, D = 96, E = 108,  
    F = 136, G = 144, H = 156  
  e  A = 0.2, B = 0.8, C = 1.2, D = 1.6, E = 2.3,  
    F = 2.9, G = 3.2, H = 3.7  
  f  A = 0.6, B = 2.3, C = 3.8, D = 4.4, E = 5.6,  
    F = 7.0, G = 7.6, H = 9.4

2  Age against arm span

3  The table shows the age and second-hand value of cars.

4  ![](image1.png)

5  a  ![](image2.png)

6  a  ![](image3.png)

b  Tanya is generally correct to say that people who did well in Spanish also did well in French.

This can be seen as the data seems to fall into a line (the higher the French mark, the higher the Spanish mark).

b  There does seem to be some link between infant mortality and life expectancy. As the infant mortality increases, the life expectancy decreases.
**Practise... 4.2 Interpreting scatter graphs**

1 a i positive correlation  
    ii negative correlation  
    iii positive correlation – probably strong  
    iv positive correlation  
    v negative correlation  

b i The higher the number of hours of sunshine, the higher the income for sales of iced drinks.  
    ii The higher the number of cars on the road, the lower the average speed.  
    iii The higher the distance travelled, the higher the amount of petrol used.  
    iv The higher the number of bedrooms, the higher the price of the house.  
    v The higher the number of hours of sunshine, the lower the income for sales of umbrellas.

2 a i strong positive correlation  
    ii no correlation  
    iii weak positive correlation  
    iv no correlation  
    v strong negative correlation  

b i The higher the rainfall, the heavier the weight of apples.  
    ii There is no correlation.  
    iii The higher the number of caps, the higher the cost of the footballer.  
    iv There is no correlation.  
    v The older the car, the lower the cost.

3 a [Age against arm span graph]  

b The scatter graph shows positive correlation.  

c The older the person, the bigger the arm span.

4 a [Sunshine and rainfall graph]  

b The scatter graph shows strong negative correlation.  

c The greater the amount of sunshine, the less the amount of rainfall.

5 A vast number of possible answers. 
Examples are:  
   a age of the car against value (strong negative)  
   b age of the car against mileage (strong positive)  
   c age of the car against the number of passengers (no correlation).

6 a From 0 to 20 the shoe size increases with age, so there is positive correlation.  

b Feet stop growing after about 20 years of age.

7 a [Calories and Fat graph]  

b The relation does not hold for milkshakes, where there is a high calorie value in terms of fat content.  
This value is called a rogue value as it does not fit in with the other data.
1 a

Rainfall and sunbeds

Number of sunbeds sold

Amount of rainfall (mm)

100
200
300
400

0 2 4 6 8 10 12

b

Rainfall and sunbeds

Number of sunbeds sold

Amount of rainfall (mm)

100
200
300
400

0 2 4 6 8 10 12

i 300  ii 10 mm

2 a

Age and value of car models

Value of car (£)

Age of car (years)

0 2 4 6 8 10

i £1800  ii 3.4 years old

3 a

Visitors against temperature at an art gallery

Number of visitors

Temperature (ºC)

0 10 20 30 40

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b

Visitors against temperature at an art gallery

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Number of visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>800</td>
</tr>
<tr>
<td>16</td>
<td>700</td>
</tr>
<tr>
<td>18</td>
<td>600</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
</tr>
<tr>
<td>22</td>
<td>400</td>
</tr>
<tr>
<td>24</td>
<td>300</td>
</tr>
<tr>
<td>26</td>
<td>200</td>
</tr>
</tbody>
</table>

i 280

ii 22.75°C

These answers are not absolutes – they will depend on where students draw the line of best fit.

5

4

a There is strong positive correlation for boys and girls.

b 64 months

c 67 months

d Dianne (this can also be read from the table)

b 64 months

c 67 months

d Dianne (this can also be read from the table)

6

Average temperatures

a The temperature decreases as the distance from the equator increases.

b The temperature for Dubai should be 27°C

c time of the year, height above sea level, humidity ...
The scatter graph shows strong positive correlation.

2  a  According to the graph, the more the students watch TV the less they score in the test, which demonstrates a negative correlation between the two sets of data.

   b  Student ‘1’ and Student ‘4’ do not seem to fit the trend.

   They both watched a reasonably low amount of TV but scored low marks.

3  There would seem to be no correlation between the two sets of data.

4  a  

   b  i  72.5 cm

   ii  5 m

   c  Part i is a better estimate as the information is in the main body of the graph.

   Part ii is at the edges of the graph so is probably less reliable.

5  a  Number of pages = 140 and weight = 96 g is a rogue value.

   It is possible that the two figures were interchanged as number of pages = 96 and weight = 140 g is a likely value.
There is strong positive correlation.

Around 32 cm

Examiner's tip

Examination-style questions

1 a and c

b Yes, Adnan's hypothesis is correct; the data shows a positive correlation: the more pages, the heavier the book.

b There is strong positive correlation.

d around 32 cm

e value outside given range of data
5

Equations and inequalities

Practise... 5.1 Simple equations

1  a  x = 6   e  b = 2.5   i  z = 3.3
   b  y = 6   f  c = -2   j  a = -7
   c  z = 7   g  x = 11   k  b = -2
   d  a = 1.5 h  y = 8   l  c = -5.7

2  a  x = 12   g  x = 6   m  x = 3
   b  y = 20   h  y = 4   n  y = -1
   c  z = 5   i  z = 4   o  z = 1.5
   d  a = 4   j  a = -3   p  t = 7
   e  b = 0   k  b = -1
   f  c = -6   l  c = 3

3  a  Various possible answers
   b  Various possible answers

4  2x + 11 = 19
   So, x = 4
   5  7x + 5 = 47
   So, x = 6
   6  12
   7  x + 72 + 38 = 180
   So, x = 70
   8  3y + 2y + 115 + 100 = 360
   So, y = 29

Practise... 5.2 Harder equations

1  a  x = 6   e  p = 3.5   i  c = -\frac{1}{2}
   b  y = 7   f  q = 2   j  d = 7
   c  z = 5   g  a = -1   k  e = 3
   d  t = 1.5 h  b = -2   l  f = -2

2  He should have added 4x to both sides of the equation but instead he has taken away 4x from 9x

3  She has taken 2 from 6 instead of 6 from 2. She should have got -4 not 4

4  Yes. He has taken 4 from 11 instead of adding 11 to 4

5  Yes. He has added the y terms incorrectly, getting y instead of 5y

6  27
   7  14

8  a  33 - 8 = 25
   b  If b = 11, 25 would have to equal 19 - 2b, which means that 25 would have to equal 19 - 22 which it does not.

9  a  9 - -20 = 29
   b  If c = -4, 29 would have to equal 6c + 13, which means that 29 would have to equal -24 + 13, which it does not.

Practise... 5.3 Equations with brackets

1  a  x = 8   c  z = 10   e  b = 3
   b  y = 12   d  a = 5   f  c = 1.5

2  a  p = 0.5   f  c = 4   k  y = 2
   b  q = 5   g  d = 0.5   l  k = -1.5
   c  t = 1.5   h  e = -3   m  t = 0.75
   d  a = -11   i  f = -2   n  p = 14
   e  b = -10   j  x = -1   o  q = 2

3  2(x + 7) = 38
   2x + 14 = 38
   2x = 24
   x = 12

4  4(x - 5) = 32
   4x - 20 = 32
   4x = 52
   x = 13

Practise... 5.4 Equations with fractions

1  a  x = 18   f  c = -18   k  q = 6
   b  y = 20   g  x = 8   l  t = 6
   c  z = 12   h  y = 11   m  x = 15
   d  a = 3   i  z = 6   n  y = 8
   e  b = 14   j  p = 17   o  z = 16

2  a  a = -3   c  c = 8   e  q = 1.5
   b  b = 4.5   d  p = 3   f  t = 10

3  Faria is not correct. x = 3

4  Gary is correct.
The equation simplifies to $6p - 5 = 8 + 6p$. Because $6p$ appears on both sides with different numbers, the equation cannot be solved. The two sides of the equation cannot possibly equal each other.

The possible heights cannot be listed as there are too many possibilities due to incrementation.

Let $x = Asif’s$ age now.
$x + 9 \geq (x - 14)$, leading to $x \leq 37$; Asif is now 37 years of age.

The possible heights cannot be listed as there are too many possibilities due to incrementation.
1  3.5
Enlargements

Practise... 6.1 Introduction to enlargement and scale factor

1  a  3
   b  5
   c  2

2  a  \( EF = 10 \text{ cm} \)
   b  \( HG = 8 \text{ cm} \)
   c  \( EH = 6 \text{ cm} \)
   d  \( FG = 6 \text{ cm} \)

3  a

\[
\begin{array}{c}
\text{H}\\
\text{H}\\
\end{array}
\]

b

\[
\begin{array}{c}
\text{L}\\
\text{L}\\
\end{array}
\]

c

\[
\begin{array}{c}
\text{A}\\
\text{A}\\
\end{array}
\]

4

\[
\begin{array}{c}
\text{A}\\
\text{B}\\
\end{array}
\]

\[
\begin{array}{c}
\text{C}\\
\text{C}\\
\end{array}
\]

\[
\begin{array}{c}
\text{D}\\
\text{D}\\
\end{array}
\]

\[
\begin{array}{c}
\text{E}\\
\text{E}\\
\end{array}
\]

\[
\begin{array}{c}
\text{F}\\
\text{F}\\
\end{array}
\]

5  a  2.5 cm
   b  45°

6  a  2.8 m by 2.8 m
   b  5.6 m by 5.6 m
   c  4
   d  area of \( X = 1.96 \text{ m}^2 \)
      area of \( Y = 7.84 \text{ m}^2 \)
      area of \( Z = 31.36 \text{ m}^2 \)
   e  total area of flower beds = 41.16 m²
      area of lawn plus flower beds
      \( = 14 \times 12 = 168 \text{ m}^2 \)
      area of lawn = 168 \( - 41.16 = 126.84 \text{ m}^2 \)

7  a  2
   b  i 6
      ii 60 cm
      iii 3

\( AB = 2.236 \) (to 3 d.p.)
6.2 Centres of enlargement

1. a
   ![Diagram](image)

   b
   ![Diagram](image)

   c
   ![Diagram](image)

2. a
   ![Diagram](image)

   b
   ![Diagram](image)

   c
   ![Diagram](image)

3. a 3 centre (0, 0)  
   b 2 centre (2, 9)  
   c 3 centre (4, -5)

4. enlargement scale factor 5 centre (0, 0)
Practise... 6.3 Enlargements, similar shapes and ratio

1 a 3:1
   b perimeter of $A = 36\text{ cm}$
   perimeter of $B = 12\text{ cm}$
   c $36:12 = 3:1$
   d 3

2 a 1:2
   b 2
   c 16 cm

3 a $8:40 = 1:5$
   b 27 cm

4 a Yes
   b No

5 5 cm and 48 cm

6 a $3:24 = 1:8$
   b smaller triangle 3.6 cm
   larger triangle 24 cm

7 a–b
   c $(9, 3), (9, 6), (15, 3)$ and $(15, 6)$

8 a Yes, 2.8
   b 60 cm by 40 cm

9 1.31, 1.26, 1.27, 1.28, 1.4, 1.43.
   No, the scale factors are not all the same.
**Assess 6**

1. 2
2. 18 units and 12 units
3. 

**4 a-b**

- **c** (4, 1), (4, 13) and (16, 13)

**5 a-b**

- **a** \(1.5:10.5 = 3:21 = 1:7\). Scale factor = 7
- **b** \(2.8 \times 7 = 19.6\) m
- **c** area of table tennis playing area = \(4.2\) m\(^2\)
  area of tennis court = \(205.8\) m\(^2\)
- **d** \(4.2:205.8 = 42:2058 = 1:49\)

**AQA Examination-style questions**

1. \(RQ = 60\) cm
2. True.
   The angles of shape \(B\) are the same as the angles of shape \(A\).

The perimeter of shape \(B\) is twice the perimeter of shape \(A\).
7 Trial and improvement

Practise... 7.1 Trial and improvement

1 a 10.95 m  b 24.49 m  c 17.89 m  
2 a 2.0  b 8.0  c 7.6  d −7.0  
3 4.1  
4 a 4.58  b 4.71  c −2.91  
5 a 2.91  b 4.34  c 3.83  d −3.15

Assess 7

1 4.9  
2 −1.80, −7.65
3 3.124 cm
4 a 3.23  b 1.70  c 4.71  d −3.27

AQA Examination-style questions

1 2.4  
2 a (0, −8)  
b \( x = 2.5 \)
8 Percentages and ratios

Practise... 8.1 Finding a percentage of a quantity

1 a 12 squares shaded  
   b 6 squares shaded  
   c 18 squares shaded

2 i £76  
   ii £1750  
   iii 2170 litres  
   iv 34 km  
   v 222 g  
   vi 135 ml

3 a 0.40 or 0.4  
   b To find

<table>
<thead>
<tr>
<th>40%</th>
<th>1%</th>
<th>15%</th>
<th>24%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>0.01</td>
<td>0.15</td>
<td>0.24</td>
</tr>
<tr>
<td>0.09</td>
<td>0.06</td>
<td>0.125</td>
<td>0.035</td>
</tr>
</tbody>
</table>

c i 100  
   ii 4.2  
   iii 96

4 a 51  
   b 9

5 No, 60% of £19 = £11.40. She has misread the answer from her calculator.

6 a 1.10 or 1.1  
   b To increase by

<table>
<thead>
<tr>
<th>10%</th>
<th>20%</th>
<th>5%</th>
<th>7.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>1.2</td>
<td>1.05</td>
<td>1.075</td>
</tr>
</tbody>
</table>

   To decrease by

<table>
<thead>
<tr>
<th>10%</th>
<th>20%</th>
<th>5%</th>
<th>7.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>0.8</td>
<td>0.95</td>
<td>0.925</td>
</tr>
</tbody>
</table>

Practise... 8.2 Writing one percentage as a quantity of another

1 a 32%  
   b 25%  
   c 40%  
   d 12%  
   e 5.4%  
   f 17.5%

2 75%

3 26.7%

4 10.2%

5 a 45.7%  
   b 54.3%

6 76.8%

7 14.7%

8 6.9%

9 11.2%

10 a i 19.4%  
    ii 26.3%  
    b 22.4%

11 a Greg has divided by the new cost instead of the original cost.  
    b 14.3%

12 a 4%  
    b 1.5%  
    c 51.4%  
    d 20.8%

13 a 25% increase  
    b 56.3% increase

14 % change

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>21.2% increase</td>
</tr>
<tr>
<td>Greece</td>
<td>22.6% decrease</td>
</tr>
<tr>
<td>Italy</td>
<td>13.4% increase</td>
</tr>
<tr>
<td>Slovakia</td>
<td>347.4% increase</td>
</tr>
<tr>
<td>Turkey</td>
<td>72.2% increase</td>
</tr>
</tbody>
</table>

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15

<table>
<thead>
<tr>
<th>Food</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole milk</td>
<td>13.1% decrease</td>
</tr>
<tr>
<td>Skimmed milk</td>
<td>1.8% increase</td>
</tr>
<tr>
<td>Cream</td>
<td>13.6% decrease</td>
</tr>
</tbody>
</table>

16

<table>
<thead>
<tr>
<th></th>
<th>December</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths</td>
<td>46%</td>
<td>62%</td>
</tr>
<tr>
<td>Science</td>
<td>53%</td>
<td>71%</td>
</tr>
</tbody>
</table>

Teacher: Maths % increase = \( \frac{16}{46} \times 100 = 34.8\% \); Science % increase = \( \frac{18}{53} \times 100 = 33.9\% \), so he has done better in maths.

Paul just looked at the differences i.e. Maths = 62 - 46 = 16%, Science = 71 - 53 = 18%, He should have compared the differences with original marks.

### Practise... 8.3 Using ratios and proportion

1. **a** Any three pairs of numbers where the second in each pair is three times the first.
   **b** The second number in each pair is three times the first.

2. **a** \( \frac{2}{14} \)  \( \frac{3}{21} \)  \( \frac{a}{7a} \)
   **b** \( \frac{5}{35} \)  \( \frac{500}{3500} \)

3. No. He has added 50 ml to each amount, but this does not give amounts in the same ratio. The simplest forms of the ratios are 1 : 4 and 5 : 17 and these are not the same.

4. **a** 15 buckets of sand
   **b** 2 buckets of cement
   **c** 5 buckets of cement and 25 buckets of sand

5. **a** 16
   **b** 9
   **c** \( \frac{11}{3} \)
   **d** \( \frac{3}{4} \)
   **e** \( x = 15 \) and \( y = 20 \)

6. **a** i 50 g butter, 25 g sugar, 75 g flour, 25 g peanuts
   ii 250 g butter, 125 g sugar, 375 g flour, 125 g peanuts
   **b** i 80
   ii 400 g butter, 200 g sugar, 600 g flour

7. Pack of 32 (19.625p each compared with 24.75p each)

8. **a** £125
   **b** 16 hours
   **c** all at the same rate of pay

9. **a** i 1.2 euros per £
   ii 330 euros
   **b** i £0.80 or 80p
   ii £84

10. **a** 312 km
    **b** 390 miles

11. **a** i \( \frac{4}{9} \)
    ii \( \frac{1}{3} \)
    iii \( \frac{2}{9} \)
    **b** \( \frac{4}{9} + \frac{1}{3} + \frac{2}{9} = 1 \)

12. 62.5%

13. **a**

<table>
<thead>
<tr>
<th>Number of books</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>0</td>
<td>3.25</td>
<td>6.5</td>
<td>9.75</td>
</tr>
</tbody>
</table>

14. **a**

   **i**

   **b** i £7.50
   ii £3.00
   iii £7.20
c i See graph.
   ii No, giving a reason, for example, not straight line through (0, 0), double time does double the cost etc.

15 a 6 km
   b No, the map distance should be doubled to give 24 cm

16 1:8 is steeper. It is equivalent to 12.5%

17 a 3:2  b 45 cm by 30 cm (same ratio)

18 a 5  b 6

19 a Small gives 300 ml for £1.99 in 2 bottles, equivalent to 66.33…p per 100 ml
   Regular gives 300 ml for £2.39 in 1 bottle, equivalent to 79.66…p per 100 ml
   Large gives 400 ml for £2.88 in 1 bottle, equivalent to 72p per 100 ml
   The small bottles give the best value.
   b It may be more convenient to have the shampoo in one bottle, rather than two. May want more than 300 ml.

20 19 parent volunteers are needed
### 9.1 Writing formulae using letters and symbols

1. **a** $x + 5$  
   **b** $3x$

2. **a** $y - 4$  
   **b** $2y$

3. $12z$

4. $18m$

5. $40k + 20$

6. **a** $4x$  
   **b** $5z + 6x$  
   **c** $2x + 2y$  
   **d** $xyz$  
   **e** $7x + 2y$  
   **f** $6x - \frac{2}{5}y$

7. **a** $x + 3$  
   **b** $2x$  
   **c** $x - 5$  
   **d** $3x + 2$

8. $d = \frac{5}{2}$

9. $a = \frac{w}{240}$

10. Various possible answers

11. $32m + 15n$

12. $3n - 5$

13. **a** $T = 70x + 80y$  
   **b** $T = 90c + 20b$

14. $C = 90x + 80y$ incorrect as the tea ($x$) cost 80p, and the coffee ($y$) cost 90p.  
   $C = 80x + 90y$ correct  
   $C = 80 \times 90y$ incorrect as this means you multiply the terms, not add them together.

15. Profit $= 8x + 12x - 45$

16. **a** $xy$  
   **b** $C = 200 - xy$

17. **a** $12$  
   **b** $22$

18. **a** £4.50  
   **b** £3

19. Sedgwick Tool Hire charge £18 to hire a cement mixer for 1 day. They charge £9 for every day extra.  
   Harry says the formula for the total charge is $C = 18d + 9$  
   He uses $d$ for the number of days and $C$ for the total charge.  
   **a** He has multiplied the number of days by 18 when he should have multiplied by 9  
   **b** $C = 18 + 9d$  
   **c** Various possible answers

### 9.2 Using formulae

1. £2.75

2. **a** $y = 14$  
   **b** $y = 30$  
   **c** $y = 7$  
   **d** $y = 23$  
   **e** $y = 4$  
   **f** $y = 70$

3. £210  
   £200  
   $W = h \times r$

4. **a** $r = 6$  
   **b** $r = 12$  
   **c** $r = 13$  
   **d** $r = 7.5$  
   **e** $r = 3$  
   **f** $r = 4$  
   **g** $r = 2$  
   **h** $r = 15.5$

5. **a** $m = 2$  
   **b** $m = -9$  
   **c** $m = -6$  
   **d** $m = 9$  
   **e** $m = 14$  
   **f** $m = -16$

6. **a** 126  
   **b** 240

7. $y = 2x + 6$  
   $y = 2(x + 6)$  
   $y = 2 \times 5 + 6$  
   $y = 2 \times 5 + 6$  
   $y = 16$  
   $y = 22$

So formula $y = 2(x + 6)$ gives the larger value for $y$.

8. Mary has not followed the hierarchy of operations (BIDMAS), so she has added 3 before multiplying by 10, when she should have multiplied by 10 then added 3.

9. James has not substituted into the correct part of the formula. He knows the speed and is trying to find the distance travelled. So he should have multiplied by 10, not divided.

10. **a** 20  
    **b** 0

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Assess 9

1  $s = 14$
2  a £5.90  b 3 miles  c 5.41 miles
3  a $y = c - a$  b $y = d + e$  c $y = \frac{f - e}{2}$  d $y = \frac{d - h}{3}$  e $y = \frac{j + 3k}{4}$
4  a $x = y + 32$  b $x = \frac{y}{b}$  c $x = \frac{d + 60}{7}$  d $x = \frac{t - p}{s}$
5  B $x = \frac{m + 3}{4}$

Practise... 9.3 Changing the subject of a formula

1  a Formula  b Expression  c Expression  d Equation  e Equation  f Expression  g Formula
2  $n = M - 42$
3  a $y = c - a$  b $y = d + e$  c $y = \frac{f - e}{2}$  d $y = \frac{d - h}{3}$  e $y = \frac{j + 3k}{4}$
4  a $x = y + 32$  b $x = \frac{y}{b}$  c $x = \frac{d + 60}{7}$  d $x = \frac{t - p}{s}$
5  B $x = \frac{m + 3}{4}$

6  $d = \frac{C}{\pi}$
7  Karen is incorrect. It should be $y - 4 = x$
8  Sam is incorrect. It should be $x = \frac{3}{y}$
9  $t = \frac{v - u}{a}$
10  $h = \frac{V}{m^2h}$
11  $C = \frac{5(F - 32)}{9}$
12  a £500  b $T = 300 + 50m$  c $m = \frac{T - 300}{50}$
    d 8 months. Check by substituting back into the original formula (part b).
13  200 miles

Assess 9

1  £33
2  $k + 15$
3  $q - 3$
4  a $y = 8$  b $y = 3$  c $y = 24$  d $y = 5$
5  a $p = 2l + 2w$  b $w = 7h$  c $d = s \times t$
    d $v = l \times w \times h$  e $l = \frac{a}{w}$  f $c = 5p + 2$

6  a 26 cm  b 30 m
7  $v = 9$
8  $25x + 14y$
9  a formula  b equation  c expression
10  $C = 3$
11  $x = \frac{y + 7}{4}$
12  $C = \frac{m + 6}{3}$

Examiner's tip
Examination-style questions

AQA GCSE Mathematics Foundation Book 2 Answers

1  a £256  b 2 years  c £20
10 Probability

Practise… 10.1 Describing probability

Answers do not need simplifying unless stated; simplified alternative answers are only given for information.

1 a IMPOSSIBLE
   b UNLIKELY
   c EVENS
   d IMPOSSIBLE

2 students’ own answers

3

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<th>a</th>
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a, d

b

Practise… 10.2 Combining events

1 a HA HO HP BA BO BP CA CO CP EA EO EP
   b Sandwich / Fruit | Apple | Orange | Pear
                      | Ham   | HO     | HP
                      | Beef  | BO     | BP
                      | Cheese| CO     | CP
                      | Egg   | EO     | EP

   c i \( \frac{1}{12} \)
   ii \( \frac{3}{12} = \frac{1}{4} \)
   d Each sandwich and fruit was equally likely to be chosen by Trevor.
   e This is probably not valid as it is quite unlikely that Trevor likes each sandwich and each fruit exactly the same amount.

2 a

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b i \( \frac{1}{36} \)
   ii \( \frac{3}{36} = \frac{1}{12} \)
   iii \( \frac{5}{36} \)
   iv \( \frac{13}{36} = \frac{1}{4} \)

3 a

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<td>12</td>
<td>18</td>
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</table>

b i \( \frac{1}{36} \)
   ii \( \frac{4}{36} = \frac{1}{9} \)
   iii \( \frac{17}{36} \)
   iv \( \frac{9}{36} = \frac{1}{4} \)

4 There are four possible outcomes: TT, HH, TH and HT, so it is \( \frac{3}{4} \).

5 \( \frac{3}{8} \) (HHT, HTH or THH out of a total of eight possible outcomes)

6 The probability of a prime total when two dice rolled is \( \frac{15}{36} \).
   The probability of a square total when two dice rolled is \( \frac{7}{36} \).
   She would not be wise to take her parents’ suggestion!

7 5 or 9

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**Practise... 10.3 Mutually exclusive events**

1. **b, c and d**
2. **0.05**
3. **0.93**
4. **0.999**
5. **\(\frac{7}{10}\)**
6. **a \(\frac{5}{15} = \frac{1}{3}\)  c \(\frac{12}{15} = \frac{4}{5}\)  e \(\frac{4}{15}\)
   **b \(\frac{3}{15} = \frac{1}{5}\)  d \(\frac{7}{15}\)  f \(\frac{9}{15} = \frac{3}{5}\)**
7. **\(\frac{17}{20}\)**
8. **a 0.55**

**Practise... 10.4 Relative frequency**

1. **\(\frac{1}{4}\)**
2. **\(\frac{25}{200} = \frac{1}{8}\)**
3. **a 100**
   **b No, random fluctuations would mean exactly 100 was quite unlikely.**
4. **a 120**
   **b Probably not. 109 is not that far from the expected 120.**
5. **a 20**
   **b 20**
   **c Probably not (or not possible to tell) as there have not been enough trials made.**
6. **a 5**
   **b approximately 1700**
7. **a \(\frac{9}{40}\)  b \(\frac{21}{40}\)  c \(\frac{1}{4}\)  d The additional 40 draws are unlikely to have the same set of outcomes as the first 40.**
8. **a i 6**
   **ii 22**
   **b 0.4**
9. **a 5**
   **b 0**
   **c EITHER**

**Assess 10**

1. **Antidestabilishmentarianism** = \(\frac{5}{28}\) = 0.1786 (4 d.p.)
2. **Floccinuacinihilipilification** = \(\frac{9}{29}\) = 0.3103 (4 d.p.)
3. **Pneumonoultramicroscopicsilicovolcanoconiosis** = \(\frac{6}{45}\) = 0.1333 (4 d.p.)
   So it is Floccinuacinihilipilification
4  a  3 or 4  
b  around 14 or 15  
c  around 6050

5  a  

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b  i  \(\frac{3}{25}\)  ii \(\frac{4}{25}\) iii \(\frac{2}{25}\) iv 6

c  

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i  \(\frac{3}{25}\) ii \(\frac{2}{25}\) iii \(\frac{1}{25}\) iv 4

6  a  \(\frac{45}{250}\)  
b  \(\frac{36}{250}\)  
c  \(\frac{114}{250}\)  
d  The frequencies are quite similar after a fairly large number of trials  
e  all six frequencies around the 1000 mark (probably plus or minus 50) but not all six frequencies of exactly 1000

7  a  \(\frac{1}{8}\)  b  \(\frac{1}{4}\)  c  \(\frac{9}{16}\)  d  \(\frac{41}{80}\)  

8  0.2

9  The player should choose to throw one dice.

---

**AQA Examination-style questions**

1  1, 1, 1, 2, 2, 3, 3, 4
11 Construction

Practise... 11.1 Draw triangles accurately

1 a i

\[ 54° + 37° + 89° = 180° \]

ii

\[ 34° + 62° + 84° = 180° \]

iii

\[ 42° + 69° + 69° = 180° \]

2 Jill is correct. 4 cm + 5 cm = 9 cm, which is less than 10 cm, so the two shorter sides do not meet to make a triangle.

3 a i

\[ 30° + 30° + 120° = 180° \]

b For answer to part a i, \(30° + 30° + 120° = 180°\)

For answer to part a ii, \(40° + 50° + 90° = 180°\)

For answer to part a iii, \(30° + 25° + 125° = 180°\)

4 student's accurate drawing

5 student's accurate drawing

6

There are two possible triangles. The given angle must be between two known sides in order for the triangle to be unique.

7 student's accurate drawing

8

9 student's accurate drawing
**11.2 Constructions**

1. 
   ![Diagram](image1)

2. 
   ![Diagram](image2)

3. student's accurate drawing

4. a–b

5. 
   ![Diagram](image3)
   - The perpendicular bisectors all meet at one point.

6. Student's accurate drawing. The shape is called a triangular prism.

7. 
   ![Diagram](image4)
   - The angle bisectors all meet at one point.

8. 
   ![Diagram](image5)
   - 30°
9 a Harvey needs to draw a straight line through 
P and the place where the arcs converge 
above the line.
b because the point P is in the correct position 
on the line already and you only need 
two points to draw a straight line

c

10 a Construct this rectangle.
b Label your diagram carefully and draw in 
the diagonal AC.
c Construct the perpendicular from vertex B to 
the diagonal AC.

11 a because the point P is in the correct position 
above the line already and you only need 
two points to draw a straight line
b Harriet needs to draw a straight line through 
P and the place where the arcs converge 
above the line.
c

12 Student’s accurate drawing. The third side is 
6 cm

13 Student’s accurate drawing. The width of the 
base is 87 mm

**Practise... 11.3 Using scales**

1 a 8 cm → 8 × 70 000 cm = 560 000 cm = 5.6 km
b 2.8 → 196 000 cm = 1.96 km
c 8 mm → 560 000 mm = 0.56 km

2 a 20 km → 20 × 1000 m = \(\frac{20 000}{25 000}\) m = 80 cm
b 65.2 km → 260.8 cm
c 400 m → 1.6 cm

3 a 1800 m → 18 km   b 8000 cm → 20 cm

4 a 1500 m or 1.5 km   b 2 cm

5 a
6 a

\[ \begin{align*}
&12.6 \text{ cm} \\
&\text{11 cm} \\
&\text{6.2 cm}
\end{align*} \]

\[ \begin{align*}
\text{b} & \quad \text{scaled length} = 12.6 \text{ cm} \\
& \quad \text{actual length} = 6.3 \text{ m}
\end{align*} \]

7 Molly is not correct. Possible reasons:

5 cm represents \( 40 \times 5 \text{ cm} = 200 \text{ cm} = 2 \text{ m} \) but the room is 8 m

\( 8 \text{ m} = 800 \text{ cm}, \frac{800 \text{ cm}}{40} = 20 \text{ cm} \), so the scale drawing should be 20 cm not 5 cm

8 a 8.784 m  

b 1 : 110

9 student’s accurate drawing

10 No, the claim is not correct.

\[ \begin{align*}
&\text{1.26 m} \\
&\text{40°} \\
&\text{40°} \\
&\text{12.6 m}
\end{align*} \]

\[ \begin{align*}
\text{1.26 m} + 3 \text{ m} = 4.26 \text{ m} \text{ so using a scale drawing the height is only 4.26 m}
\end{align*} \]

11 Scale 1 cm = 0.2 m (20 cm)

\[ \begin{align*}
&\text{AB = height of cupboard} = 8 \text{ cm (1.6 m)} \\
&\text{BC = depth of cupboard} = 3.6 \text{ cm (0.72 m)}.
\end{align*} \]

(possible space available)

The cupboard will fit (side on) under the stairs. There needs to be 60 cm depth at the height of 1.6 m and there is 72 cm.

However the doors will not open fully in this position.

**Practise...**

### 11.4 Similarity and congruence

1 \( AI, BE, CJ, DK, FG, HL \)

2 \( A, D, E, J \)

3 The following three groups of shapes are congruent within their groups:

\[ \begin{align*}
\text{The following two shapes are not congruent to any other:}
\end{align*} \]

4 \( B, D, F, J \)
5 The following three groups of shapes are similar within their groups:

The following shape is not similar to any other:

6 a Yes. Two different-sized squares still have the same shape.
b No. You can double one side of a rectangle and not the others and still get a rectangle.
c Yes. Two different-sized circles still have the same shape.
d No. An equilateral triangle is not the same shape as a right-angled triangle.

7 a

<table>
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<th>right angled isosceles</th>
<th>scalene</th>
<th>scalene</th>
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b

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<th>square</th>
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Assess 11

1 Similar: AB, BC, DG, EH
   Congruent: AC, DF

2 student’s own drawing

3 a 4 km b 1.4 km c 0.4 km

4 a 40 cm b 9.2 cm

5 There are two possible triangles that can be drawn.

6 student’s accurate drawing

7 a–b

A

\[AB = 5\text{ cm}\]

\[BC = 4\text{ cm}\]

\[CD = 5\text{ cm}\]

\[DA = 4\text{ cm}\]

B

8 student’s accurate drawing

9 student’s accurate drawing

Examiner’s tip

Examination-style questions

1 student’s accurate drawing ±2 mm

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12.1 Drawing and measuring lines, angles and circles

1. a

b The diagonal is 9.4 cm (to 1 d.p.)

2. a

b $AC = 9.0$ cm (to 1 d.p.)

c $BAC = 35^\circ$ and $ACB = 55^\circ$ (to the nearest degree)

3

4

5 student's accurate drawing

6 student's accurate drawing

7 student's accurate drawing

rectangle
1 Nicky runs the shortest distance. The point on the wall that marks the shortest journey can be found by reflecting S in the wall, and drawing a straight line from this reflection to F.

2 a Slide 1 Slide 2 b Swing c Roundabout

3 a circle, radius 5 cm

4

5 Hope is correct. The ball will bounce and change direction suddenly. The ball will follow a series of curves.

6

The first arrangement is probably the best, as it has the smallest area on the left (the driver’s side that is not covered).

7

8 a

b

9

10 a a circle, centre P, radius 5 cm b two concentric circles of radius 4 cm and 8 cm

11 a a fixed distance from a point b a fixed distance from a line c twice as far from one line as the other d equidistant from two lines

12
13  a  The coin rotates twice as it goes round the stationary one.
  b  The locus of a point on the moving coin as it goes round:
If one coin had a diameter twice the size of the other, the coin would rotate once (large one rotating, or three times (small one rotating)

Practise…  12.3 Constructing loci

1  Kat is correct. Alice's outer corners and Becky’s inner corners are further away than required.

2  a–b

3  a–b

4  a–c

5  a–d

6  Students should draw a triangle and two perpendicular bisectors.

7  Students should draw a triangle and two angle bisectors.
Assess 12

1. $BC = 6.5 \text{ cm}, AB = 5.8 \text{ cm}$ and $AC = 5.5 \text{ cm}$
   Angle $A = 70.1^\circ, B = 52.8^\circ, C = 57.1^\circ$

2. student's accurate drawing

3. student's accurate drawing

4. 

5. a

   Scale $1 \text{ cm} = 2 \text{ m}$

   b

   Distance of gnome, G from D = 3.5 cm
   ($= 7 \text{ metres}$)

6. a–b

7. The required area is shaded.
1. Angle bisector to ± 2 degrees
   Circles of arcs 4 cm and 7 cm from A to ± 2 mm
   Correct line segment indicated
13 Quadratics

Practise...

13.1 Drawing graphs of simple quadratics

1 a

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b

![Graph of quadratic function]

2 a

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<th>-1</th>
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<td>0</td>
<td>2</td>
<td>8</td>
<td>18</td>
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</table>

b

![Graph of quadratic function]

3 a No. \( y = 3x^2 \) is a quadratic so it should be a parabola.

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<td>3</td>
<td>12</td>
<td>27</td>
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c Incorrect signs for negative \( x \) values, e.g \( 3(-3)^2 = 3 \times 9 = 27 \)

4 a

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<td>-1</td>
<td>0</td>
<td>-1</td>
<td>-4</td>
<td>-9</td>
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b It has a negative coefficient of \( x^2 \)

c (0, 0)

5 a In the example it was for \( y = x^2 + 2x \) and here the equation is \( y = x^2 - 2x \). The third row is now labelled \(-2x\) instead of \(+2x\)

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<td>9</td>
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<td>8</td>
<td>3</td>
<td>-1</td>
<td>0</td>
<td>3</td>
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6 a

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
x & -2 & -1 & 0 & 1 & 2 & 3 & 4 \\
\hline
x^2 & 4 & 1 & 0 & 1 & 4 & 9 & 16 \\
\hline
-x & 2 & 1 & 0 & -1 & -2 & -3 & -4 \\
\hline
y & 6 & 2 & 0 & 0 & 2 & 6 & 12 \\
\hline
\end{array}
\]

b

\[
(1, -1)
\]

c

\[
(1, 1)
\]

d

\[
-5.2 \text{ to } -5.3 (-5.25)
\]

e

no solution

7 a

\[
\begin{array}{|c|c|c|c|c|c|c|c|c|}
\hline
x & -2 & -1 & 0 & 1 & 2 & 3 & 4 \\
\hline
-x & -4 & -1 & 0 & -1 & -4 & -9 & -16 \\
\hline
+2x & -4 & -2 & 0 & 2 & 4 & 6 & 8 \\
\hline
y & -8 & -3 & 0 & 1 & 0 & -3 & -8 \\
\hline
\end{array}
\]

b

\[
(1, 1)
\]

c

\[
-5.25
\]

d

no solution

8

\[
\begin{array}{|c|c|c|c|c|c|c|c|c|}
\hline
s & 20 & 30 & 40 & 50 & 60 & 70 & 80 \\
\hline
d & 3 & 5.5 & 9 & 13.5 & 19 & 25.5 & 33 \\
\hline
\end{array}
\]

9 a

\[
y = x^2
\]

\[
\begin{array}{|c|c|c|c|c|c|c|c|c|}
\hline
x & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 \\
\hline
y & 16 & 9 & 4 & 1 & 0 & 1 & 4 & 9 & 16 \\
\hline
\end{array}
\]
\[
y = x^2 + 3
\]

<table>
<thead>
<tr>
<th>(x)</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>19</td>
<td>12</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>12</td>
<td>19</td>
</tr>
</tbody>
</table>

\[
y = x^2 - 4
\]

<table>
<thead>
<tr>
<th>(x)</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>12</td>
<td>5</td>
<td>0</td>
<td>-3</td>
<td>-4</td>
<td>-3</td>
<td>0</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

\(y = x^2 + 3\) moves every point on the \(y = x^2\) graph up by 3 units so the minimum is now at (0, 3).

\(y = x^2 - 4\) moves every point on the \(y = x^2\) graph down by 4 units so the minimum is now at (0, -4).

**Practise... 13.2 Drawing graphs of harder quadratics**

\[
\begin{array}{cccccccc}
\text{a} & x & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\text{b} & x^2 & 4 & 1 & 0 & 1 & 4 & 9 & 16 & 25 \\
-2x & 4 & 2 & 0 & -2 & -4 & -6 & -8 & -10 \\
y & 0 & -5 & -8 & -9 & -8 & -5 & 0 & 7 \\
\end{array}
\]
2

<table>
<thead>
<tr>
<th>$x$</th>
<th>−2</th>
<th>−1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x^2$</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>$-x$</td>
<td>−2</td>
<td>+1</td>
<td>0</td>
<td>−1</td>
<td>−2</td>
<td>−3</td>
<td>−4</td>
</tr>
<tr>
<td>−6</td>
<td>−6</td>
<td>−6</td>
<td>−6</td>
<td>−6</td>
<td>−6</td>
<td>−6</td>
<td>−6</td>
</tr>
<tr>
<td>$y$</td>
<td>0</td>
<td>−4</td>
<td>−6</td>
<td>−6</td>
<td>−4</td>
<td>0</td>
<td>+6</td>
</tr>
</tbody>
</table>

c $-5$
d $x = -8$ and 6

3

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-x^2$</td>
<td>0</td>
<td>−1</td>
<td>−4</td>
<td>−9</td>
<td>−16</td>
<td>−25</td>
<td>−36</td>
</tr>
<tr>
<td>+6$x$</td>
<td>0</td>
<td>6</td>
<td>12</td>
<td>18</td>
<td>24</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>−9</td>
<td>−9</td>
<td>−9</td>
<td>−9</td>
<td>−9</td>
<td>−9</td>
<td>−9</td>
<td>−9</td>
</tr>
<tr>
<td>$y$</td>
<td>−9</td>
<td>−4</td>
<td>−1</td>
<td>0</td>
<td>−1</td>
<td>−4</td>
<td>−9</td>
</tr>
</tbody>
</table>

4

<table>
<thead>
<tr>
<th>$x$</th>
<th>−3</th>
<th>−2</th>
<th>−1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x^2$</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>+1</td>
<td>+1</td>
<td>+1</td>
<td>+1</td>
<td>+1</td>
<td>+1</td>
<td>+1</td>
<td>+1</td>
</tr>
<tr>
<td>$y$</td>
<td>10</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

5

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2x^2$</td>
<td>0</td>
<td>0.5</td>
<td>2</td>
<td>4.5</td>
<td>8</td>
<td>12.5</td>
<td>18</td>
</tr>
<tr>
<td>−7$x$</td>
<td>0</td>
<td>−3.5</td>
<td>−7</td>
<td>−10.5</td>
<td>−14</td>
<td>−17.5</td>
<td>−21</td>
</tr>
<tr>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
<td>+5</td>
</tr>
<tr>
<td>$y$</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>−1</td>
<td>−1</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

c $\text{(0, 1)}$
d $x = -1$ and 7

c When $x = 1.75$, $y = 2(1.75)^2 - 7(1.75) + 5$
$= -1.125$
$\text{(1.75, -1.125)}$
6 a

<table>
<thead>
<tr>
<th>x</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x - 4)</td>
<td>-7</td>
<td>-6</td>
<td>-5</td>
<td>-4</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>(x + 2)</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>y</td>
<td>+7</td>
<td>0</td>
<td>-5</td>
<td>-8</td>
<td>-9</td>
<td>-8</td>
<td>-5</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>

6 b

c (1, -9)
d $x = -2.4$ and 4.4

7 a

<table>
<thead>
<tr>
<th>t</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.2t</td>
<td>0</td>
<td>78.4</td>
<td>156.8</td>
<td>235.2</td>
<td>313.6</td>
</tr>
<tr>
<td>$-4.9t^2$</td>
<td>0</td>
<td>-19.6</td>
<td>-78.4</td>
<td>-176.4</td>
<td>-313.6</td>
</tr>
<tr>
<td>$h$</td>
<td>0</td>
<td>58.8</td>
<td>78.4</td>
<td>58.8</td>
<td>0</td>
</tr>
</tbody>
</table>

7 b

c 4 seconds
d 78.4 metres
e 1.4 and 6.6 seconds

8 a

<table>
<thead>
<tr>
<th>$r$ (metres)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A = \frac{1}{2}rt^2$</td>
<td>0</td>
<td>1.6</td>
<td>6.3</td>
<td>14.1</td>
<td>25.1</td>
<td>39.3</td>
</tr>
</tbody>
</table>

8 b

c i 3.5 m$^2$
d i 4.4 m

c ii 22 m$^2$
d ii 3.19 m
Assess 13

1  a and b

2  a

<table>
<thead>
<tr>
<th>x</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>12</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>12</td>
</tr>
</tbody>
</table>

b

3  a

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-x²</td>
<td>-1</td>
<td>-4</td>
<td>-9</td>
<td>-16</td>
<td>-25</td>
</tr>
<tr>
<td>+5x</td>
<td>-5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>-6</td>
<td>-6</td>
<td>-6</td>
<td>-6</td>
<td>-6</td>
<td>-6</td>
</tr>
<tr>
<td>A</td>
<td>-2</td>
<td>0</td>
<td>0</td>
<td>-2</td>
<td>-6</td>
</tr>
</tbody>
</table>

b  x = 2.5

c  A = -(2.5)² + 5(2.5) - 6 = 0.25

d  x = -1 and 1
1 a \( x^2 \) is always positive, never negative
\((-) \times (-) = (+) \) and \((+ \times (+) = (+)\)

b \[ \]

\[ x = 1.75 \]

2 a

\[
\begin{array}{c|cccccccc}
\text{x} & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\
\hline
\text{y} & 6 & 1 & -2 & -3 & -2 & 1 & 6 \\
\end{array}
\]

b \[ \]

\[ x = -2.2 \text{ and } +2.2 \]
## 14 Pythagoras’ theorem

### Practise... 14.1 Pythagoras’ theorem

<table>
<thead>
<tr>
<th>1</th>
<th>a</th>
<th>13 cm</th>
<th>b</th>
<th>10 cm</th>
<th>c</th>
<th>6.1 m</th>
<th>d</th>
<th>25 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>a</td>
<td>15.7 cm</td>
<td>b</td>
<td>3.1 m</td>
<td>c</td>
<td>23.4 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>a</td>
<td>9 cm</td>
<td>b</td>
<td>35.3 cm</td>
<td>c</td>
<td>13 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Beth: $10^2 + 24^2 = 26^2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>a</td>
<td>11.2 cm</td>
<td>c</td>
<td>25.6 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>1.7 cm</td>
<td>d</td>
<td>11.3 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sarah has added instead of subtracting. Ravi has not found the square root of 435. The correct answer is 20.86 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4.5 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2.5 km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>a</td>
<td>5 units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>i</td>
<td>5 units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii</td>
<td>7.81 units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii</td>
<td>5 units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>a</td>
<td>15.8 cm</td>
<td>b</td>
<td>9.3 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>50.1 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assess 14

| 1 | a | 24 cm | c | 34.8 m |
|   | b | 8.9 cm | d | 8.7 mm |
| 2 | 30.25 cm |
| 3 | 13 cm |
| 4 | 47 m |
| 5 | 3.6 km |
| 6 | a | $h = 9.08$ m |
|   | b | $x = 11.84$ m |

### AQA Examination-style questions

| 1 | 6.5 |
| 2 | 4.7 m |
| 3 | 27.2 cm |