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<td>Hard calculator questions</td>
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<td>F and H</td>
<td>C</td>
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<td>Solving equations</td>
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<td>Trial and improvement</td>
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<td>C</td>
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<td>Index Notation for Multiplication &amp; Division</td>
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<td>Drawing Quadratic Graphs</td>
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<td>Real-life Graphs</td>
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<td>Pythagoras' Theorem</td>
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<td>C</td>
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<td>C</td>
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<td>C</td>
<td>117</td>
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<td>131</td>
<td>Bearings</td>
<td>F and H</td>
<td>C</td>
<td>124</td>
</tr>
<tr>
<td>132</td>
<td>Experimental probabilities</td>
<td>F and H</td>
<td>C</td>
<td>125</td>
</tr>
<tr>
<td>133</td>
<td>Averages from a table</td>
<td>F and H</td>
<td>C</td>
<td>126</td>
</tr>
<tr>
<td>134</td>
<td>Questionnaires</td>
<td>F and H</td>
<td>C</td>
<td>127</td>
</tr>
</tbody>
</table>
1)  a) Write the number forty five thousand, two hundred and seventy three in figures.  \( \underline{45\,273} \)

b) Write the number five thousand, one hundred and three in figures.  \( \underline{5\,103} \)

c) Write the number three hundred thousand, seven hundred and ninety one in figures.  \( \underline{300\,791} \)

d) Write the number two and a half million in figures.  \( \underline{2\,500\,000} \)

e) Write the number one and three quarter million in figures.  \( \underline{1\,750\,000} \)

2)  Write the following numbers in words

a) 1 250  \( \text{One thousand, two hundred and fifty} \)

b) 3 502  \( \text{Three thousand, five hundred and two} \)

c) 72 067  \( \text{Seventy two thousand, and sixty seven} \)

d) 192 040  \( \text{One hundred and ninety two thousand, and forty} \)

e) 30 000 000  \( \text{Thirty million} \)

3)  a) Write down the value of the 7 in the number 3 752.  \( \text{Seven hundred} \)

b) Write down the value of the 6 in the number 56 025.  \( \text{Six thousand} \)

c) Write down the value of the 2 in the number 99 723.  \( \text{Twenty} \)

d) Write down the value of the 5 in the number 258 610.  \( \text{Fifty thousand} \)

e) Write down the value of the 2 in the number 1 253 549.  \( \text{Two hundred thousand} \)
Put these numbers in order, starting with the smallest:

1) 74, 57, 38, 8, 61
   8, 38, 57, 61, 74

2) 39, 84, 11, 128, 24
   11, 24, 39, 84, 128

3) 76, 102, 12, 140, 73
   12, 73, 76, 102, 140

4) 3.1, 31, 1.3, 13, 1.03
   1.03, 1.3, 3.1, 13, 31

5) 0.321, 0.312, 1.04, 1.23
   0.312, 0.321, 1.04, 1.23

6) 0.34, 0.047, 0.4, 0.43, 0.403
   0.047, 0.34, 0.4, 0.403, 0.43

7) 0.79, 0.709, 0.97, 0.792
   0.709, 0.79, 0.792, 0.97

8) 2.71, 2.074, 2.071, 2.701
   2.071, 2.074, 2.701, 2.71

9) 0.875, 0.88, 0.0885, 0.008, 0.11
   0.008, 0.0885, 0.11, 0.875, 0.88

10) 3, −2, −7, 10, −1
    −7, −2, −1, 3, 10

11) −3, −11, 1, −5, 7
    −11, −5, −3, 1, 7

12) −4, 6, 0, −6, −1
    −6, −4, −1, 0, 6
1) Round these numbers to the nearest 10:
   a) 26  30
   b) 62  60
   c) 75  80
   d) 231 230
   e) 797 800
   f) 5842 5840
   g) 9875 9880
   h) 13758 13760

2) Round these numbers to the nearest 100:
   a) 78  100
   b) 223 200
   c) 549 500
   d) 1450 1500
   e) 1382 1400
   f) 4537 4500
   g) 9193 9200
   h) 17625 17600

3) Round these numbers to the nearest 1000:
   a) 850 1000
   b) 1455 1000
   c) 3230 3000
   d) 7500 8000
   e) 8455 8000
   f) 9690 10000
   g) 12390 12000
   h) 28910 29000
1) What is the reading on each of these scales?

   a) 2.5
   b) 1.3
   c) 3.9

   ![Diagram with readings: 2.5 kg, 1.3 kg, 3.9 kg]

   d) 15
   e) 325
   f) 56

   ![Diagram with readings: 15 kg, 325 kg, 56 kg]

2) This scale shows degrees Centigrade.

   ![Diagram of temperature scale]

   a) What temperature is the arrow pointing to? 3.5°C
   b) Draw an arrow which points to –17°C

3) This is a diagram for converting gallons to litres.

   ![Diagram of gallons to litres conversion]

   Use the diagram to convert

   a) 3 gallons to litres. 13.7 litres
   b) 4.5 gallons to litres. 20.5 litres
   c) 6 litres to gallons. 1.3 gallons
1) Multiply the following numbers by 10, 100 and 1000:

<table>
<thead>
<tr>
<th>e.g.</th>
<th>(\times 10)</th>
<th>(\times 100)</th>
<th>(\times 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>210</td>
<td>2100</td>
<td>21000</td>
</tr>
<tr>
<td>9</td>
<td>90</td>
<td>900</td>
<td>9000</td>
</tr>
<tr>
<td>63</td>
<td>630</td>
<td>6300</td>
<td>63000</td>
</tr>
<tr>
<td>845</td>
<td>8450</td>
<td>84500</td>
<td>845000</td>
</tr>
<tr>
<td>3.65</td>
<td>36.5</td>
<td>365</td>
<td>3650</td>
</tr>
<tr>
<td>0.4</td>
<td>4</td>
<td>40</td>
<td>400</td>
</tr>
<tr>
<td>1.324</td>
<td>13.24</td>
<td>132.4</td>
<td>1324</td>
</tr>
</tbody>
</table>

2) Divide the following numbers by 10, 100 and 1000:

<table>
<thead>
<tr>
<th>e.g.</th>
<th>(\div 10)</th>
<th>(\div 100)</th>
<th>(\div 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>2.1</td>
<td>0.21</td>
<td>0.021</td>
</tr>
<tr>
<td>9</td>
<td>0.9</td>
<td>0.09</td>
<td>0.009</td>
</tr>
<tr>
<td>63</td>
<td>6.3</td>
<td>0.63</td>
<td>0.063</td>
</tr>
<tr>
<td>845</td>
<td>84.5</td>
<td>8.45</td>
<td>0.845</td>
</tr>
<tr>
<td>3.65</td>
<td>0.365</td>
<td>0.0365</td>
<td>0.00365</td>
</tr>
<tr>
<td>0.4</td>
<td>0.04</td>
<td>0.004</td>
<td>0.0004</td>
</tr>
<tr>
<td>1.324</td>
<td>0.1324</td>
<td>0.01324</td>
<td>0.001324</td>
</tr>
</tbody>
</table>

3) Work out the following:

- \(3 \times 100 = 300\)
- \(65 \times 10 = 650\)
- \(17 \div 10 = 1.7\)
- \(359 \times 10 = 3590\)
- \(0.5 \div 100 = 0.005\)
- \(2.3 \times 1000 = 2300\)
- \(42 \div 100 = 0.42\)
- \(3582 \div 100 = 35.82\)
- \(0.9 \times 10 = 9\)
- \(3.645 \times 100 = 364.5\)
- \(88 \div 1000 = 0.088\)
- \(39.62 \times 1000 = 39620\)
1) At midnight, the temperature was -7°C.
   By 7am the next morning, the temperature had increased by 6°C.
   a) Work out the temperature at 7am the next morning.
      -1°C
   At midday, the temperature was 3°C.
   b) Work out the difference between the temperature at midday and the temperature at midnight.
      10°C
   c) Work out the temperature which is halfway between -7°C and 3°C.
      -2°C

2) The table below gives the temperature recorded on 25th December of 7 cities across the world.

<table>
<thead>
<tr>
<th>City</th>
<th>Edinburgh</th>
<th>London</th>
<th>New York</th>
<th>Moscow</th>
<th>Paris</th>
<th>Rome</th>
<th>Cairo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-6 °C</td>
<td>0 °C</td>
<td>-15 °C</td>
<td>-23 °C</td>
<td>3 °C</td>
<td>5 °C</td>
<td>18 °C</td>
</tr>
</tbody>
</table>

   a) Which city recorded the lowest temperature?
      **Moscow**
   b) What is the difference in temperature between New York and Paris?
      18°C
   c) What is the difference in temperature between Cairo and Edinburgh?
      24°C
   d) The temperature in Madrid was 9°C lower than in Rome.
      What was the temperature in Madrid?
      -4°C
   e) The temperature in Mexico was 6°C higher than in New York.
      What was the temperature in Mexico?
      -9°C

3) The table shows the temperature on the surface of each of five planets.

<table>
<thead>
<tr>
<th>Planet</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venus</td>
<td>210 °C</td>
</tr>
<tr>
<td>Jupiter</td>
<td>-150 °C</td>
</tr>
<tr>
<td>Saturn</td>
<td>-180 °C</td>
</tr>
<tr>
<td>Neptune</td>
<td>-210 °C</td>
</tr>
<tr>
<td>Pluto</td>
<td>-230 °C</td>
</tr>
</tbody>
</table>

   a) Work out the difference in temperature between Jupiter and Pluto.
      80°C
   b) Work out the difference in temperature between Venus and Saturn.
      390°C
   c) Which planet has a temperature 30°C lower than Saturn?
      **Neptune**
   The temperature on Mars is 90°C higher than the temperature on Jupiter.
   d) Work out the temperature on Mars.
      -60°C
Work out the following:

1) $-3 \times 6 = -18$

2) $4 \times 2 = 8$

3) $10 \div -2 = -5$

4) $-6 \div -3 = 2$

5) $-5 \times -7 = 35$

6) $7 \times -3 = -21$

7) $12 \div 4 = 3$

8) $-24 \div 6 = -4$

9) $-8 \times 2 = -16$

10) $-9 \div 3 = -3$

11) $4 \div -1 = -4$

12) $-3 \times -9 = 27$

13) $-70 \div -7 = 10$

14) $11 \times -6 = -66$

15) $4 \times -3 \times 2 = -24$

16) $-5 \times 2 \times -4 = 40$

17) $4 \times 5 \div -2 = -10$

18) $-8 \div -2 \times -6 = -24$

19) $-2 \times -3 \times -4 = -24$

20) $8 \div -2 \times -6 = 24$
1) Work out the following:

a) \( \frac{1}{2} \) of £10 = £5

b) \( \frac{1}{3} \) of £9 = £3

c) \( \frac{1}{5} \) of £25 = £5

d) \( \frac{1}{2} \) of 24kg = 12kg

e) \( \frac{1}{4} \) of 36cm = 9cm

f) \( \frac{1}{6} \) of 42kg = 7kg

g) \( \frac{1}{8} \) of 48kg = 6kg

h) \( \frac{1}{11} \) of £66 = £6

i) \( \frac{1}{9} \) of 90km = 10km

j) \( \frac{1}{7} \) of £28 = £4

k) \( \frac{1}{5} \) of 125kg = 25kg

l) \( \frac{1}{6} \) of 240km = 40km

2) Work out the following:

a) \( \frac{1}{4} \) of 20 = 5

b) \( \frac{3}{4} \) of 20 = 15

c) \( \frac{1}{3} \) of 21 = 7

d) \( \frac{2}{3} \) of 21 = 14

e) \( \frac{3}{4} \) of 44 = 33

f) \( \frac{2}{3} \) of 24 = 16

g) \( \frac{3}{5} \) of 15 = 9

h) \( \frac{3}{4} \) of 36 = 27

i) \( \frac{7}{9} \) of 81 = 63

j) \( \frac{5}{7} \) of 56 = 40

k) \( \frac{3}{10} \) of 50 = 15

l) \( \frac{6}{11} \) of 33 = 18

m) \( \frac{1}{4} \) of 14 = 3.5

n) \( \frac{3}{4} \) of 14 = 10.5

o) \( \frac{3}{8} \) of 20 = 7.5

3) The highest possible mark for a Maths test was 64.

Dora got \( \frac{7}{8} \) of the full marks.

How many marks did she get? 56 marks

\[ 64 \div 8 = 8 \]
\[ 8 \times 7 = 56 \]

4) At MathsWatch School there are 1500 students.

\( \frac{7}{15} \) of these students are male.

a) What fraction of students are female? \( \frac{8}{15} \)

b) How many are male? 700

\[ 1500 \div 15 = 100 \]
\[ 100 \times 7 = 700 \]

c) How many are female? 800

\[ 1500 - 700 = 800 \]
1) a) In the numbers, above, find six of the first seven square numbers.  
1, 4, 9, 16, 36, 49  
b) Which of the first seven square numbers is missing?  
25  

2) Work out the following:  
a) $10^2$  
b) $9^2$  
c) $7^2 + 3^2$  
d) $8^2 - 2^2$  
100  
81  
49 + 9 = 58  
64 - 4 = 60  

3) For each pair of numbers, below, there is just one square number that lies between them. In each case, write the square number:  
a) 7  15  
b) 21  29  
c) 72  96  
d) 130  156  
9  
25  
81  
144  

4) Work out the following:  
a) $\sqrt{25}$  
b) $\sqrt{81}$  
c) $\sqrt{16 + 6^2}$  
5  
9  
$4 + 36 = 40$  

5) The first cube number is $1^3 = 1$  
Write out the 2nd, 3rd, 4th and 10th cube numbers.  
8, 27, 64, ..., 1000  

6) Work out the following:  
a) $1^3 + 3^3$  
b) $10^3 + 5^3$  
$1 + 27 = 28$  
$1000 + 125 = 1125$  

7) Work out the following:  
a) $3^3 + 6^2$  
b) $10^3 + \sqrt{100}$  
$27 + 36 = 63$  
$1000 + 10 = 1010$  

8) Work out what should go in the boxes:  
a) $\sqrt{36} = 6$  
b) $\sqrt{64} = 8$
1. Write the following fractions as decimals and percentages:

\[ \frac{3}{10} = 0.3 = 30\% \]

\[ \frac{1}{5} = 0.2 = 20\% \]

\[ \frac{2}{5} = 0.4 = 40\% \]

\[ \frac{1}{4} = 0.25 = 25\% \]

\[ \frac{3}{4} = 0.75 = 75\% \]

\[ \frac{1}{2} = 0.5 = 50\% \]

\[ \frac{1}{3} = 0.33\overline{3} = 33\frac{1}{3}\% \]

2. Fill in the blanks in the table below:

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Decimal</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{6}{10} )</td>
<td>0.6</td>
<td>60%</td>
</tr>
<tr>
<td>( \frac{1}{5} )</td>
<td>0.2</td>
<td>20%</td>
</tr>
<tr>
<td>( \frac{9}{10} )</td>
<td>0.9</td>
<td>90%</td>
</tr>
<tr>
<td>( \frac{2}{5} )</td>
<td>0.4</td>
<td>40%</td>
</tr>
<tr>
<td>( \frac{1}{4} )</td>
<td>0.25</td>
<td>25%</td>
</tr>
<tr>
<td>( \frac{4}{5} )</td>
<td>0.8</td>
<td>80%</td>
</tr>
<tr>
<td>( \frac{12}{100} )</td>
<td>0.12</td>
<td>12%</td>
</tr>
<tr>
<td>( \frac{1}{3} )</td>
<td>0.33\overline{3}</td>
<td>33\frac{1}{3}%</td>
</tr>
<tr>
<td>( \frac{7}{10} )</td>
<td>0.7</td>
<td>70%</td>
</tr>
</tbody>
</table>
1) Bill buys 3 melons at £1.09 each.
   a) How much does he spend? £3.27
   b) How much change does he get from £5? £1.73

2) Jenny is taking her family to the cinema.
   Jenny pays for 1 adult and 3 children.
   a) How much does she spend? £18.50
   b) How much change does she get from £20? £1.50

3) Bob is paid £7 per hour.
   a) Last monday Bob worked for 8 hours
      Work out his pay for that day. £56
   b) Yesterday Bob was paid £42.
      Work out how many hours Bob worked. 6 hours

4) Complete this bill.
   
   1½ kg of carrots at 40p per kg = £0.60
   3 kg of potatoes at 52p per kg = £1.56
   ...2... boxes of tea bags at 90p each = £1.80
   4 packs of yogurts at £1.20 each = £4.80
   __________________________
   Total = £8.76
Shading Fractions

1) What fraction of each of the following shapes is shaded?
   a) \[
   \frac{2}{6} \text{ or } \frac{1}{3}
   \]
   b) \[
   \frac{2}{6} \text{ or } \frac{1}{3}
   \]
   c) \[
   \frac{3}{5}
   \]
   d) \[
   \frac{6}{12} \text{ or } \frac{1}{2}
   \]
   e) \[
   \frac{5}{6}
   \]
   f) \[
   \frac{6}{16} \text{ or } \frac{3}{8}
   \]

2) Shade the given fraction in the following grids.
   a) \[
   \frac{3}{5}
   \]
   b) \[
   \frac{1}{4}
   \]
   c) \[
   \frac{4}{6}
   \]

3) Which of these fractions is the smallest?
   \[
   \frac{5}{6} = 45 \text{ sq.}
   \]
   \[
   \frac{7}{9} = 42 \text{ sq.}
   \]
   (use the grids to help)

4) Which of these fractions is the largest?
   \[
   \frac{2}{7} \text{ or } \frac{1}{3}
   \]
   (you must show your working)
1. Change these fractions to decimals

   \( \frac{1}{5} \) \rightarrow 0.2

   a) \( \frac{3}{5} \) b) \( \frac{4}{5} \) c) \( \frac{1}{4} \) d) \( \frac{3}{4} \) e) \( \frac{1}{3} \) f) \( \frac{2}{3} \)

   0.6 0.8 0.25 0.75 0.3 0.6

5 3 0

2. Change these percentages to decimals

   \( 52\% \) \rightarrow 0.52

   a) 63% b) 8% c) 59% d) 81% e) 28.5% f) 6.5%

   0.63 0.08 0.59 0.81 0.285 0.065

3. Write the following numbers in order of size (smallest to largest)

   a) 0.61 0.6 0.59 0.55 0.6

   0.61 0.6 0.59 0.55 0.6

   b) 81% 0.78 0.8 0.75 0.805

   81% 0.78 0.8 0.75 0.805

   c) \( \frac{1}{3} \) 0.3 0.25 0.285 0.32

   0.3 0.3 0.25 0.285 0.32

   d) 0.23 0.21 0.2 0.22 0.192

   0.23 0.21 0.2 0.22 0.192

   e) 1% 0.012 0.03 0.021 0.025

   0.01 0.012 0.03 0.021 0.025

   1% 0.012 0.021 0.025
1) Work out an estimate  
\[
\text{eg. } 17 \times 193 \quad \rightarrow \quad 20 \times 200 = 4000
\]
\[
a) \quad 12 \times 304 \quad 3000 \\
b) \quad 38 \times 72 \quad 2800 \\
c) \quad 231 \times 56 \quad 12000 \\
d) \quad 773 \times 13 \quad 8000
\]

2) Work out an estimate  
\[
\text{eg. } 4.7 \times 54 \quad \rightarrow \quad 5 \times 50 = 250
\]
\[
a) \quad 3.8 \times 52 \quad 200 \\
b) \quad 7.9 \times 103 \quad 800 \\
c) \quad 9.6 \times 265 \\
d) \quad 512 \times 2.4 \quad 1000
\]

3) Work out an estimate  
\[
\text{eg. } 37 \div 12 \quad \rightarrow \quad 40 \div 10 = 4
\]
\[
a) \quad 122 \div 53 \quad 2 \\
b) \quad 372 \div 44 \quad 10 \\
c) \quad 341 \div 28 \quad \frac{300}{30} \quad 10 \\
d) \quad 109 \div 96 \quad \frac{100}{100} \quad 1
\]

4) Work out an estimate  
\[
\text{eg. } 37 \div 1.2 \quad \rightarrow \quad 40 \div 1 = 40
\]
\[
a) \quad 68 \div 1.7 \quad 35 \\
b) \quad 37 \div 7.9 \quad 5 \\
c) \quad 253 \div 4.6 \quad \frac{300}{5} \quad 60 \\
d) \quad 96 \div 10.4 \quad \frac{100}{10} \quad 10
\]

5) Work out an estimate  
\[
\text{eg. } \frac{62 \times 28}{89} \quad \rightarrow \quad \frac{60 \times 30}{90} = \frac{1800}{90}
\]
\[
a) \quad \frac{50 \times 20}{45 \times 21} \quad \frac{1000}{10} \quad 100 \\
b) \quad \frac{80 \times 20}{76 \times 17} \quad \frac{1600}{40} \quad 40 \\
c) \quad \frac{40 \times 50}{42 \times 53} \quad \frac{2000}{2} \quad 1000 \\
d) \quad \frac{30 \times 60}{33 \times 61} \quad \frac{1800}{9} \quad 200
\]
1) Use the information that \(23 \times 68 = 1564\)
work out the value of:
   a) \(2.3 \times 68\) \(156.4\)
   b) \(2.3 \times 6.8\) \(15.64\)
   c) \(0.23 \times 68\) \(15.64\)
   d) \(2.3 \times 0.68\) \(1.564\)
   e) \(230 \times 68\) \(15640\)
   f) \(230 \times 6.8\) \(1564\)
   g) \(2300 \times 680\) \(1564000\)
   h) \(1564 \div 23\) \(68\)
   i) \(1564 \div 2.3\) \(680\)
   j) \(15640 \div 23\) \(680\)

2) Using the information that \(416 \times 35 = 14560\)
work out the value of:
   a) \(4.16 \times 35\) \(145.6\)
   b) \(41.6 \times 0.35\) \(14.56\)
   c) \(41600 \times 350\) \(14560000\)
   d) \(0.416 \times 350\) \(145.6\)
   e) \(4160 \times 0.035\) \(145.6\)
   f) \(41.6 \times 350000\) \(14560000\)
   g) \(0.00416 \times 0.0035\) \(0.00001456\)
   h) \(14560 \div 3.5\) \(4160\)
   i) \(145.6 \div 4.16\) \(35\)
   j) \(1.456 \div 0.35\) \(4.16\)

3) If \(78 \div 2.5 = 31.2\), what do you have to divide 78 by to get an answer of 0.312? \(250\)

4) If \(812 \times 2.9 = 2354.8\), what do you have to multiply 8.12 by to get an answer of 23548? \(2900\)
Addition and Subtraction

1) a) 4 2  
    + 2 6  
    ----
    6 8

   b) 5 7  
    + 3 8  
    ----
    9 5

   c) 9 6  
    + 7 5  
    ----
   17 1

2) a) 6 3 7  
    + 9 6 1  
    ----
   1 5 9 8

   b) 9 8 3  
    + 4 4 2  
    ----
   1 4 2 5

   c) 9 6 9  
    + 7 5 8  
    ----
   1 7 2 7

3) a) 452 + 38  
     4 9 0

   b) 147 + 763  
     9 1 0

   c) 813 + 431 + 38  
     1 2 8 2

4) There were two exhibitions at the NEC one Sunday.  
   3816 people went to one of the exhibitions and 13427 people went to the other exhibition.  
   How many people went to the NEC, in total, on the Sunday?  17243

5) a) 2.6 + 1.2  
    3 8

   b) 2.74 + 6.81  
    9 5 5

   c) 45.36 + 6.81  
    5 2 1 7

6) a) 23 + 1.5  
    2 4 5

   b) 13.6 + 38  
    5 1 6

   c) 13.2 + 17.82  
    3 1 0 2

7) a) 7 8  
    - 4 2  
    ----
    3 6

   b) 7 4  
    - 2 6  
    ----
    4 8

   c) 6 2  
    - 3 9  
    ----
    2 3

8) a) 4 8 5  
    - 2 9 1  
    ----
    1 9 4

   b) 7 7 3  
    - 4 8 6  
    ----
    2 8 7

   c) 1 0 0  
    - 3 4  
    ----
    6 6

9) a) 653 − 48  
    6 0 5

   b) 362 − 183  
    1 7 9

   c) 2000 − 461  
    1 5 3 9

10) There were two films showing at a cinema one Saturday.  
    One of the films was shown in a large room and the other was in a smaller room.  
    The film in the larger room was watched by a total of 3562 people.  
    The film in the smaller room was watched by 1671 people.  
    How many more people saw the film in the larger room?  1891

11) a) 782 + 426 − 278  
    9 3 0

   b) 8162 + 1149 − 799  
    8 5 1 2
Long Multiplication

1) Work out
   a) \(13 \times 18\) \[234\] d) \(264 \times 43\) \[11352\] g) \(286 \times 48\) \[13728\]
   b) \(135 \times 27\) \[3645\] e) \(326 \times 24\) \[7824\] h) \(428 \times 34\) \[14552\]
   c) \(116 \times 41\) \[4756\] f) \(281 \times 59\) \[16579\] i) \(461 \times 45\) \[20745\]

2) “MathsWatch Travel” has 36 coaches.
   Each of these coaches can carry 53 passengers. \[36 \times 53\]
   How many passengers in total can all the coaches carry? \[1908\]

3) “MathsWatch Tours” has a plane that will carry 47 passengers.
   To fly from Manchester to Lyon, each passengers pays £65 \[47 \times 65\]
   Work out the total amount that the passengers pay. \[£3055\]

4) A litre of petrol costs 86p.
   Work out the cost of 35 litres of petrol. \[86 \times 35 = 3010\]
   \textit{Give your answer in pounds (£).} \[£30.10\]

5) Last week, MathsWatch posted 439 parcels.
   Each parcel needed a 97p stamp.
   Work out the total cost of the stamps. \[439 \times 97 = 42583\]
   \textit{Give your answer in pounds (£).} \[£425.83\]

6) A stationery supplier sells rulers for 23p each.
   MathsWatch college buys 455 of these rulers.
   Work out the total cost of these 455 rulers. \[23 \times 455 = 10465\]
   \textit{Give your answer in pounds (£).} \[£104.65\]

7) A Maths book costs £1.99
   Mr Smith buys a class set of 36 books. \[199 \times 36 = 7164\]
   Work out the total cost of the 36 books. \[£71.64\]

8) The cost of a calculator is £7.39
   Work out the cost of 32 of these calculators. \[739 \times 32 = 23648\]
   \[£236.48\]

9) Salvatore makes pizzas.
   He receives an order for 34 pizzas.
   Salvatore charges £2.55 for each pizza. \[34 \times 255 = 8670\]
   Work out the total amount he would charge for 34 pizzas. \[£86.70\]

10) A ream of tracing paper costs £3.23
    Work out the cost of 45 reams of tracing paper. \[323 \times 45 = 14535\]
    \[£145.35\]
1) Work out
   a) $325 \div 5 = 65$
   d) $377 \div 29 = 13$
   g) $75 \div 4 = 18.75$
   b) $448 \div 8 = 56$
   e) $27 \div 6 = 4.5$
   h) $135 \div 20 = 6.75$
   c) $221 \div 13 = 17$
   f) $123 \div 15 = 8.2$
   i) $381 \div 12 = 31.75$

2) A box can hold 19 books.
   Work out how many boxes will be needed to hold 646 books.
   $646 \div 19 = 34$ boxes

3) The distance from Glasgow to Paris is 1290 km.
   A flight from Glasgow to Paris lasts 3 hours.
   \[
   \text{Average speed} = \frac{\text{Distance}}{\text{Time}}
   \]
   Given that $1290 \div 3 = 430\text{ km/h}$

4) Pencils cost 25p each.
   Mr Smith spends £15 on pencils.
   Work out the number of pencils he gets.
   $1500 \div 25 = 60$ pencils

5) Yesterday, Gino was paid £19.61 for delivering pizzas.
   He is paid 53p for each pizza he delivers.
   Work out how many pizzas Gino delivered yesterday.
   $1961 \div 53 = 37$ pizzas

6) Emma sold 38 teddy bears for a total of £513
   She sold each teddy bear for the same price.
   Work out the price at which Emma sold each teddy bear.
   £13.50

7) Canal boat for hire
   £1855.00 for 14 days
   Work out the cost per day of hiring the canal boat.
   £132.50

8) A teacher has £539 to spend on books.
   Each book costs £26
   How many books can the teacher buy?
   $539 \div 26 = 20$ books

9) John delivers large wooden crates with his van.
   The weight of each crate is 68 kg.
   The greatest weight the van can hold is 980 kg.
   Work out the greatest number of crates that the van can hold.
   $980 \div 68 = 14$ crates

10) Rulers cost 17p each.
    MathsWatch High School has £120 to spend on rulers.
    Work out the number of rulers bought.
    £12000 \div 17 = 705$ rulers
1)  Work out
   a)  $6 \times 0.2 = 1.2$
   b)  $0.2 \times 0.3 = 0.06$
   c)  $0.4 \times 7 = 2.8$
   d)  $0.2 \times 0.8 = 0.16$
   e)  $0.03 \times 0.9 = 0.027$
   f)  $1.5 \times 0.2 = 0.3$

2)  A box contains 7 books, each weighing 2.5 kg.
    Work out the total weight of the box.
    $7 \times 2.5 = 17.5$ kg

3)  John takes 13 boxes out of his van.
    The weight of each box is 25.5 kg
    Work out the total weight of the 13 boxes.
    $13 \times 25.5 = 331.5$ kg

4)  Work out
   a)  $9 \div 0.3 = 30$
   b)  $6 \div 0.1 = 60$
   c)  $12 \div 0.4 = 30$
   d)  $25 \div 0.5 = 50$
   e)  $21 \div 0.3 = 70$
   f)  $15 \div 0.2 = 75$

5)  Work out
   a)  $3.6 \div 0.4 = 9$
   b)  $0.8 \div 0.2 = 4$
   c)  $2.4 \div 0.4 = 6$
   d)  $0.56 \div 0.08 = 7$
   e)  $5.5 \div 0.05 = 110$
   f)  $8.1 \div 0.09 = 90$

6)  John takes boxes out of his van.
    The total weight of the boxes is 4.9 kg
    The weight of each box is 0.7 kg
    Work out the number of boxes in John’s van.
    $4.9 \div 0.7 = 7$ boxes

7)  Mr Rogers bought a bag of elastic bands for £6
    Each elastic band costs 12p.
    Work out the number of elastic bands in the bag.
    $600 \div 12 = 50$ elastic bands
1) Round the following numbers to 1 decimal place
   a) 13.681  b) 344.7234  c) 0.76133
      13.7  344.7  0.8

2) Round the following numbers to 2 decimal places
   a) 45.7241  b) 0.6851  c) 4623.33621
      45.72  0.69  4623.34

3) Round the following numbers to 1 significant figure
   a) 4252  b) 26112  c) 7523987
      4 000  30 000  8 000 000

4) Round the following numbers to 1 significant figure
   a) 963  b) 9562  c) 991236
      1 000  10 000  1 000 000

5) Round the following numbers to 1 significant figure
   a) 0.005621  b) 0.07756  c) 0.0000523647
      0.006  0.08  0.00005

6) Round the following numbers to 2 significant figures
   a) 752305  b) 147006  c) 296124
      750 000  150 000  300 000

7) Round the following numbers to 2 significant figures
   a) 0.00036264  b) 0.00045921  c) 0.0003654871
      0.00036  0.00046  0.00037

8) Round the following numbers to 3 significant figures
   a) 923146  b) 0.0048912  c) 299622
      923 000  0.00489  300 000

9) Use a calculator to work out the following sums.
   Give all answers to 3 significant figures.
   a) $236 \times 149$  b) $17.3 \div 0.14$  c) $67 \div 3892$
      35 200  124  0.0172
   d) $779 \times 9984$  e) $47.5 \div 0.0037$  f) $215 \times 3.2 \div 0.0018$
      7 780 000  12 800  382 000
1) Which number is in the middle of
   a) 3 and 9       6
   b) 12 and 28     20
   c) 11 and 22     16.5
   d) 17 and 32     24.5
   e) 72 and 108    90
   f) 1 and 100     50.5
   g) –6 and 2      –2
   h) –9 and –3     –6
   i) 3.2 and 3.8   3.5
   j) 5.7 and 6.3   6
   k) 58.3 and 73.5 65.9

2) a) 7 is in the middle of 3 and which other number?  11
    b) 16 is in the middle of 9 and which other number?  23
    c) 2.4 is in the middle of 1.1 and which other number?  3.7
1) Write down the reciprocal of
   a) 8  \( \frac{1}{8} \)
   b) 3  \( \frac{1}{3} \)
   c) 1  1
   d) 12  \( \frac{1}{12} \)

2) Write down the reciprocal of
   a) \( \frac{1}{2} \)  2
   b) \( \frac{1}{3} \)  3
   c) \( \frac{1}{4} \)  4
   d) \( \frac{1}{8} \)  8

3) Write down the reciprocal of
   a) 0.1  \( \frac{1}{0.1} \)  10
   b) 0.5  \( \frac{1}{0.5} \)  2
   c) 0.2  \( \frac{1}{0.2} \)  5

4) Why can’t we have a reciprocal of 0?  
   Because division by "0" does not exist.
1) 8 bananas cost £1.60
Work out the cost of 5 bananas. £1.00
\[
\frac{5 \times 0.20}{1} = 1.00
\]

2) Emily bought 4 identical pairs of sock for £3.60
Work out the cost of 9 pairs of these socks. £8.10
\[
\frac{9 \times 0.90}{1} = 8.10
\]

3) The price of a box of chocolates is £7.20
There are 36 chocolates in the box.
Work out the cost of one chocolate. £0.20 or 20p
\[
\frac{36 \sqrt{7.20}}{1} = 0.20
\]

4) Theresa bought 5 theatre tickets for £60
Work out the cost of 9 theatre tickets. £108
\[
\frac{9 \times 12}{1} = 108
\]

5) Jenny buys 4 folders.
The total cost of these 4 folders is £6.40
Work out the total cost of 7 of these folders. £11.20
\[
\frac{7 \times 1.60}{1} = 11.20
\]

6) The cost of 15 litres of petrol is £12
Work out the cost of 20 litres of petrol. £16
\[
\frac{20 \times 0.8}{1} = 16
\]

7) 3 maths books cost £7.47
Work out the cost of 5 of these. £12.45
\[
\frac{5 \times 2.49}{1} = 12.45
\]

8) Five 1 litre tins of paint cost a total of £48.75
Work out the cost of seven of these 1 litre tins of paint. £68.25
\[
\frac{7 \times 9.75}{1} = 68.25
\]

9) William earns £9.30 for \(1 \frac{1}{2}\) hours of work.
Work out how much he would earn for:
a) 30 minutes £3.10
\[
\frac{0.5 \times 6.2}{1} = 3.10
\]
b) 5 hours £31
\[
\frac{5 \times 6.2}{1} = 31
\]

10) It took 1 hour for Emyr to lay 150 bricks.
He always works at the same speed.
How long will it take Emyr to lay 720 bricks?
Give your answer in hours and minutes. 4 hours and 48 mins
\[
\frac{720 \div 150}{1} = 4.8 \text{ hours}
\]
\[
\frac{0.8 \text{ hours} = 0.8 \times 60}{1} = 48 \text{ mins}
\]
\[
\frac{4.8 \text{ hours} = 4 \text{ hours and 48 mins}}{1} = 4 \text{ hours and 48 mins}
\]
1) The table shows the distances in kilometres between some cities in the USA.

<table>
<thead>
<tr>
<th>San Francisco</th>
<th>New York</th>
<th>Miami</th>
<th>Los Angeles</th>
<th>Chicago</th>
</tr>
</thead>
<tbody>
<tr>
<td>4827</td>
<td>4990</td>
<td>668</td>
<td>3493</td>
<td></td>
</tr>
</tbody>
</table>

a) Write down the distance between San Francisco and Miami. **4990 km**

One of the cities in the table is 4541 km from Los Angeles.

b) Write down the name of this city. **New York**

c) Write down the name of the city which is furthest from Chicago. **San Francisco**

2) The table shows the distances in miles between four cities.

<table>
<thead>
<tr>
<th>London</th>
<th>Cardiff</th>
<th>York</th>
<th>Edinburgh</th>
</tr>
</thead>
<tbody>
<tr>
<td>155</td>
<td>212</td>
<td>413</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>245</td>
<td>212</td>
<td>400</td>
</tr>
</tbody>
</table>

a) Write down the distance between London and York. **212 miles**

b) Write down the distance between Edinburgh and Cardiff. **400 miles**

c) Which two cities are the furthest apart? **London and Edinburgh**

Tom travels from London to York. He then travels from York to Edinburgh. He finally travels back to London from Edinburgh.

d) Work out the total distance travelled by Tom. **818 miles**

Peter and Jessica both drive to York. Peter travels from London whilst Jessica travels from Cardiff.

e) Who travels the furthest out of Peter and Jessica and by how much? **Jessica by 33 miles**
1) Change the following to the 24 hour clock
   a) 4.30 pm  16 30  
   b) 5 am      05 00  
   c) 10.26 am  10 26  
   d) 7.15 pm   19 15  
   e) Quarter past midnight  00 15  
   f) Half past noon  12 30  

2) Change the following to the 12 hour clock
   a) 06 35  6.35 am  
   b) 14 30  2.30 pm  
   c) 12 45  12.45 pm  
   d) 19 15  7.15 pm  
   e) 00 50  0.50 am  
   f) Half past midnight  0.30 am  

3) What is the difference in hours and minutes between the following
   a) 10.15 pm and 11.30 pm  1 hr 15 mins  
   b) 14 20 and 17 10  2 hrs 50 mins  
   c) 11.50 pm and 3.20 am  3 hrs 30 mins  
   d) 22 45 and 01 00  2 hrs 15 mins  

4) Here is part of a train timetable

<table>
<thead>
<tr>
<th></th>
<th>05 15</th>
<th>06 06</th>
<th>06 45</th>
<th>07 05</th>
<th>07 15</th>
<th>07 46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stockport</td>
<td>05 26</td>
<td>06 16</td>
<td>06 55</td>
<td>07 15</td>
<td>07 25</td>
<td>07 55</td>
</tr>
<tr>
<td>Macclesfield</td>
<td>05 39</td>
<td>06 29</td>
<td>07 08</td>
<td></td>
<td>07 38</td>
<td>08 08</td>
</tr>
<tr>
<td>Stoke</td>
<td>05 54</td>
<td>06 45</td>
<td>07 24</td>
<td>07 54</td>
<td>08 24</td>
<td></td>
</tr>
<tr>
<td>Stafford</td>
<td>06 12</td>
<td></td>
<td>07 41</td>
<td>08 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euston</td>
<td>08 09</td>
<td>08 26</td>
<td>09 06</td>
<td>09 11</td>
<td>09 50</td>
<td>10 08</td>
</tr>
</tbody>
</table>

   a) Tim catches the 06 06 train from Manchester.  
      At what time should he expect to arrive at Euston? 08 26  

   b) Jenny arrives at the Stockport train station at 07 00  
      (i) How long should she expect to wait for a train to Stoke? 25 mins  
      (ii) How long should her train journey take? 29 mins  

   c) Sarah needs to travel to Euston from Macclesfield.  
      She has to arrive at Euston before 09 30.  
      What is the departure time of the latest train she can catch to get there on time? 07 08
Clue 26: Powers

1) Write the following using indices:
   eg. \(3 \times 3 \times 3 = 3^3\)
   
   a) \(2 \times 2 \times 2 \times 2 = 2^4\)  
   b) \(4 \times 4 \times 4 = 4^3\)  
   c) \(5 \times 5 \times 5 \times 5 \times 5 = 5^6\)
   
   d) \(12 \times 12 \times 12 \times 12 \times 12 = 12^5\)  
   e) \(3.6 \times 3.6 = 3.6^2\)  
   f) \(5.2 \times 5.2 \times 5.2 = 5.2^3\)

2) Write each of the following as a single power:
   eg. \(5^2 \times 5^4 = 5^6\)
   
   a) \(6^2 \times 6^3 = 6^5\)  
   b) \(7^4 \times 7^2 = 7^6\)  
   c) \(9^3 \times 9^6 = 9^9\)
   
   d) \(5^3 \times 5 = 5^4\)  
   e) \(2^4 \times 2^3 = 2^{12}\)  
   f) \(7.2^3 \times 7.2^2 = 7.2^5\)

3) Write each of the following as a single power:
   eg. \(7^5 \div 7^3 = 7^2\)
   
   a) \(9^5 \div 9^3 = 9^2\)  
   b) \(6^9 \div 6^5 = 6^4\)  
   c) \(11^7 \div 11^2 = 11^5\)
   
   d) \(\frac{7^8}{7^3} = 7^5\)  
   e) \(\frac{3^6}{3} = 3^5\)  
   f) \(\frac{8^{15}}{8^4} = 8^{11}\)

4) Write each of the following as a single power:
   eg. \(\frac{7^3 \times 7^8}{7^6} = 7^7 = 7^5\)
   
   a) \(\frac{4^2 \times 4^3}{4^6} = 4^{10} \div 4^6 = 4^4\)  
   b) \(\frac{9^2 \times 9^6}{9^4} = 9^8 \div 9^4 = 9^4\)

5) Match together cards with the same answer

![Card Matching Diagram]
1) The graph shows the number of ice creams sold each day during one week.

a) How many more ice creams were sold on Sunday than on Friday? 200
b) Explain what might have happened on Monday. It might have been raining.
c) On Saturday, 250 ice creams were sold. Update the graph with this information.
d) About how many ice creams were sold on Wednesday? 213 (you can have between 206 and 220)

2) The average temperature, in degrees Centigrade, was recorded for each month. The results are as follows:
January 5°C February 3°C March 8°C April 13°C May 15°C June 21°C
July 34°C August 29°C September 20°C October 12°C November 8°C December 6°C
Draw a line graph to show these results.
1. Write down the coordinates of the points A to H.
   - A (8, 8)
   - B (3, 9)
   - C (1, 6)
   - D (0, 2)
   - E (6, 5)
   - F (4, 3)
   - G (5, 0)
   - H (10, 2)

2. a) Write down the coordinates of: 
   - (i) A (8, 8)
   - (ii) B (1, 3)

   b) Write down the coordinates of the midpoint of the line AB. (3, 4)

3. Using the pair of axes,
   a) Plot the points A(2, 0), B(4, 0), C(5, 2) and D(3, 2).

   b) Join the points in order, to form a shape and name the shape. Parallelogram

   M is the midpoint of the line segment AC.

   c) Find the coordinates of M. (3.5, 1)

4. Using the same pair of axes,
   a) Plot the points R(-1, -2), S(1, 1) and T(-1, 2).

   b) Join R to S and S to T.

   RSTU is a kite.

   c) Write the coordinates of point U. (-3, 1)
1) Here are some patterns made from matchsticks

```
Pattern 1          Pattern 2                             Pattern 3
```

a) Draw pattern 4.

```
Pattern 4
```

b) How many matchsticks are used in
   (i) Pattern 5  **16 matchsticks**
   (ii) Pattern 10 **31 matchsticks**

c) Which pattern will have 46 matchsticks? **pattern 15**

2) A pattern is made of rectangles and circles

```
Pattern 1          Pattern 2                  Pattern 3
```

a) Draw pattern 4.

```
Pattern 4
```

b) Complete the table below.

<table>
<thead>
<tr>
<th>Pattern number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of rectangles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Number of circles</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Total rectangles + circles</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

c) Which pattern will have 64 circles? **32**
d) Which pattern will have a total (rectangles + circles) of 90? **30**

3) For each of the following sequences write down the next two terms.

a) 5, 10, 15, 20... **25, 30**
c) 27, 23, 19, 15... **11, 7**

b) 9, 16, 23, 30... **37, 44**
d) 12, 7, 2, –3... **-8, -13**

4) Look at this number sequence: 4, 10, 16, 22...
The 50th term of the sequence is 298.

a) Write down the 51st term. **304**

b) Will 643 be a term in this sequence? **No.**
   Explain your answer. **All the numbers in this sequence are “even”.**
1) Here is a table for the rule $\times 3$ then $-1$

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>35</td>
</tr>
</tbody>
</table>

Complete the table.

2) Here is the table for the rule $+5$ then $\div 2$

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
</tbody>
</table>

Complete the table.

3) Here is a table for the rule $\times 4$ then $-3$ then $\times 2$

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>74</td>
</tr>
<tr>
<td>11</td>
<td>82</td>
</tr>
</tbody>
</table>

Complete the table.
1) a) One of these angles is an acute angle. Which one? \textbf{Angle B}

b) Write the names of the other three angles next to them.

\begin{itemize}
  \item \textbf{Obtuse angle} \hspace{1cm} \textbf{Reflex angle}
  \item \textbf{Right angle}
\end{itemize}

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

2) a) Sketch a triangle which has three internal (inside) acute angles.

b) Sketch a right-angled triangle.

c) Sketch a triangle with one internal obtuse angle.

3) Debbie says she is going to draw a triangle with two internal obtuse angles. Harry says that this is impossible.

Is Harry correct? Explain why.

\textbf{Harry is correct.}

An obtuse angle is bigger than 90°. Two of them would mean the angles added up to more than 180°.

But we know the angles of a triangle add up to 180°.

4) Draw a quadrilateral with

a) Two internal acute angles, one reflex angle and one obtuse angle.

b) Three internal acute angles and one reflex angle.
### Congruent and Similar Shapes

Fill in the table on the left.

You are allowed to use tracing paper to help get the correct answers.

<table>
<thead>
<tr>
<th>Congruent to</th>
<th>Similar to</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>I</td>
</tr>
<tr>
<td>B</td>
<td>J</td>
</tr>
<tr>
<td>C</td>
<td>G</td>
</tr>
<tr>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>F</td>
<td>A and I</td>
</tr>
<tr>
<td>G</td>
<td>C</td>
</tr>
<tr>
<td>H</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>J</td>
<td>F</td>
</tr>
</tbody>
</table>

![Images of shapes A to J]
1) Find the perimeter of the following rectangle and pentagon:

\[
\begin{align*}
4 \text{ cm} & + 6 \text{ cm} + 4 \text{ cm} + 6 \text{ cm} = 20 \text{ cm} \\
6 \text{ cm} & + 4.5 \text{ cm} + 4.5 \text{ cm} = 13.5 \text{ cm} \\
4 \text{ cm} & + 4 \text{ cm} + 3 \text{ cm} + 4.5 \text{ cm} = 15.5 \text{ cm}
\end{align*}
\]

2) A rectangle has a perimeter of 40 cm. The length of the longest side is 12 cm. Sketch the rectangle, and find the length of the shorter side.

\[
\begin{align*}
40 - 12 - 12 & = 16 \\
16 \div 2 & = 8 \text{ cm}
\end{align*}
\]

3) Find the area of the following rectangles:

\[
\begin{align*}
4 \text{ cm} & \times 7 \text{ cm} = 28 \text{ cm}^2 \\
8 \text{ cm} & \times 3.5 \text{ cm} = 28 \text{ cm}^2 \\
6.3 \text{ cm} & \times 2.1 \text{ cm} = 13.23 \text{ cm}^2
\end{align*}
\]

4) A rectangle has an area of 40 cm\(^2\) and a length of 8 cm. Sketch the rectangle and find the width.

\[
40 \div 8 = 5 \text{ cm}
\]

5) Why can’t we find the area of this parallelogram?

Because we don’t know its height.

6) What is the area of the parallelogram, below?

\[
9 \times 4 = 36 \text{ cm}^2
\]

7) Find the area of the following triangles:

\[
\begin{align*}
6 \text{ cm} & \times 10 \text{ cm} = 60 \text{ cm}^2 \\
60 \div 2 & = 30 \text{ cm}^2 \\
8 \text{ cm} & \times 6.4 \text{ cm} = 51.2 \text{ cm}^2 \\
51.2 \div 2 & = 25.6 \text{ cm}^2 \\
24 \text{ cm} & \times 10 \text{ cm} = 240 \text{ cm}^2 \\
240 \div 2 & = 120 \text{ cm}^2
\end{align*}
\]

8) The area of a triangle is 60 cm\(^2\). The base of the triangle is 12 cm long. Sketch a triangle with this area and base and work out the height of the triangle.

\[
60 \times 2 = 120 \\
120 \div 12 = 10 \text{ cm}
\]
1) Find the volume of this cuboid. \( \text{Volume} = 300 \text{ cm}^3 \)

\[
\begin{align*}
V &= W \times L \times H \\
V &= 10 \times 6 \times 5 \\
V &= 300 \text{ cm}^3
\end{align*}
\]

2) Find the volume of this cuboid. \( \text{Volume} = 3.128 \text{ m}^3 \)

\[
\begin{align*}
V &= W \times L \times H \\
V &= 2.3 \times 1.7 \times 0.8 \\
V &= 3.128 \text{ m}^3
\end{align*}
\]

3) The volume of this cuboid is 480 cm\(^3\). Find the length of the side marked \( x \). \( x = 10 \text{ cm} \)

\[
\begin{align*}
V &= W \times L \times H \\
480 &= 8 \times x \times 6 \\
480 &= 48 \times x \\
x &= 10 \text{ cm}
\end{align*}
\]

4) Boxes A and B are both cuboids. How many of box B could be packed into box A? 80 of box B go into box A
1) Complete this table by writing down a sensible unit for each measurement. Four have been done for you.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>km</td>
<td>miles</td>
</tr>
<tr>
<td>cm</td>
<td>inches</td>
</tr>
<tr>
<td>kg</td>
<td>pounds</td>
</tr>
<tr>
<td>litres</td>
<td>gallons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The distance between London and Manchester</th>
<th>km</th>
<th>miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>The length of a pen</td>
<td>cm</td>
<td>inches</td>
</tr>
<tr>
<td>The weight of your Maths Teacher</td>
<td>kg</td>
<td>pounds</td>
</tr>
<tr>
<td>The amount of petrol in a car</td>
<td>litres</td>
<td>gallons</td>
</tr>
<tr>
<td>The length of an ant</td>
<td>mm</td>
<td>inches</td>
</tr>
</tbody>
</table>

2) Change the following measurements:

a) 4 cm to mm \[\text{40 mm}\]  
d) 10 cm to mm \[\text{100 mm}\]  
g) 1 km to m \[\text{1000 m}\]

b) 7 m to cm \[\text{700 cm}\]  
e) 25 m to mm \[\text{25000 mm}\]  
h) 1 km to cm \[\text{100000 cm}\]

c) 5 m to mm \[\text{5000 mm}\]  
f) 34 m to cm \[\text{3400 cm}\]  
i) 23 km to m \[\text{23000 m}\]

3) Change the following measurements:

a) 300 cm to m \[\text{3 m}\]  
d) 6 cm to m \[\text{0.06 m}\]  
g) 4386 cm to m \[\text{43.86 m}\]

b) 4 mm to cm \[\text{0.4 cm}\]  
e) 412 cm to m \[\text{4.12 m}\]  
h) 549 mm to cm \[\text{54.9 cm}\]

c) 7425 mm to m \[\text{7.425 m}\]  
f) 1500 m to km \[\text{1.5 km}\]  
i) 0.3 km to m \[\text{300 m}\]

4) Change the following measurements:

a) 5 m² to cm² \[\text{50000 cm²}\]  
d) 8.2 m² to cm² \[\text{82000 cm²}\]  
g) 5.1 m³ to cm³ \[\text{5100000 cm³}\]

b) 8 cm² to mm² \[\text{800 mm²}\]  
e) 7320 mm² to cm² \[\text{73.2 cm²}\]  
h) 53478 mm³ to cm³ \[\text{53.478 cm³}\]

c) 250 cm² to m² \[\text{0.025 m²}\]  
f) 8 m³ to cm³ \[\text{8000000 cm³}\]  
i) 183000 cm³ to m³ \[\text{0.183 m³}\]
For each of the shapes A to N, below:

a) Name the shape.

b) Mark on the shape, or write in words, the features that make it special.

eg) Shape A is a square because it has four equal sides and four right angles.

Square
4 equal sides
4 right angles

Right-angled triangle
1 right angle

Hexagon
6 sides

Parallelogram
2 pair of parallel sides
2 pairs of equal angles

Trapezium
1 pair of parallel sides

Rectangle
2 pairs of equal sides
4 right angles

Rhombus
4 equal sides
2 pairs of equal angles
2 pairs of parallel sides

Scalene triangle
No equal sides
No equal angles

Regular Octagon
8 equal sides
8 equal angles

Kite
2 pairs of equal sides
1 pair of equal angles

Regular pentagon
5 equal sides
5 equal angles

Isosceles triangle
1 pair of equal sides
1 pair of equal angles

Equilateral triangle
All sides equal
All angles 60°
Names of Solids

1) Draw a sketch of each of the following solids:
   a) A cube.
   b) A cylinder.

2) Write down the mathematical name of each of these 3-D shapes.
   a) Cone
   b) Cuboid
   c) Sphere

3) Look at this solid.
   a) What is its name? **Triangular prism**
   b) How many vertices does it have? **6**
   c) How many edges are there? **9**
   d) How many faces does it have? **5**

4) This is a picture of a pentagonal prism.
   a) How many faces does it have? **7**
   b) How many edges does it have? **15**
   c) How many vertices does it have? **10**
1) On the grid below, show how the shaded shape will tessellate. You should draw at least six shapes.

2) On the grid below, show how the shaded shape will tessellate. You should draw at least six shapes.

3) On the grid below, show how the shaded shape will tessellate. You should draw at least six shapes.
1) Copy the shape below, onto the isometric grid.

2) The shape below, is made out of 2 cm by 2 cm by 2 cm cubes. Copy the shape onto the isometric grid.
1) a) On the probability scale below, mark with a cross (×) the probability that it will snow in Birmingham in July.

![Probability Scale](image)

b) On the probability scale below, mark with a cross (×) the probability that it will rain in Wales next year.

![Probability Scale](image)

c) On the probability scale below, mark with a cross (×) the probability that you will get a tail when you flip a fair coin.

![Probability Scale](image)

d) On the probability scale below, mark with a cross (×) the probability that you will get a number bigger than 4 when you roll an ordinary dice.

![Probability Scale](image)

2) 4 jelly babies are in a bag. 2 are red, 1 is green and 1 is black.

Without looking in the bag, a jelly baby is taken out.

a) On the probability scale below, mark with a cross (×) the probability that the jelly baby taken from the bag is green.

![Probability Scale](image)

b) On the probability scale below, mark with a cross (×) the probability that the jelly baby taken from the bag is green or black.

![Probability Scale](image)

c) On the probability scale below, mark with a cross (×) the probability that the jelly baby taken from the bag is red or black.

![Probability Scale](image)
1) Kaya made a list of his homework marks.

3 2 3 4 1 4 5 5 2 4

a) Write down the mode of Kaya’s marks. **4**

b) Work out his mean homework mark. **3.3**

\[
\frac{3 + 2 + 3 + 4 + 1 + 4 + 5 + 5 + 2 + 4}{10} = 3.3
\]

2) Lydia rolled an 8-sided dice ten times.

Here are her scores.

5 1 2 5 3 8 6 6 3 2

a) Work out Lydia’s median score. **4**

b) Work out the mean of her scores. **4.1**

\[
\frac{5 + 1 + 2 + 5 + 3 + 8 + 6 + 6 + 3 + 2}{10} = 4.1
\]

c) Work out the range of her scores. **7**

\[
8 - 1 = 7
\]

3) 20 students scored goals for the school football team.

The table gives information about the number of goals they scored.

<table>
<thead>
<tr>
<th>Goals scored</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

\[
\begin{array}{c}
8 \\
3 \\
6 \\
3
\end{array}
\]

\[
20 \\
44
\]

a) Write down the modal number of goals scored. **1**

b) Work out the range of the number of goals scored. **3**

\[
4 - 1 = 3
\]

c) Work out the mean number of goals scored. **2.2**

\[
\frac{8 + 6 + 18 + 12}{20} = 2.2
\]

4) Laura spun a 4-sided spinner 100 times.

The sides of the spinner are labelled 1, 2, 3 and 4.

Her results are shown in the table.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
</tr>
</tbody>
</table>

\[
\begin{array}{c}
1 \\
2 \\
3 \\
4
\end{array}
\]

\[
247
\]

Work out the mean score. **2.47**
1) The pictogram shows the number of watches sold by a shop in January, February and March.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>February</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>April</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key ✙ represents 4 watches.

a) How many watches were sold in January? 16 watches

b) Work out how many more watches were sold in March than in February? 3 watches more

19 watches were sold in April.
14 watches were sold in May.

c) Use this information to complete the pictogram.

2) The pictogram shows the number of DVDs borrowed from a shop on Monday and Tuesday.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key ✘ represents 10 DVDs.

a) How many DVDs were borrowed on
   (i) Monday, 40 DVDs
   (ii) Tuesday 25 DVDs

On Wednesday, 50 DVDs were borrowed.
On Thursday, 15 DVDs were borrowed.

b) Show this information in the pictogram.
1) Use the graph to convert:

a) 11 gallons to litres 
   50 litres
b) 40 litres to gallons 
   8.8 gallons
c) 15 gallons to litres 
   68 litres
d) 25 litres to gallons 
   5.5 gallons

2) The conversion graph below converts between kilometres and miles.

a) Bob travels 50 miles. 
   What is this distance in kilometres? 
   80 km
b) Terry travels 100 kilometres. 
   What is this distance in miles? 
   62 miles
c) The distance between the surgery and the hospital is 25 kilometres. 
   What is this distance in miles? 
   16 miles
d) Bill completes a 10 mile run. 
   How far is this in kilometres? 
   16 km
1) Write the factors of
   a) 6  b) 16  c) 18  d) 30
   1, 2, 3, 6  1, 2, 4, 8, 16  1, 2, 3, 6, 9, 18  1, 2, 3, 5, 6, 10, 15, 30

2) In a pupil’s book the factors of 12 are listed as
   1 2 3 4 6 12
   The above list contains a mistake.
   Cross it out from the list and replace it with the correct number.

3) The factors of 30 and 40 are listed
   30: 1, 2, 3, 5, 6, 10, 15, 30
   40: 1, 2, 4, 5, 8, 10, 20, 40
   Write the common factors of 30 and 40 (the numbers that are factors of 30 and 40).
   1, 2, 5, 10

4) Write the first four multiples of
   a) 3  b) 5  c) 10  d) 15
   3, 6, 9, 12  5, 10, 15, 20  10, 20, 30, 40  15, 30, 45, 60

5) In a pupil’s book the first 7 multiples of 8 are listed as
   8 16 22 32 40 48 54
   The above list contains 2 mistakes.
   Cross them out and replace them with the correct numbers.

6) The first five multiples of 4 and 10 are listed
   4: 4, 8, 12, 16, 20
   10: 10, 20, 30, 40, 50
   From the two lists above, write the common multiple of 4 and 10.
   20

7) List the first five prime numbers
   2, 3, 5, 7, 11

8) Using just this list of numbers:
   11 18 1 4 21 24 9 3 12 2 19
   find the following:
   a) The prime numbers 2, 3, 11, 19
   b) The factors of 18 1, 2, 3, 9, 18
   c) The multiples of 3 3, 9, 12, 18, 21, 24
1. Evaluate
a) $7^2 = 49$
$7 \times 7 = 49$
b) $2^4 = 16$
$2 \times 2 \times 2 \times 2 = 16$
c) $5^2 = 25$
$5 \times 5 = 25$
d) $3^3 = 27$
$3 \times 3 \times 3 = 27$
e) $1^6 = 1$
$1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1$

2. Work out the square of
a) $1 = 1$
$1^2 = 1$
b) $2 = 4$
$2^2 = 4$
c) $4 = 16$
$4^2 = 16$
d) $6 = 36$
$6^2 = 36$
e) $11 = 121$
$11^2 = 121$

3. Work out
a) $3^2 = 9$
$3 \times 3 = 9$
b) $9^2 = 81$
$9 \times 9 = 81$
c) $10^2 = 100$
$10 \times 10 = 100$
d) $12^2 = 144$
$12 \times 12 = 144$
e) $100^2 = 10000$
$100 \times 100 = 10000$

4. Work out the cube of
a) $1 = 1$
$1^3 = 1$
b) $3 = 27$
$3^3 = 27$
c) $5 = 125$
$5^3 = 125$
d) $6 = 216$
$6^3 = 216$
e) $100 = 1000000$
$100^3 = 1000000$

5. Work out
a) $2^3 = 8$
$2 \times 2 \times 2 = 8$
b) $4^3 = 64$
$4 \times 4 \times 4 = 64$
c) $10^3 = 1000$
$10 \times 10 \times 10 = 1000$

6. Work out the square root of
a) $1 = 1$
$1 \times 1 = 1$
b) $9 = 3$
$3 \times 3 = 9$
c) $81 = 9$
$9 \times 9 = 81$

7. Work out
a) $\sqrt{25} = 5$
$5^2 = 25$
b) $\sqrt{49} = 7$
$7^2 = 49$
c) $\sqrt{121} = 11$
$11^2 = 121$

8. Work out the cube root of
a) $27 = 3$
$3^3 = 27$
b) $1 = 1$
$1^3 = 1$
c) $125 = 5$
$5^3 = 125$

9. From the following numbers
4 27 8 64 16 19 100 360 45 3
Find
a) The square numbers
4 64 16 100
$2^2 = 4$, $8^2 = 64$, $4^2 = 16$, $10^2 = 100$
b) The cube numbers
27 8 64
$3^3 = 27$, $2^3 = 8$, $4^3 = 64$
c) The square root of 64
8
$8^2 = 64$
d) The cube root of 27
3
$3^2 = 27$

10. Match together cards with the same answer

```
<table>
<thead>
<tr>
<th>9^2</th>
<th>\sqrt{9}</th>
<th>81</th>
<th>5^3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2^5</td>
<td>125</td>
<td>32</td>
<td>3</td>
</tr>
</tbody>
</table>
```
Equivalent Fractions, Simplifying and Ordering Fractions

1) Write down three equivalent fractions for each of these
   a) \(\frac{3}{4}\)
   b) \(\frac{2}{5}\)
   c) \(\frac{7}{8}\)
   etc...

2) Match together equivalent fractions

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>B</th>
<th>A</th>
<th>C</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{10}{15})</td>
<td>(\frac{3}{5})</td>
<td>(\frac{18}{21})</td>
<td>(\frac{21}{35})</td>
<td>(\frac{2}{3})</td>
<td>(\frac{6}{7})</td>
<td>(\frac{30}{50})</td>
</tr>
</tbody>
</table>

3) Find the missing values in these equivalent fractions
   a) \(\frac{1}{4} = \frac{2}{8} = \frac{4}{16} = \frac{10}{40}\)
   b) \(\frac{6}{9} = \frac{2}{3} = \frac{60}{90} = \frac{48}{66}\)
   c) \(\frac{4}{5} = \frac{12}{15} = \frac{20}{25} = \frac{28}{35} = \frac{48}{60}\)
   d) \(\frac{4}{10} = \frac{24}{60} = \frac{2}{5} = \frac{48}{120} = \frac{80}{200}\)

4) Write these fractions in their simplest form
   a) \(\frac{24}{48} = \frac{1}{2}\)
   b) \(\frac{8}{20} = \frac{2}{5}\)
   c) \(\frac{45}{63} = \frac{5}{7}\)
   d) \(\frac{39}{45} = \frac{13}{15}\)
   e) \(\frac{72}{104} = \frac{9}{13}\)

5) Write these fractions in order of size (smallest first)
   a) \(\frac{3}{8} = \frac{9}{16} = \frac{1}{4} = \frac{15}{32} = \frac{5}{8} = \frac{4}{8} = \frac{3}{8} = \frac{7}{14} = \frac{5}{7} = \frac{7}{14}\)
   b) \(\frac{2}{3} = \frac{7}{12} = \frac{3}{6} = \frac{7}{12} = \frac{5}{30} = \frac{4}{6} = \frac{5}{30} = \frac{16}{30} = \frac{6}{10} = \frac{16}{30}\)

6) Ben spent his pocket money this way:
   a) \(\frac{7}{20}\) on magazines; \(\frac{7}{20}\)
   b) \(\frac{4}{10}\) on chocolates; \(\frac{8}{20}\)
   c) \(\frac{1}{4}\) on games. \(\frac{5}{20}\)

Order the items Ben bought by value (largest first). chocolates, magazines, games
Show all working
Value for Money

1) Which of the following offer better value for money? 

 Working must be shown 

 a) 200ml of toothpaste for 50p or 400ml of toothpaste for 90p
   - 400ml of toothpaste for £1.00

 b) 600g of bananas for 70p or 200g of bananas for 22p
   - 600g of bananas for 66p

 c) 2 litres of paint for £1.60 or 5 litres of paint for £3.50
   - 1 litre of paint for 80p or 1 litre of paint for 70p

 d) 60 teabags for £1.62 or 40 teabags for £0.96
   - 120 teabags for £3.24 or 120 teabags for £2.88

2) Which of these is the best buy? 

 Working must be shown

<table>
<thead>
<tr>
<th>20 exercise books</th>
<th>35 exercise books</th>
</tr>
</thead>
<tbody>
<tr>
<td>for £4.00</td>
<td>for £7.80</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
200 \div 20 &= 20 \\
\text{20p per book} \\
780 \div 35 &= 22.3 \\
\text{22p per book}
\end{align*}
\]

3) Hamza needs to buy 2 litres of paint.

 At the shop he gets two choices: 

 500ml for £2.55 or 1 litre for £4.79.

 Working must be shown please, for question 3.

 a) Work out which of these would be the best buy for Hamza.

 1 litre of paint for £5.10

 b) How much does he save if he buys the ‘best buy’ rather than the ‘worst buy’.

 \[
 \begin{align*}
 \text{£0.31 or 31p} \\
 \text{£5.10} \\
 \text{£4.79} \\
 \text{£0.31}
 \end{align*}
 \]

4) Honey pots are sold in two sizes.

 A small pot costs 45p and weighs 450g. 

 A large pot costs 80p and weighs 850g.

 You must show all your working.

 Which pot of honey is better value for money? 

 Large pot at 80p for 850g
Find a Percentage with a Calculator

1) Work out
   a) 21% of 340  71.4  
   b) 9% of 2700  243  
   c) 17.5% of 420  73.5  
   d) 3.5% of 78.6  2.751  
   e) 80.5% of 3200 2576  
   f) 117.5% of 35  41.125

2) Work out the total cost (including VAT) of the following items.

   Trainers  
   £45.50  
   plus 17.5% VAT  
   £53.46

   Tennis racquet  
   £28.99  
   plus 17.5% VAT  
   £34.06

   Football boots  
   £57  
   plus 17.5% VAT  
   £66.98

3) 850 people attended a festival. 
   16% of the people were children. 
   Work out the number of children at the festival.  136 children

Find a Percentage Without a Calculator

1) Work out  
   (i) 10% and (ii) 5% and (iii) 15% of:  
   a) 200 (i) 20 (ii) 10 (iii) 30  
   b) 30 (i) 3 (ii) 1.5 (iii) 5  
   c) 450 (i) 45 (ii) 22.5 (iii) 67.5  
   d) 54 (i) 5.4 (ii) 2.7 (iii) 8.1

2) Work out  
   a) 30% of 280  84  
   b) 80% of 3500  2800  
   c) 15% of 540  81  
   d) 17.5% of 300  52.5  
   e) 55% of 700  385  
   f) 17.5% of 180  31.5

3) Work out the total cost (including VAT) of the following items.

   Video recorder  
   £200  
   + 17.5% VAT  
   235

   Tape player  
   £60  
   + 17.5% VAT  
   70.5

   Laptop  
   £1200  
   + 17.5% VAT  
   1410

4) There are 1300 students at MathsWatch College. 
   45% of these students are boys.  585 boys  
   Work out the number of boys.  585 boys
1) In a class of 37 pupils, 22 are boys.
   a) What percentage of the class are boys? \( \frac{22}{37} \times 100 = 59.5\% \)
   b) What percentage of the class are girls? \( \frac{15}{37} \times 100 = 40.5\% \)

2) Sarah sat a mock examination and gained the following marks:
   a) Write each of Sarah’s marks as a percentage.
   b) Which is Sarah’s best subject in terms of percentage score? English

3) A brand new car costs £16 500.
   A discount of £2 227.50 is negotiated with the dealer.
   What is the percentage discount? \( \frac{2227.5}{16500} \times 100 = 13.5\% \)

1) Write the following as percentages:
   a) 13 out of 50 = 26\%\quad \frac{13}{50} = \frac{26}{100} \\
   b) 6 out of 20 = 30\%\quad \frac{6}{20} = \frac{30}{100} \\
   c) 17 out of 25 = 68\%\quad \frac{17}{25} = \frac{68}{100} \\
   d) 34 out of 40 = 85\%\quad \frac{34}{40} = \frac{17}{20} = \frac{85}{100} \\
   e) 12 out of 80 = 15\%\quad \frac{12}{80} = \frac{3}{4} = \frac{15}{100} \\
   f) 27 out of 60 = 45\%\quad \frac{27}{60} = \frac{9}{20} = \frac{45}{100}

2) In a football tournament, Team A won 16 of the 20 games they played, whilst team B won 19 of their 25 games.
   What percentage of their games did they each win?

   Team A: 80\% \quad \frac{16}{20} = \frac{80}{100} \\
   Team B: 76\% \quad \frac{19}{25} = \frac{76}{100} \\

3) 60 participants were invited to a conference.
   36 of the participants were females.
   a) Work out the percentage of female participants.
   b) What is the percentage of male participants?

   a) 60\% \quad \frac{36}{60} = \frac{12}{20} = \frac{60}{100} \\
   b) 40\% \quad 100\% - 60\% = 40\%

4) A company has 800 employees.
   440 of these 800 employees are males.
   176 of these 800 employees are under 25 years old.
   a) What percentages of males are employed in this company?
   b) What percentage of employees are under 25?

   a) 55\% \quad \frac{440}{800} = \frac{55}{100} \\
   b) 22\% \quad \frac{176}{800} = \frac{22}{100}
Find a Fraction of an Amount

1. Work out these amounts.
   a) \(\frac{3}{4}\) of £20  £15  
   b) \(\frac{2}{3}\) of 60 kg  40 kg  
   c) \(\frac{3}{8}\) \(\times\) 24  9  
   d) 150 \(\times\) \(\frac{2}{3}\)  100  
   e) \(\frac{2}{9}\) of 180 cm  40 cm  
   f) 49 \(\times\) \(\frac{4}{7}\)  28  
   g) 60 \(\times\) \(\frac{1}{4}\)  15  
   h) \(\frac{5}{8}\) of £48  £30  
   i) 4000 \(\times\) \(\frac{7}{8}\)  3500

2. There are 600 apples on a tree and there are maggots in \(\frac{3}{5}\) of them.  
   How many apples have maggots in them?  
   360 apples

3. Liz and Lee are travelling in a car from Glasgow to Poole (770 km).  
   At midday they had already travelled \(\frac{5}{7}\) of the total distance.  
   What distance, in km, had they travelled by midday?  
   550 km

4. A digital camera that cost £49 was sold on eBay for \(\frac{3}{7}\) of the original price.  
   What was the selling price?  
   £21

5. Yesterday Thomas travelled a total of 175 miles.  
   He travelled \(\frac{2}{5}\) of this distance in the morning.  
   How many miles did he travel during the rest of the day?  
   105 miles

6. Debra received her £15 pocket money on Saturday.  
   She spent \(\frac{1}{3}\) of her pocket money on magazines.  
   She spent \(\frac{2}{5}\) of her pocket money on a necklace.  
   How much of the £15 did she have left?  
   £4
1. Work out the following giving your answer as a fraction in its simplest form
   a) \( \frac{3}{5} + \frac{1}{5} \)  
   b) \( \frac{3}{7} + \frac{2}{7} \)  
   c) \( \frac{5}{8} - \frac{3}{8} \)  
   d) \( \frac{7}{13} - \frac{4}{13} \)

2. Work out the following giving your answer as a fraction in its simplest form
   a) \( \frac{3}{5} + \frac{2}{10} \)  
   b) \( \frac{1}{3} + \frac{2}{9} \)  
   c) \( \frac{13}{20} - \frac{3}{5} \)  
   d) \( \frac{9}{12} - \frac{1}{3} \)

3. Change the following to mixed numbers
   a) \( \frac{8}{5} \)  
   b) \( \frac{14}{3} \)  
   c) \( \frac{35}{6} \)  
   d) \( \frac{17}{5} \)

4. Change the following to top heavy (or improper) fractions
   a) \( \frac{\frac{2}{5}}{7} \)  
   b) \( \frac{\frac{13}{4}}{6} \)  
   c) \( \frac{\frac{31}{5}}{2} \)  
   d) \( \frac{\frac{23}{9}}{2} \)

5. Work out the following giving your answer as a fraction in its simplest form
   a) \( \frac{\frac{2}{3} + \frac{1}{5}}{7} \)  
   b) \( \frac{\frac{3}{4} + \frac{1}{2}}{11} \)  
   c) \( \frac{\frac{4}{5} - \frac{1}{3}}{6} \)  
   d) \( \frac{\frac{7}{12} + \frac{3}{4}}{13} \)

6. Work out the following giving your answer as a fraction in its simplest form
   a) \( \frac{\frac{3}{4} - \frac{1}{5}}{11} \)  
   b) \( \frac{\frac{5}{13} + \frac{3}{11}}{8} \)  
   c) \( \frac{\frac{5}{2} - \frac{2}{3}}{5} \)  
   d) \( \frac{\frac{7}{12} + \frac{3}{4}}{13} \)

7. Ted received his pocket money on Friday.
   He spent \( \frac{3}{5} \) of his pocket money on games.
   He spent \( \frac{1}{10} \) of his pocket money on magazines.
   What fraction of his pocket money did he have left? \( \frac{3}{10} \)

8. Maisie buys a bag of flour.
   She uses \( \frac{1}{4} \) to bake a cake and \( \frac{2}{5} \) to make a loaf.
   a) What fraction of the bag of flour was used? \( \frac{13}{20} \)
   b) What fraction of the bag of flour is left? \( \frac{7}{20} \)

9. Work out the total length of this shape.
   Give your answer as a mixed number.
   \( 5 \frac{11}{12} \) inches

   \( \leftarrow 3 \frac{1}{2} \) inches \( \rightarrow 2 \frac{3}{4} \) inches
Work out the following giving your answer as a fraction in its simplest form.

1) \( \frac{4}{5} \times \frac{1}{3} = \frac{4}{15} \)

11) \( \frac{1}{3} \div \frac{5}{6} = \frac{2}{5} \)

2) \( \frac{3}{4} \times \frac{2}{3} = \frac{1}{2} \)

12) \( \frac{2}{7} \div \frac{10}{21} = \frac{3}{5} \)

3) \( \frac{3}{10} \times \frac{4}{9} = \frac{2}{15} \)

13) \( \frac{4}{5} \div 8 = \frac{1}{10} \)

4) \( \frac{3}{7} \times \frac{5}{6} = \frac{5}{14} \)

14) \( \frac{4}{11} \div \frac{1}{11} = 1 \)

5) \( \frac{6}{25} \times \frac{15}{18} = \frac{1}{5} \)

15) \( \frac{4}{5} \div \frac{8}{9} = \frac{9}{10} \)

6) \( \frac{4}{15} \times \frac{3}{16} = \frac{1}{20} \)

16) \( \frac{5}{8} \div \frac{10}{19} = \frac{13}{16} \)

7) \( 2\frac{2}{5} \times 3\frac{2}{3} = 9 \)

17) \( 1\frac{2}{3} \div 2\frac{1}{2} = \frac{2}{3} \)

8) \( 1\frac{2}{7} \times 3\frac{1}{10} = 5\frac{1}{2} \)

18) \( 3\frac{1}{5} \div 2\frac{2}{3} = 1 \frac{1}{5} \)

9) \( 4\frac{2}{3} \times \frac{5}{7} = 3\frac{1}{3} \)

19) \( 25 \div 2\frac{1}{7} = 11 \frac{2}{3} \)

10) \( \frac{3}{5} \times 12\frac{1}{2} = 7\frac{1}{2} \)

20) \( \frac{2}{3} \div 2\frac{2}{5} = \frac{3}{10} \)
Write the following fractions as decimals

1) \( \frac{3}{10} \) 0.3
2) \( \frac{7}{10} \) 0.7
3) \( \frac{9}{100} \) 0.09
4) \( \frac{1}{2} \) 0.5
5) \( \frac{3}{4} \) 0.75
6) \( \frac{2}{5} \) 0.4
7) \( \frac{7}{20} \) 0.35
8) \( \frac{1}{3} \) 0.3
9) \( \frac{1}{8} \) 0.125
10) \( \frac{5}{8} \) 0.625
Work out

1) \(6 \times 5 + 2 = 32\) \(\quad 30 + 2 = 32\)
2) \(2 + 6 \times 5 = 32\) \(\quad 2 + 30 = 32\)
3) \(35 - 4 \times 3 = 23\) \(\quad 35 - 12 = 23\)
4) \(48 \div (14 - 2) = 4\) \(\quad 48 \div 12 = 4\)
5) \(27 \div (3 + 6) = 3\) \(\quad 27 \div 9 = 3\)
6) \(27 \div 3 + 6 = 15\) \(\quad 9 + 6 = 15\)
7) \((9 + 2) \times 2 + 5 = 27\) \(\quad 11 \times 2 + 5 \quad , \quad 22 + 5 = 27\)
8) \(4 \times (1 + 4) - 6 = 14\) \(\quad 4 \times 5 - 6 \quad , \quad 20 - 6 = 14\)
9) \(6 \times 4 - 3 \times 5 = 9\) \(\quad 24 - 15 = 9\)

10) \(\frac{9 + 3}{4 + 2} = 2\) \(\quad \frac{12}{6} = 2\)

11) \(\frac{23 + 9}{7 - 3} = 8\) \(\quad \frac{32}{4} = 8\)

12) \(\frac{7 - 2^2}{4^2 - 15} = 3\) \(\quad \frac{7 - 4}{16 - 15} \quad , \quad \frac{3}{1} = 3\)

13) \(\frac{5^2 + 3}{2 \times 7} = 2\) \(\quad \frac{25 + 3}{14} \quad , \quad \frac{28}{14} = 2\)

14) \(\frac{5 \times 6 - 4}{13} = 2\) \(\quad \frac{30 - 4}{13} \quad , \quad \frac{26}{13} = 2\)

15) \(\frac{8 \times 2 - 4}{3 + 1^2} = 3\) \(\quad \frac{16 - 4}{3 + 1} \quad , \quad \frac{12}{4} = 3\)

16) \(\frac{12 - 3 \times 2}{14 \div 7} = 3\) \(\quad \frac{12 - 6}{2} \quad , \quad \frac{6}{2} = 3\)

17) \(\frac{20 - 3^2}{10 - (5 + 4)} = 11\) \(\quad \frac{20 - 9}{10 - 9} \quad , \quad \frac{11}{1} = 11\)

18) \(\frac{3 + 9 \times 8}{1 + 6 \times 4} = 3\) \(\quad \frac{3 + 72}{1 + 24} \quad , \quad \frac{75}{25} = 3\)
1. Work out
   a) $7 \times 4.3 = 30.1$
   b) $5 \times 3.16 = 15.8$
   c) $2.3 \times 1.2 = 2.76$
   d) $7.2 \times 42.5 = 306$
   e) $12.5 \times 0.59 = 7.375$
   f) $0.652 \times 0.37 = 0.24124$
   g) $5.62 \times 9 = 50.58$
   h) $26.7 \times 4.9 = 130.83$
   i) $1.56 \times 0.059 = 0.09204$

2. David buys 5 books for £8.75 each. How much does he pay? **£43.75**

3. A DVD costs £12.25. Work out the cost of 9 of these DVDs. **£110.25**

4. John takes 27 boxes out of his van. The weight of each box is 41.7 kg. Work out the total weight of the 27 boxes. **1125.9 kg**

5. Nina bought 43 teddy bears at £9.35 each. Work out the total amount she paid. **£402.05**

   He buys
   - 0.5 kg of pears at £0.84 per kg. **£0.42**
   - 2.5 kg of grapes at £1.89 per kg. **£4.73**
   - 6 kg of potatoes at £0.25 per kg. **£1.50**
   How much does he pay? **£6.65**

7. Brian hires a car for 3 days.
   Tariffs are:
   - £44.80 for the first day and **£44.80**
   - £37.50 for each extra day. **£37.50**
   - + **£37.50**
   How much does he pay? **£119.80**
1. Write the following ratios in their simplest form
   a) 6 : 9  b) 10 : 5  c) 7 : 21  d) 4 : 24
   \[ \frac{6}{9} = \frac{2}{3}, \frac{10}{5} = \frac{2}{1}, \frac{7}{21} = \frac{1}{3}, \frac{4}{24} = \frac{1}{6} \]
   e) 12 : 40  f) 18 : 27  g) 4 : 2 : 8  h) 18 : 63 : 9
   \[ \frac{12}{40} = \frac{3}{10}, \frac{18}{27} = \frac{2}{3}, \frac{4}{2} = 2 : 1, \frac{18}{63} = \frac{2}{7} : 1 \]

2. Complete the missing value in these equivalent ratios
   a) 3 : 5 = 12 : \[\boxed{20}\]  b) 4 : 9 = \[\boxed{12}\] : 27  c) \[\boxed{8}\] : 7 = 16 : 14  d) 2 : 3 = 3 : 4.5

3. Match together cards with equivalent ratios:
   
<table>
<thead>
<tr>
<th>3 : 4</th>
<th>10 : 5</th>
<th>50 : 100</th>
<th>2 : 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 : 2</td>
<td>15 : 20</td>
<td>15 : 6</td>
<td>1 : 2</td>
</tr>
</tbody>
</table>

4. The ratio of girls to boys in a class is 4 : 5.
   a) What fraction of the class are girls? \[\frac{4}{9}\]
   b) What fraction of the class are boys? \[\frac{5}{9}\]

5. A model of a plane is made using a scale of 1 : 5.
   a) If the real length of the plane is 20m, what is the length of the model in metres? \[4m\]
   b) If the wings of the model are 100cm long, what is the real length of the wings in metres? \[5m\]

6. Share out £250 in the following ratios:
   a) 1 : 4  b) 2 : 3  c) 7 : 3  d) 9 : 12 : 4
   \[\frac{£50}{£100} \text{ and } \frac{£200}{£150} \text{ and } \frac{£175}{£75} \text{ and } \frac{£90}{£120} \text{ and } £40\]

7. Share out £80 between Tom and Jerry in the ratio 3 : 2. Tom gets £48, Jerry gets £32
   \[3 + 2 = 5 \quad 80 \div 5 = 16 \quad 3 \times 16 = 48 \quad 2 \times 16 = 32\]

8. A box of chocolates has 3 milk chocolates for every 2 white chocolates.
   There are 60 chocolates in the box.
   Work out how many white chocolates are in the box. 24 white chocolates
   \[3 + 2 = 5 \quad 60 \div 5 = 12 \quad 2 \times 12 = 24\]

9. In a bracelet, the ratio of silver beads to gold beads is 5 : 2.
   The bracelet has 25 silver beads.
   How many gold beads are in the bracelet? 10 gold beads
   \[5 \times 5 = 25 \quad \frac{5}{2} \times 5\]

10. To make mortar you mix 1 shovel of cement with 5 shovels of sand.
    How much sand do you need to make 30 shovels of mortar? \[25 \text{ shovels of sand}\]
    \[1 + 5 = 6 \quad 30 \div 6 = 5 \quad 5 \times 5 = 25\]
1) Here are the ingredients for making a vegetable soup for 6 people:

| 2 carrots | 1 onion | 800ml stock | 50g lentils | 4g thyme |

Work out the amount of each ingredient for
a) 12 people: 4 carrots, 2 onions, 1600ml stock, 100g lentils, 8g thyme
b) 9 people: 2 onions, 1 ½ onions, 1200ml stock, 75g lentils, 6g thyme
c) 30 people: 10 carrots, 5 onions, 4000ml stock, 250g lentils, 20g thyme

2) Here are the ingredients for making apple crumble for 4 people:

| 80g plain flour | 60g ground almonds | 90g sugar | 60g butter | 4 apples |

Work out the amount of each ingredient for
a) 2 people: 40g plain flour, 30g ground almonds, 45g sugar, 30g butter, 2 apples
b) 6 people: 120g plain flour, 90g ground almonds, 135g sugar, 90g butter, 6 apples
c) 18 people: 360g plain flour, 270g ground almonds, 405g sugar, 270g butter, 18 apples

3) Here are the ingredients for making 1500 ml of parsnip soup:

| 450g parsnips | 300g leeks | 150g bramley apples | 3 onions | 1 ½ pints of chicken stock |

Work out the amount of each ingredient for
a) 500 ml of soup: 150g parsnips, 100g leeks, 50g bramley apples, 1 onion, ½ pint of chicken stock
b) 1000 ml of soup: 300g parsnips, 200g leeks, 100g bramley apples, 2 onions, 1 pint of chicken stock
c) 2500 ml of soup: 750g parsnips, 500g leeks, 250g bramley apples, 5 onions, 2 ½ pints of chicken stock
1) Find the value of the following:
   (write down all the figures on your calculator display)
   
   a) \((0.3 + 2.8)^2\)  \[9.61\]  
   b) \(2.7^2 + 3.9^2\)  \[22.5\]  
   c) \(4.5^2 - \sqrt{53}\)  \[12.96989011\]  
   d) \(6 \times \sqrt{(37 \div 4)}\)  \[18.24828759\]

2) Find the value of the following:
   (write your answers correct to 1 decimal place)
   
   a) \(2.1 + 6.53\)  \[8.6\]  
   b) \(87.4 \div (39 + 3)\)  \[2.2\]  
   c) \(23412 \div 3412\)  \[3.1\]  
   d) \(15^2 - 12^2 \div \sqrt{9.6 - 3.87}\)  \[33.8\]

3) Work out \(\sqrt{16.75 + 1.53^2}\)
   
   a) Write down all the figures on your calculator display.  \[6.433576386\]  
   b) Write your answer to part (a) correct to 1 decimal place.  \[6.4\]

4) Work out \((2.4 \times 1.9)^2 \times 2.03\)  \[42.211008\]
   Write down all the figures on your calculator display.

5) Use your calculator to work out the value of \(\frac{7.34 \times 4.71}{5.63 + 11.89}\)
   
   a) Write down all the figures on your calculator display.  \[1.973253425\]  
   b) Write your answer to part (a) to an appropriate degree of accuracy.  \[1.97 or 2.0\]
1) Lance goes on holiday to France.
The exchange rate is £1 = 1.40 Euros.
He changes £350 into Euros.
a) How many Euros should he get? €490  
\[ 350 \times 1.40 = 490 \]
In France, Lance buys a digital camera for 126 Euros.
b) Work out the cost of the camera in pounds.  £90  
\[ 126 \div 1.40 = 90 \]

2) Whilst on holiday in Spain, Gemma bought a pair of sunglasses for 77 Euros.
In England, an identical pair of sunglasses costs £59.99.
The exchange rate is £1 = 1.40 Euros.
In which country were the glasses the cheapest, and by how much?
Show all your working.  Spain, by £4.99  
\[ 77 \div 1.40 = 55 \]  \[ 59.99 - 55.00 = 4.99 \]

3) Luke buys a pair of trainers in Switzerland.
He can pay either 86 Swiss Francs or 56 Euros.
The exchange rates are:
£1 = 2.10 Swiss Francs
£1 = 1.40 Euros
Which currency should he choose to get the best price, and how much would he save?
Give your answer in pounds (£).  Euros, saving £0.95  
\[ 86 \div 2.10 = 40.95 \]  \[ 56 \div 1.40 = 40 \]

4) The total cost of 5 kg of potatoes and 2 kg of carrots is £4.88.
3 kg of potatoes cost £1.98.
Work out the cost of 1 kg of carrots.  £0.79  
\[ 1.98 \div 3 = 0.66 \]  \[ 5 \times 0.66 = 3.30 \]  \[ 4.88 - 3.30 = 1.58 \]  \[ 1.58 \div 2 = 0.79 \]

5) The cost of 4 kg of bananas is £5.80.
The total cost of 3 kg of bananas and 1.5 kg of pears is £5.61.
Work out the cost of 1 kg of pears.  £0.84  
\[ 5.80 \div 4 = 1.45 \]  \[ 3 \times 1.45 = 4.35 \]  \[ 5.61 - 4.35 = 1.26 \]  \[ 1.26 \div 1.5 = 0.84 \]
1. Write down the first 5 terms and the 10th term of the following sequences:

   eg. \(2n + 1\) \(3, 5, 7, 9, 11, \ldots, 21\)

   a) \(2n + 2\) \(4, 6, 8, 10, 12, \ldots, 22\)
   d) \(7n\) \(7, 14, 21, 28, 35, \ldots, 70\)

   b) \(3n + 1\) \(4, 7, 10, 13, 16, \ldots, 31\)
   e) \(3n - 1\) \(2, 5, 8, 11, 14, \ldots, 29\)

   c) \(n + 3\) \(4, 5, 6, 7, 8, \ldots, 13\)
   f) \(7n - 3\) \(4, 11, 18, 25, 32, \ldots, 67\)

2. Find the \(n^{th}\) term of the following sequences:

   a) \(5, 10, 15, 20, \ldots\) \(5n\)
   b) \(5, 8, 11, 14, \ldots\) \(3n + 2\)
   c) \(1, 8, 15, 22, \ldots\) \(7n - 6\)
   d) \(22, 18, 14, 10, \ldots\) \(-4n + 26\)
   e) \(-3, 3, 9, 15, \ldots\) \(6n - 9\)
   f) \(-4, -1, -6, -11, \ldots\) \(-5n + 9\)

3. Here are some patterns made from sticks.

   a) Draw pattern 4 in the space, below.

   b) How many sticks are used in

      (i) pattern 10 \(51\) sticks
      (ii) pattern 20 \(101\) sticks
      (iii) pattern 50 \(251\) sticks

   c) Find an expression, in terms of \(n\), for the number of sticks in pattern number \(n\). \(5n + 1\)

   d) Which pattern number can be made using 301 sticks? Pattern 60
1) Work out the value of $5x$ when
   a) $x = 2$ \quad 10 \quad b) $x = 6$ \quad 30 \quad c) $x = 10$ \quad 50

2) Work out the value of $3x$ when
   a) $x = -2$ \quad -6 \quad b) $x = 10$ \quad 30 \quad c) $x = -12$ \quad -36

3) Work out the value of $x^2$ when
   a) $x = 3$ \quad 9 \quad b) $x = -4$ \quad 16 \quad c) $x = -10$ \quad 100

4) Work out the value of $2x^2$ when
   a) $x = 5$ \quad 50 \quad b) $x = -4$ \quad 32 \quad c) $x = 10$ \quad 200

5) Work out the value of $3x + 5$ when
   a) $x = 2$ \quad 11 \quad b) $x = 6$ \quad 23 \quad c) $x = -1$ \quad 2

6) Work out the value of $4 + 2x$ when
   a) $x = 7$ \quad 18 \quad b) $x = -1$ \quad 2 \quad c) $x = -3$ \quad -2

7) Work out the value of $3x + 2y$ when
   a) $x = 1$ and $y = 2$ \quad 7 \quad b) $x = 4$ and $y = 3$ \quad 18 \quad c) $x = 5$ and $y = -4$ \quad 7

8) Work out the value of $6x - 3y$ when
   a) $x = 2$ and $y = 1$ \quad 9 \quad b) $x = 1$ and $y = -2$ \quad 12 \quad c) $x = -3$ and $y = 4$ \quad -30

9) Work out the value of $3x^2 + 4y$ when
   a) $x = 1$ and $y = 5$ \quad 23 \quad b) $x = -2$ and $y = 2$ \quad 20 \quad c) $x = 3$ and $y = -2$ \quad 19

10) Using the formula $P = H \times R$, where $P$ is the total pay, $H$ is the number of hours worked, and $R$ is the hourly rate of pay.
    Work out the total pay ($P$) of the following people:
    a) Betty worked 10 hours at £7 per hour \quad £70 \quad P = 10 \times 7
    b) John worked 15 hours and is paid £9 per hour \quad £135 \quad P = 15 \times 9
    c) Mike worked for 90 minutes at £16 an hour. \quad £24 \quad P = 1.5 \times 16

11) The equation of a straight line is given as $y = 3x + 2$
    a) Work out the value of $y$ when
       (i) $x = 0$ \quad $y = 2$ \quad $y = 3x + 2$
       (ii) $x = 1$ \quad $y = 5$ \quad $y = 3x + 2$
       (iii) $x = 2$ \quad $y = 8$ \quad $y = 3x + 2$

    b) What is the value of $x$ when $y = 17$? \quad $x = 5$ \quad $17 = 3x + 2$
       \quad $17 - 2 = 3x$ \quad $15 = 3x$ \quad $x = \frac{15}{3}$
1) Line PQ is parallel to line RS
   If angle PQR is equal to 36°
   a) What is the size of angle QRS? 36°
   b) Give a reason for your answer. **Alternate angles**

2) Line DCE is parallel to line AB
   a) Find the size of angle ABC 33°
   b) Find the size of angle DCA 68°
   c) Calculate the size of angle ACB 79°

3) a) Find the size of angle DBF 54°
    b) Find the size of angle HGC 136°
1) Work out the size of the angles marked with letters.

2) Work out the size of the angles marked with letters.

3) Work out the size of the angles marked with letters.
1) \(ABC\) is a triangle.
   a) Find the size of angle \(A\).
   \[180 - 60 - 60\]
   Angle \(A\) is \(60^\circ\)
   b) Triangle \(ABC\) is equilateral.
   Explain why.
   Triangle \(ABC\) is equilateral because all three angles are \(60^\circ\).

2) \(BCD\) is a triangle.
   \(ABC\) is a straight line.
   Angle \(CBD\) = \(70^\circ\).
   \(BD = CD\).
   a) (i) Work out the value of \(x\).
   \[180 - 70\]
   \(x = 110^\circ\)
   (ii) Give a reason for your answer.
   Angles on a straight line add up to \(180^\circ\).
   b) (i) Work out the value of \(y\).
   \[180 - 70 - 70\]
   \(y = 40^\circ\)
   (ii) Give reasons for your answer.
   Base angles of an isosceles triangle are equal.
   \(180^\circ\) in a triangle.

3) The diagram shows a 5-sided shape.
   All the sides of the shape are equal in length.
   a) (i) Find the value of \(x\).
   \[x = 60^\circ\]
   (ii) Give a reason for your answer.
   The triangle in the diagram is equilateral.
   b) (i) Work out the value of \(y\).
   \(y = 150^\circ\)
   (ii) Explain your answer.
   Angle \(y\) is made up of the angle in the square and the angle in the equilateral triangle. This is \(90^\circ + 60^\circ = 150^\circ\).
Angles of Regular Polygons

1)

a) Work out the size of an **exterior** angle of a regular hexagon. \(60^\circ\) \(360 \div 6\)

b) Work out the size of an **interior** angle of a regular hexagon. \(120^\circ\) \(180 - 60\)

2)

a) Name the regular polygon, above. \textbf{Decagon}

b) Work out the size of an **exterior** angle and of an **interior** angle for this polygon.

\[
\text{Exterior angle } = 36^\circ \quad \text{Interior angle } = 144^\circ
\]

\[
360 \div 10 \quad 180 - 36
\]

3) The size of each **exterior** angle of a regular polygon is 90°.

Work out the number of sides of the regular polygon. \textbf{4 sides} \(360 \div ? = 90\)

4) The size of each **exterior** angle of a regular polygon is 40°.

Work out the number of sides of the regular polygon. \textbf{9 sides} \(360 \div ? = 40\)

5) The size of each **interior** angle of a regular polygon is 120°.

Work out the number of sides of the regular polygon. \textbf{6 sides}

\[
\text{Interior angle } = 120, \quad \text{exterior angle } = 60, \quad 360 \div ? = 60
\]

6) The size of each **interior** angle of a regular polygon is 150°.

Work out the number of sides of the regular polygon. \textbf{12 sides}

\[
\text{Interior angle } = 150, \quad \text{exterior angle } = 30, \quad 360 \div ? = 30
\]
1) Find the areas of the following shapes.
   Take \( \pi \) to be 3.14
   
   a) \[ 3.14 \times 3^2 = 28.26 \text{ cm}^2 \]
   b) \[ 3.14 \times 5^2 = 78.5 \text{ m}^2 \]
   c) \[ 3.14 \times 4^2 = 50.24 \text{ cm}^2 \]

2) Work out the areas of the following shapes.
   
   a) \( 3.14 \times 6^2 = 113.04 \) \( 113.04 \div 2 = 56.52 \text{ mm}^2 \)
   b) \[ 3.14 \times 10^2 = 314 \] \( 314 \div 4 = 78.5 \text{ cm}^2 \]

3) The diagram shows a circular garden comprising a rectangular pond enclosed by grass.
   The circular garden has a diameter of 10 m.
   The rectangular pond measures 8 m by 6 m.

   Work out the area of the garden covered in grass.
   Take \( \pi \) to be 3.14 and give your answer to the nearest m\(^2\).

   Circular garden area: \( 3.14 \times 5^2 = 78.5 \)  
   Rectangular pond area: \( 8 \times 6 = 48 \)  
   \[ 78.5 - 48 = 30.5 \text{ m}^2 \]

4) The radius of the top of a circular table is 60 cm.
   The table also has a circular base with diameter 30 cm.
   
   a) Work out the area of the top of the table.
      \[ 3.14 \times 60^2 = 11304 \text{ cm}^2 \]
   b) Work out the area of the base of the table.
      \[ 3.14 \times 15^2 = 706.5 \text{ cm}^2 \]

5) The diagram shows a shape, made from a semi-circle and a rectangle.
   The diameter of the semi-circle is 13 cm.
   The length of the rectangle is 17 cm.

   Calculate the area of the shape.
   Give your answer correct to 3 significant figures.
   \[ 287 \text{ cm}^2 \]
   \[ 221 + 66.3325 = 287.3325 \]
1) Find the circumference of the following shapes. Take $\pi$ to be 3.14.

- a) $C = 2 \times 3.14 \times 3$ 
  \[ C = 18.84 \text{ cm} \]

- b) $C = 2 \times 3.14 \times 5$ 
  \[ C = 31.4 \text{ m} \]

- c) $C = 2 \times 3.14 \times 4$ 
  \[ C = 25.12 \text{ cm} \]

2) Work out the perimeter of the following shapes, taking $\pi$ to be 3.14.

- a) Perimeter is green length plus 12 mm. 
  \[ P = 30.84 \text{ mm} \]

- b) Perimeter is green length plus 10 cm + 10 cm 
  \[ P = 35.7 \text{ cm} \]

3) The radius of the top of a circular table is 60 cm. The table also has a circular base with diameter 30 cm.

- a) Work out the circumference of the top of the table. Let $\pi$ be 3.14 
  \[ C = 2 \times 3.14 \times 60 \]
  \[ C = 376.8 \text{ cm} \]

- b) Work out the circumference of the base of the table. Let $\pi$ be 3.14 
  \[ C = 2 \times 3.14 \times 15 \]
  \[ C = 94.2 \text{ cm} \]

4) The diameter of a wheel on Kyle’s bicycle is 0.75 m. 

- a) Calculate the circumference of the wheel. 
  \[ C = 2 \times 3.14 \times 0.375 \]
  \[ C = 2.36 \text{ m} \]

Kyle cycles 2000 metres.

- b) Using your answer in (a), calculate the number of complete turns the wheel makes. 
  \[ \text{Turns} = 2000 \div 2.36 \]
  \[ 847 \text{ complete turns} \]

5) The diagram shows a shape, made from a semi-circle and a rectangle. 

The diameter of the semi-circle is 12 cm. The length of the rectangle is 15 cm.

Calculate the perimeter of the shape. Give your answer correct to 3 significant figures. 
\[ P = 60.8 \text{ cm} \]
1) Find the area of each shape.

a) \[ \text{Area} = 82 \text{ cm}^2 \]

b) \[ \text{Area} = 525 \text{ cm}^2 \]

c) \[ \text{Area} = 72 \text{ m}^2 \]

d) \[ \text{Area} = 24 \text{ mm}^2 \]

2) Find the shaded area of each shape.

a) \[ \text{Area} = 54 \text{ cm}^2 \] \[ \text{(60 - 6)} \]

b) \[ \text{Area} = 56 \text{ cm}^2 \] \[ \text{(84 - 28)} \]

c) \[ \text{Area} = 48 \text{ mm}^2 \] \[ \text{(60 - 4 - 8)} \]

d) \[ \text{Area} = 66 \text{ m}^2 \] \[ \text{(132 - 66)} \]
1) a) Rotate triangle T 90°
   anti-clockwise about the point (0, 0).
   Label your new triangle U

   b) Rotate triangle T 180°
   about the point (2, 0).
   Label your new triangle V

2) Describe fully the single transformation which maps
   triangle T to triangle U.
   Rotation,
   90° clockwise,
   centre of rotation (-1, -1)
1) a) Reflect triangle T in the x axis. Label your new triangle U.

b) Reflect triangle T in the line with equation $y = -x$. Label your new triangle V.

2) a) Describe fully the single transformation which maps triangle T to triangle U. 
   **Reflection in the x axis.**

b) Describe fully the single transformation which maps triangle T to triangle V. 
   **Reflection in the y = x line.**
1) a) Enlarge triangle T by scale factor 2 using point (-5, 2) as the centre of enlargement. Label your new triangle U.

b) Enlarge triangle V by scale factor a half using the point (-2, -3) as the centre of enlargement. Label your new triangle W.

2) Describe fully the single transformation which maps triangle S to triangle T

*Enlargement, scale factor 3, centre of enlargement (0, 3).*
1) a) Translate triangle T by vector $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$ and label it U

b) Translate triangle T by vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ and label it V

2) a) Describe fully the single transformation which maps triangle A to triangle B.

b) Describe fully the single transformation which maps triangle A to triangle C.
1) Find the midpoint of A and B where A has coordinates (-2, 5) and B has coordinates (4, -1). **Midpoint at (1, 2)**

2) Find the midpoint of A and B where A has coordinates (2, 0) and B has coordinates (8, 6). **Midpoint at (5, 3)**

3) Find the midpoint of A and B where A has coordinates (-4, -2) and B has coordinates (2, 4). **Midpoint at (-1, 1)**

4) Find the midpoint of A and B where A has coordinates (-3, -2) and B has coordinates (7, 5). **Midpoint at (2, 1.5)**

5) Find the midpoint of A and B where A has coordinates (2, -5) and B has coordinates (7, 4). **Midpoint at (4.5, -0.5)**

6) Find the midpoint of A and B where A has coordinates (-7, -4) and B has coordinates (-2, -1). **Midpoint at (-4.5, -2.5)**

7) The midpoint of A and B is at (1, 3). The coordinates of A are (-2, 4). Work out the coordinates of B. (4, 2)

8) The midpoint of A and B is at (3.5, 2.5). The coordinates of A are (2, 5). Work out the coordinates of B. (5, 0)
1) Measure the following angles:

- \( \angle ABC = 60^\circ \)
- \( \angle PQR = 127^\circ \)
- \( \angle XYZ = 275^\circ \)

2) Draw the following angles:

- a) \( \angle ABC = 60^\circ \)
- b) \( \angle PQR = 127^\circ \)
- c) \( \angle XYZ = 275^\circ \)
1) The diagram shows the sketch of triangle ABC.

![Triangle ABC](image)

a) Make an accurate drawing of triangle ABC.

b) Measure the size of angle A on your diagram.  \( \text{Angle } A = 59^\circ \)

2) Use ruler and compasses to **construct** an equilateral triangle with sides of length 6 centimetres.

3) The diagram shows the sketch of triangle PQR.

![Triangle PQR](image)

\( \text{Angle } P = 43^\circ \)
The diagram shows a prism drawn on an isometric grid.

a) On the grid below, draw the front elevation of the prism from the direction marked by the arrow.

b) On the grid below draw a plan of the prism.
1) Sketch nets of these solids.

a) 

b) 

2) 

3) The two nets, below, are folded to make cubes. Two other vertices will meet at the dot, A. Mark them with As. One other vertex will meet at the dot B. Mark it with B.
1) Draw all the lines of symmetry on the triangle and the rectangle.

![Triangle and Rectangle with Lines of Symmetry](image)

2) What is the order of rotational symmetry of the two shapes below.

![Rotational Symmetry](image)

Rotational symmetry order 5  Rotational symmetry order 2

3) The diagram below shows part of a shape.

![Part of a Shape](image)

The shape has rotational symmetry of order 4 about point P. Complete the shape.

4) On each of the shapes below, draw one plane of symmetry.

![Shapes with Plane of Symmetry](image)

There are other answers for these two questions.
1) Claire wants to find how much time pupils spend on their homework. She hands out a questionnaire with the question

*How much time do you spend on your homework?*

- A lot □
- Not much □

a) Write down two things that are wrong with this question

No mention of time. Does it mean ‘per night’, ‘per week’, etc.

‘A lot’ and ‘Not much’ are not specific enough. They mean different things to different people.

b) Design a suitable question she could use.

You should include response boxes.

*How much time do you spend on homework per night?*

- Less than 15 mins □
- Between 15 and 30 mins □
- More than 30 mins □

2) Tony wants to know which type of programme pupils in his class like watching on TV. Design a suitable data collection sheet he could use to gather the information.

<table>
<thead>
<tr>
<th>Type of programme</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soap opera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reality TV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Films</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Situation comedy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documentary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) Emma asked 20 people what was their favourite pet. Here are their answers.

<table>
<thead>
<tr>
<th>cat</th>
<th>cat</th>
<th>hamster</th>
<th>cat</th>
</tr>
</thead>
<tbody>
<tr>
<td>mouse</td>
<td>hamster</td>
<td>cat</td>
<td>dog</td>
</tr>
<tr>
<td>dog</td>
<td>dog</td>
<td>snake</td>
<td>hamster</td>
</tr>
<tr>
<td>cat</td>
<td>cat</td>
<td>hamster</td>
<td>dog</td>
</tr>
<tr>
<td>cat</td>
<td>hamster</td>
<td>snake</td>
<td>cat</td>
</tr>
</tbody>
</table>

Design and complete a suitable data collection sheet that Emma could have used to collect and show this information.

<table>
<thead>
<tr>
<th>Favourite pet</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat</td>
<td>HHHI</td>
<td>8</td>
</tr>
<tr>
<td>Hamster</td>
<td>HHI</td>
<td>5</td>
</tr>
<tr>
<td>Mouse</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>Dog</td>
<td>IIII</td>
<td>4</td>
</tr>
<tr>
<td>Snake</td>
<td>IIII</td>
<td>2</td>
</tr>
</tbody>
</table>
1. Billy has been carrying out a survey. He asked 100 people the type of water they like to drink (still, sparkling or both). Here are part of his results:

<table>
<thead>
<tr>
<th></th>
<th>Still</th>
<th>Sparkling</th>
<th>Both</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>26</td>
<td>21</td>
<td>6</td>
<td>53</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>20</td>
<td>10</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>41</td>
<td>16</td>
<td>100</td>
</tr>
</tbody>
</table>

a) Complete the two-way table.

b) How many males were in the survey? 53

c) How many females drink only still water? 17

d) How many people drink only sparkling water? 41

2. 90 students each study one of three languages. The two-way table shows some information about these students.

<table>
<thead>
<tr>
<th></th>
<th>French</th>
<th>German</th>
<th>Spanish</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>6</td>
<td>11</td>
<td>23</td>
<td>40</td>
</tr>
<tr>
<td>Male</td>
<td>14</td>
<td>7</td>
<td>29</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>18</td>
<td>52</td>
<td>90</td>
</tr>
</tbody>
</table>

50 of the 90 students are male.
29 of the 50 male students study Spanish.

a) Complete the two-way table.

b) How many females study French? 6

c) How many people study Spanish? 52
1) Patrick asked some of his colleagues which was their favourite holiday destination. The table shows the results.

<table>
<thead>
<tr>
<th>City</th>
<th>Frequency</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alicante</td>
<td>8 × 9</td>
<td>72°</td>
</tr>
<tr>
<td>Paris</td>
<td>7 × 9</td>
<td>63°</td>
</tr>
<tr>
<td>Ibiza</td>
<td>15 × 9</td>
<td>135°</td>
</tr>
<tr>
<td>St Lucia</td>
<td>1 × 9</td>
<td>9°</td>
</tr>
<tr>
<td>Biarritz</td>
<td>9 × 9</td>
<td>81°</td>
</tr>
</tbody>
</table>

Draw a pie chart to illustrate the information.

\[ 360 \div ? \]
\[ 360 \div 40 = 9 \]

2) Brian asked 60 people which region their favourite rugby team came from. The table shows the results.

<table>
<thead>
<tr>
<th>Region</th>
<th>Frequency</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern England</td>
<td>9 × 6</td>
<td>54°</td>
</tr>
<tr>
<td>London</td>
<td>23 × 6</td>
<td>138°</td>
</tr>
<tr>
<td>Midlands</td>
<td>16 × 6</td>
<td>96°</td>
</tr>
<tr>
<td>Northern England</td>
<td>12 × 6</td>
<td>72°</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>360°</td>
</tr>
</tbody>
</table>

Draw a pie chart to illustrate the information.

\[ 360 \div ? \]
\[ 360 \div 60 = 6 \]

3) Sophie represents her monthly expenses using a pie chart.

Numbers from her table have been rubbed out by mistake. Use the pie chart to complete the table.

<table>
<thead>
<tr>
<th></th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothes</td>
<td>£35</td>
</tr>
<tr>
<td>Eating out</td>
<td>£73</td>
</tr>
<tr>
<td>Make up</td>
<td>£17</td>
</tr>
<tr>
<td>Magazines</td>
<td>£20</td>
</tr>
<tr>
<td>Books</td>
<td>£35</td>
</tr>
<tr>
<td>Total</td>
<td>£180</td>
</tr>
</tbody>
</table>

\[ 360 \div ? \]
\[ 360 \div 9 = 70° \]
\[ 360 \div 6 = 146° \]
\[ 360 \div 6 = 34° \]
\[ 360 \div 6 = 40° \]
\[ 360 \div 6 = 70° \]
1) The scatter graph shows some information about the marks of six students. It shows each student’s marks in Maths and Science.

The table below shows the marks for four more students.

<table>
<thead>
<tr>
<th>Maths</th>
<th>22</th>
<th>8</th>
<th>17</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>30</td>
<td>12</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

a) On the scatter graph, plot the information from the table.
b) Draw a line of best fit.
c) Describe the correlation between the marks in Maths and the marks in Science. **There is a positive correlation**

Another student has a mark of 18 in Science.
d) Use the line of best fit to estimate the mark in Maths of this student. **My answer is 14. Yours will depend on your line of best fit.**

2) The table below shows the average daily number of hours sleep of 10 children.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>4</th>
<th>2</th>
<th>5</th>
<th>1</th>
<th>9</th>
<th>6</th>
<th>8</th>
<th>7</th>
<th>10</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hours sleep</td>
<td>14</td>
<td>13</td>
<td>12.5</td>
<td>15</td>
<td>10</td>
<td>12.5</td>
<td>10.8</td>
<td>12</td>
<td>11</td>
<td>14</td>
</tr>
</tbody>
</table>

The first five results have been plotted on the scatter diagram.

a) Plot the next five points.
b) Draw a line of best fit.
c) Describe the relationship between the age of the children and their number of hours sleep per day. **A negative correlation.**
d) Use your scatter graph to estimate the number of hours sleep for a 3 year old child. **My answer is 13.6 Yours will depend on your line of best fit.**
A class of pupils is asked to solve a puzzle. The frequency table below shows the times taken by the pupils to solve the puzzle.

<table>
<thead>
<tr>
<th>Time ($t$) in min</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 &lt; t \leq 5$</td>
<td>3</td>
</tr>
<tr>
<td>$5 &lt; t \leq 10$</td>
<td>4</td>
</tr>
<tr>
<td>$10 &lt; t \leq 15$</td>
<td>5</td>
</tr>
<tr>
<td>$15 &lt; t \leq 20$</td>
<td>7</td>
</tr>
<tr>
<td>$20 &lt; t \leq 25$</td>
<td>5</td>
</tr>
</tbody>
</table>

a) Draw a frequency diagram to show this information.

b) Draw a frequency polygon to show this information.

It is OK to use a different scale.
1) 16 students sat a Maths test.  
Here are their marks:

```
64  72  39  45  49  67  73  50  
73  44  55  77  51  62  64  79
```

```
39, 44, 45, 49, 50, 51, 55, 62, 64, 67, 72, 73, 73, 77, 79
```

Draw a stem and leaf diagram to show this information.

```
<table>
<thead>
<tr>
<th>3</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

Key: 3|9 means 39 marks

2) Pat is carrying out a survey on how tall pupils in her class are.  
Here are their heights in cm:

```
173  162  170  169  163  173  156  
159  161  168  177  182  170  169
```

```
156, 159, 161, 162, 163, 168, 169, 169, 170, 170, 173, 173, 177, 182
```

Draw a stem and leaf diagram to show this information.

```
<table>
<thead>
<tr>
<th>15</th>
<th>6</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Key: 1|6 means 156 cm

3) The stem and leaf diagram below, shows information about the times, in minutes,  
it takes a group of people to eat their breakfast.

```
<table>
<thead>
<tr>
<th>0</th>
<th>5</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
```

Key: 1|0 represents 10 minutes.

a) How many people are in the group?  **15 people**

b) How many people spend 15 minutes or more eating their breakfast?  **10 people**

c) Find the median time that it took to eat breakfast.  **18 minutes**
1) Three coins are flipped.
   a) How many possible outcomes are there?  
      8 possible outcomes (2 x 2 x 2)
   b) List all the possible outcomes.
      HHH, HHT, HTH, HTT, TTH, THT, THH, TTT.

2) Two coins are flipped and a dice is rolled.
   a) How many possible outcomes are there?  
      24 possible outcomes (2 x 2 x 6)
   b) List all the possible outcomes.
      HH1, HH2, HH3, HH4, HH5, HH6, HT1, HT2, HT3, HT4, HT5, HT6, TH1, TH2, TH3, TH4, TH5, TH6, TT1, TT2, TT3, TT4, TT5, TT6.

1) If the probability of passing a driving test is 0.54, what is the probability of failing it?
   1 - 0.54 = 0.46

2) The probability that a football team will win their next game is \( \frac{2}{11} \).
The probability they will lose is \( \frac{3}{11} \).
What is the probability the game will be a draw?
   \( \frac{6}{11} \)
   \( \frac{1 - \frac{5}{11}}{11} = \frac{6}{11} \)

3) On the school dinner menu there is only ever one of four options.
Some of the options are more likely to be on the menu than others.
The table shows the options available on any day, together with three of the probabilities.

<table>
<thead>
<tr>
<th>Food</th>
<th>Curry</th>
<th>Sausages</th>
<th>Fish</th>
<th>Casserole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.36</td>
<td>0.41</td>
<td>0.09</td>
<td></td>
</tr>
</tbody>
</table>

   1 - 0.36 - 0.41 - 0.09 = 0.14
   a) Work out the probability of the dinner option being Fish.
      Sausages
   b) Which option is most likely?  
      0.36 + 0.41 = 0.77
   c) Work out the probability that it is a Curry or Sausages on any particular day.
      1 - 0.09 = 0.91
   d) Work out the probability that it is not Casserole.

4) Julie buys a book every week.
Her favourite types are Novel, Drama, Biography and Romance.
The table shows the probability that Julie chooses a particular type of book.

<table>
<thead>
<tr>
<th>Type of book</th>
<th>Novel</th>
<th>Drama</th>
<th>Biography</th>
<th>Romance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.24</td>
<td>0.16</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

   0.24 + 0.16 = 0.4
   a) Work out the probability that she will choose a Novel or a Drama.
   b) Work out the probability that she will choose a Biography or a Romance.
      1 - 0.4 = 0.6
   c) Work out the probability that she will choose a Biography.
      0.6 ÷ 2 = 0.3
Overview of Percentages

1) Find the following to the nearest penny:
   a) 23% of £670 = £154.10
   b) 12% of £580 = £69.60
   c) 48% of £64 = £30.72
   d) 13% of £7.50 = £0.98
   e) 87% of £44 = £38.28
   f) 15.7% of £7000 = £1099
   g) 23.8% of £980 = £233.24
   h) 34% of £16.34 = £5.56
   i) 48.6% of £971.26 = £472.03
   j) 78.24% of £12.82 = £10.03
   k) 42.15% of £7876.42 = £3319.91
   l) 0.57% of £60000 = £342

2) Find the following:
   a) 10% of £700 = £70
   b) 10% of £400 = £40
   c) 10% of £350 = £35
   d) 10% of £530 = £53
   e) 10% of £68 = £6.80
   f) 10% of £46 = £4.60
   g) 10% of £6.50 = £0.65
   h) 10% of £12.20 = £1.22
   i) 20% of £600 = £120
   j) 30% of £900 = £270
   k) 60% of £800 = £480
   l) 20% of £650 = £130
   m) 40% of £320 = £128
   n) 15% of £300 = £45
   o) 15% of £360 = £54
   p) 65% of £12000 = £7800
   q) 45% of £64 = £28.80
   r) 85% of £96 = £81.60
   s) 17.5% of £800 = £140
   t) 17.5% of £40 = £7
   u) 17.5% of £8.80 = £1.54

3) Change the following to percentages:
   a) 6 out of 28 = 21.4%
   b) 18 out of 37 = 48.6%
   c) 42 out of 83 = 50.6%
   d) 24 out of 96 = 25%
   e) 73 out of 403 = 18.1%
   f) 234 out of 659 = 35.5%
   g) 871 out of 903 = 96.5%
   h) 4.7 out of 23 = 20.4%
   i) 6.9 out of 79 = 8.7%
   j) 14.8 out of 23.6 = 62.7%
   k) 65.8 out of 203.7 = 32.3%
   l) 12 out of 2314 = 0.5%

4) Change the following to percentages:
   a) 46 out of 100 = 46%
   b) 18 out of 50 = 36%
   c) 7 out of 25 = 28%
   d) 23 out of 25 = 92%
   e) 9 out of 20 = 45%
   f) 16 out of 20 = 80%
   g) 7 out of 10 = 70%
   h) 9.5 out of 10 = 95%
   i) 10 out of 40 = 25%
   j) 16 out of 40 = 40%
   k) 30 out of 40 = 75%
   l) 12 out of 40 = 30%
   m) 28 out of 80 = 35%
   n) 32 out of 80 = 40%
   o) 60 out of 80 = 75%
   p) 3 out of 5 = 60%
   q) 4 out of 5 = 80%
   r) 15 out of 75 = 20%
   s) 24 out of 75 = 32%
   t) 30 out of 75 = 40%

5) A shop gives a discount of 20% on a magazine that usually sells for £2.80. Work out the discount in pence. 56p

6) A television costs £595 plus VAT at 17.5%. Work out the cost of the television including VAT. £699.13

7) Peter has 128 trees in his garden. 16 of the trees are pear trees. What percentage of the trees in his garden are pear trees? 12.5%

8) A battery operated car travels for 10m when it is first turned on. Each time it is turned on it travels 90% of the previous distance as the battery starts to run out. How many times does the car travel at least 8 metres? 3

9) Jane scored 27 out of 42 in a Maths test and 39 out of 61 in a Science test. What were her percentages in both subjects to 1 decimal place? Maths 64.3% Sci 63.9%

10) In class 7A there are 7 girls and 18 boys. What percentage of the class are girls? 28%

11) A shop decides to reduce all the prices by 15%. The original price of a pair of trainers was £70. How much are they after the reduction? £59.50

12) VAT at 17.5% is added to the price of a car. Before the VAT is added it cost £18000. How much does it cost with the VAT? £21150
## Increase/Decrease by a Percentage

### 1) Increase:
- a) 500 by 10% \(500 + 50 = 550\)
- b) 320 by 10% \(320 + 32 = 352\)
- c) 80 by 15% \(80 + 12 = 92\)
- d) 75 by 20% \(75 + 15 = 90\)

### 2) Decrease:
- a) 400 by 10% \(400 - 40 = 360\)
- b) 380 by 10% \(380 - 38 = 342\)
- c) 140 by 15% \(140 - 21 = 119\)
- d) 35 by 20% \(35 - 7 = 28\)

### 3) The price of the laptop is increased by 15%.
The old price of the laptop was £300.
Work out the new price. \(300 + 30 + 15 = £345\)

### 4) The price of a £6800 car is reduced by 10%.
What is the new price? \(6800 - 680 = £6120\)

### 5) Increase:
- a) 65 by 12% \(65 + \frac{7.8}{100} \times 65 = 72.8\)
- b) 120 by 23% \(120 + \frac{27.6}{100} \times 120 = 147.6\)
- c) 600 by 17.5% \(600 + \frac{107.5}{100} \times 600 = 705\)
- d) 370 by 17.5% \(370 + \frac{64.75}{100} \times 370 = 434.75\)

### 6) Decrease:
- a) 42 by 15% \(42 - \frac{6.3}{100} \times 42 = 35.7\)
- b) 79 by 12% \(79 - \frac{9.48}{100} \times 79 = 69.52\)
- c) 52 by 8.5% \(52 - \frac{4.42}{100} \times 52 = 47.58\)
- d) 8900 by 18% \(8900 - \frac{1602}{100} \times 8900 = 7298\)

### 7) The price of a mobile phone is £78.40 plus VAT.
VAT is charged at a rate of 17.5%.
What is the total price of the mobile phone? \(£92.12\)

### 8) In a sale, normal prices are reduced by 7%.
The normal price of a camera is £89.
Work out the sale price of the camera. \(£82.77\)

### 9) A car dealer offers a discount of 20% off the normal price of a car, for cash.
Peter intends to buy a car which usually costs £6800.
He intends to pay by cash.
Work out how much he will pay. \(£5440\)

### 10) A month ago, John weighed 97.5 kg.
He now weighs 4.5% more.
Work out how much John now weighs. \(101.9\) kg
Give your answer to 1 decimal place.
1. Write the following ratios in their simplest form
   a) 6 : 9 = 2 : 3
   b) 10 : 5 = 2 : 1
   c) 7 : 21 = 1 : 3
   d) 4 : 24 = 1 : 6
   e) 12 : 40 = 3 : 10
   f) 18 : 27 = 2 : 3
   g) 4 : 2 = 2 : 1 : 4
   h) 18 : 63 : 9 = 2 : 7 : 1

2. Complete the missing value in these equivalent ratios
   a) 3 : 5 = 12 : 20
   b) 4 : 9 = 8 : 27
   c) 8 : 7 = 16 : 14
   d) 2 : 3 = 3 : 4.5

3. Match together cards with equivalent ratios:
   - 3 : 4
   - 10 : 5
   - 50 : 100
   - 2 : 1
   - 5 : 2
   - 15 : 20
   - 15 : 6
   - 1 : 2

4. The ratio of girls to boys in a class is 4 : 5.
   a) What fraction of the class are girls? \(\frac{4}{9}\)
   b) What fraction of the class are boys? \(\frac{5}{9}\)

5. A model of a plane is made using a scale of 1 : 5.
   a) If the real length of the plane is 20m, what is the length of the model in metres? 4m
   b) If the wings of the model are 100cm long, what is the real length of the wings in metres? 5m

6. Share out £250 in the following ratios:
   a) 1 : 4
   b) 2 : 3
   c) 7 : 3
   d) 9 : 12 : 4

   - £50 and £200
   - £100 and £150
   - £175 and £75
   - £90 and £120 and £40

7. Share out £80 between Tom and Jerry in the ratio 3 : 2. Tom gets £48, Jerry gets £32

8. A box of chocolates has 3 milk chocolates for every 2 white chocolates.
   There are 60 chocolates in the box.
   Work out how many white chocolates are in the box. 24 white chocolates

9. In a bracelet, the ratio of silver beads to gold beads is 5 : 2.
   The bracelet has 25 silver beads.
   How many gold beads are in the bracelet? 10 gold beads

10. To make mortar you mix 1 shovel of cement with 5 shovels of sand.
    How much sand do you need to make 30 shovels of mortar? 25 shovels of sand
1) List the first seven prime numbers.

   2, 3, 5, 7, 11, 13, 17

2) Express the following number as the product of their prime factors:

   a) 30  
   \[2 \times 3 \times 5\]
   b) 60  
   \[2 \times 2 \times 3 \times 5\]
   c) 360 
   \[2 \times 2 \times 2 \times 3 \times 3 \times 5\]
   d) 220 
   \[2 \times 2 \times 5 \times 11\]

3) Express the following number as the product of powers of their prime factors:

   a) 24  
   \[2^3 \times 3\]
   b) 64  
   \[2^6\]
   c) 192 
   \[2^6 \times 3\]
   d) 175 
   \[5^2 \times 7\]

4) The number 96 can be written as \(2^m \times n\), where \(m\) and \(n\) are prime numbers.

   Find the value of \(m\) and the value of \(n\).

   \[
   96 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \quad \text{\(m = 5\)}
   \]

5) The number 75 can be written as \(5^x \times y\), where \(x\) and \(y\) are prime numbers.

   Find the value of \(x\) and the value of \(y\).

   \[
   75 = 3 \times 5 \times 5 \quad \text{\(x = 2\)}
   \]

HCF and LCM

1) Find the Highest Common Factor (HCF) of each of these pairs of numbers.

   a) 16 and 24  8
   \[16 = 2 \times 2 \times 2 \times 2\]
   \[24 = 2 \times 2 \times 2 \times 3\]

   b) 21 and 28  7
   \[21 = 3 \times 7\]
   \[28 = 2 \times 2 \times 7\]

   c) 60 and 150 30
   \[60 = 2 \times 2 \times 3 \times 5\]
   \[150 = 2 \times 3 \times 5 \times 5\]

   d) 96 and 108 12
   \[96 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3\]
   \[108 = 2 \times 2 \times 3 \times 3 \times 3\]

2) Find the Least (or Lowest) Common Multiple (LCM) of each of these pairs of numbers.

   a) 16 and 24  48
   \[48 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3\]

   b) 21 and 28  84
   \[84 = 2 \times 2 \times 3 \times 3 \times 7\]

   c) 60 and 150 300
   \[300 = 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5\]

   d) 96 and 108 864
   \[864 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3\]

3) a) Write 42 and 63 as products of their prime factors.

   \[
   42 = 2 \times 3 \times 7\]
   \[
   63 = 3 \times 3 \times 7\]

   b) Work out the HCF of 42 and 63.

   \[
   21
   \]

   c) Work out the LCM of 42 and 63.

   \[
   126
   \]

4) a) Write 240 and 1500 as products of their prime factors.

   \[
   240 = 2 \times 2 \times 2 \times 2 \times 3 \times 5\]
   \[
   1500 = 2 \times 2 \times 3 \times 5 \times 5 \times 5\]

   b) Work out the HCF of 240 and 1500.

   \[
   60
   \]

   c) Work out the LCM of 240 and 1500.

   \[
   6000
   \]
1) Change the following to normal (or ordinary) numbers.
   a) $4.3 \times 10^4$  
      $43\,000$
   b) $6.79 \times 10^6$  
      $6\,790\,000$
   c) $7.03 \times 10^3$  
      $7\,030$
   d) $9.2034 \times 10^2$  
      $920.34$
   e) $1.01 \times 10^4$  
      $10\,100$
   f) $4 \times 10^5$  
      $400\,000$

2) Change the following to normal (or ordinary) numbers.
   a) $4.3 \times 10^{-4}$  
      $0.00043$
   b) $6.79 \times 10^{-6}$  
      $0.00000679$
   c) $7.03 \times 10^{-3}$  
      $0.00703$
   d) $9.2034 \times 10^{-2}$  
      $0.092034$
   e) $1.01 \times 10^{-4}$  
      $0.000101$
   f) $4 \times 10^{-5}$  
      $0.00004$

3) Change the following to standard form.
   a) $360$  
      $3.6 \times 10^2$
   b) $8\,900$  
      $8.9 \times 10^3$
   c) $520\,000$  
      $5.2 \times 10^5$
   d) $62\,835$  
      $6.2835 \times 10^4$
   e) $1\,003$  
      $1.003 \times 10^3$
   f) $6\,450\,000$  
      $6.45 \times 10^6$

4) Change the following to standard form.
   a) $0.71$  
      $7.1 \times 10^{-1}$
   b) $0.0008$  
      $8 \times 10^{-4}$
   c) $0.00076$  
      $7.6 \times 10^{-4}$
   d) $0.0928$  
      $9.28 \times 10^{-2}$
   e) $0.00009$  
      $9 \times 10^{-5}$
   f) $0.00000173$  
      $1.73 \times 10^{-6}$

5) Work out the following, giving your answer in standard form.
   a) $3\,000 \times 5\,000$  
      $15\,000\,000$  
      $1.5 \times 10^7$
   b) $240 \times 0.0002$  
      $0.048$  
      $4.8 \times 10^{-2}$
   c) $9 \times 1.1 \times 10^7$  
      $9.9 \times 10^7$
   d) $5 \times 4 \times 10^3$  
      $20 \times 10^3$  
      $2 \times 10^4$
   e) $\frac{8 \times 10^4}{4 \times 10^2}$  
      $2 \times 10^2$
   f) $9 \times 10^2 \times 2 \times 10^5$  
      $18 \times 10^3$  
      $1.8 \times 10^2$
   g) $7 \times 10^2 \times 3 \times 10^{-4}$  
      $2.1 \times 10^{-1}$  
      $21 \times 10^{-2}$
   h) $2 \times 3.6 \times 10^{-5}$  
      $7.2 \times 10^{-5}$
   i) $6 \times 4.1 \times 10^3$  
      $24.6 \times 10^3$  
      $2.46 \times 10^4$
1) Write each recurring decimal as an exact fraction, in its lowest terms.

a) $0.\overline{5} = \frac{5}{9}$

b) $0.\overline{7} = \frac{7}{9}$

c) $0.\overline{4} = \frac{4}{9}$

d) $0.2\overline{4} = \frac{24}{99} = \frac{8}{33}$

e) $0.7\overline{5} = \frac{75}{99} = \frac{25}{33}$

f) $0.8\overline{2} = \frac{82}{99}$

g) $0.6\overline{17} = \frac{617}{999}$

h) $0.2\overline{16} = \frac{216}{999} = \frac{8}{37}$

i) $0.7\overline{14} = \frac{714}{999} = \frac{238}{333}$

j) $0.3\overline{24} = \frac{324}{999} = \frac{12}{37}$

k) $0.7\overline{2357} = \frac{72357}{99999} = \frac{89}{123}$

l) $0.6\overline{5214} = \frac{65214}{99999} = \frac{7246}{11111}$
Work out the following without a calculator

a) \( 6 - 9 = -3 \)
b) \( 4 \times -3 = -12 \)
c) \( -10 \div -5 = 2 \)
d) \( -7 - -6 = -1 \)
e) \( 25 \div -5 = -5 \)
f) \( -2 + -6 = -8 \)
g) \( 7 - -3 = 10 \)
h) \( 6 \times -9 = -54 \)
i) \( 5 + -11 = -6 \)
j) \( -8 \times 4 = -32 \)
k) \( 12 + -3 = 9 \)
l) \( 5 + 9 - 3 = 11 \)
m) \( -3 \times -2 \times 4 = 24 \)
n) \( -6 - -5 - 8 = -9 \)
o) \( -5 \times -6 \times -2 = -60 \)
p) \( 8 \div -4 \times -5 = 10 \)
q) \( 2 + -8 + -7 = -13 \)
r) \( 13 + -13 = 0 \)
s) \( 16 \div -2 \times 4 = -32 \)
t) \( 11 - 3 + -9 - -5 = 4 \)
u) \( -7 \times -2 \times -3 = -42 \)
v) \( -1 + -3 + 2 = -2 \)

Division by Two-Digit Decimals

1) Work out the following without a calculator

a) \( 350 \div 0.2 = 1750 \)
b) \( 2 \div 0.25 = 8 \)
c) \( 0.45 \div 0.9 = 0.5 \)
d) \( 2.42 \div 0.4 = 6.05 \)
e) \( 30.66 \div 2.1 = 14.6 \)
f) \( 5.886 \div 0.9 = 6.54 \)
g) \( 38.08 \div 1.7 = 22.4 \)
h) \( 98.8 \div 0.08 = 1235 \)

2) Sam is filling a jug that can hold 1.575 litres, using a small glass. The small glass holds 0.035 litres. How many of the small glasses will he need? 45
1. Work out an estimate for the value of

a) \[
\frac{547}{4.8 \times 9.7} \approx 10
\]

b) \[
\frac{69 \times 398}{207} \approx 140
\]

c) \[
\frac{7.5 \times 2.79}{2.71 + 3.19} \approx 4
\]

d) \[
\frac{409 \times 5.814}{0.19} \approx 12 \, 000
\]

2. a) Work out an estimate for

\[
\frac{19.6 \times 31.7}{7.9 \times 5.2} \approx 15
\]

b) Use your answer to part (a) to find an estimate for

\[
\frac{196 \times 317}{79 \times 52} \approx 15
\]

3. a) Work out an estimate for

\[
\frac{6.13 \times 9.68}{3.79 \times 2.56} \approx 5
\]

b) Use your answer to part (a) to find an estimate for

\[
\frac{613 \times 968}{379 \times 256} \approx 5
\]
1) Simplify
   a) \( x + x \) \( 2x \)
   b) \( x \times x \) \( x^2 \)
   c) \( 3x + 2x \) \( 5x \)
   d) \( 3x \times 2x \) \( 6x^2 \)
   e) \( 2x^2y^3 + 4x^2y^3 \) \( 6x^2y^3 \)
   f) \( 2x^2y \times 3xy^3 \) \( 6x^3y^4 \)

2) Simplify
   a) \( x + y + x + y \) \( 2x + 2y \)
   b) \( 3x + 2y + x + 5y \) \( 4x + 7y \)
   c) \( 6y + 2x - 2y - 3x \) \( 4y - x \)
   d) \( 5p - 3q + p + 2q \) \( 6p - q \)

3) Expand and simplify
   a) \( 2(x + y) + 3(x + y) \) \( 5x + 5y \)
   b) \( 3(2x + y) + 2(5x + 3y) \) \( 16x + 9y \)
   c) \( 5(x + y) + 3(2x - y) \) \( 11x + 2y \)
   d) \( 3(2c + d) - 2(c + d) \) \( 4c + d \)
   e) \( 4(2p + q) - 3(2p - q) \) \( 2p + 7q \)
   f) \( 3(4x - 2y) + 2(x + 2y) \) \( 14x - 2y \)
   g) \( 6(x - 3y) - 2(2x - 5y) \) \( 2x - 8y \)

4) Expand and simplify
   a) \( 5(3p + 2) - 2(4p - 3) \) \( 7p + 16 \)
   b) \( 4(2x + 3) - (x - 2) \) \( 7x + 14 \)

5) a) Simplify \( pq + 2pq \) \( 3pq \)
   b) Simplify \( 5x + 3y - x - 4y \) \( 4x - y \)
   c) Simplify \( 6a + 5b - 3b + a \) \( 7a + 2b \)
   d) Simplify \( x^4 + x^4 \) \( 2x^4 \)

6) a) Simplify \( x + y + x + y + x \) \( 3x + 2y \)
   b) Simplify \( t^2 + t^2 + t^2 \) \( 3t^2 \)
   c) Simplify \( a^3 \times a^3 \) \( a^6 \)
   d) Simplify \( 3x^2y \times 4xy^3 \) \( 12x^3y^4 \)
   e) Simplify \( 3d + e - d + 4e \) \( 2d + 5e \)
   f) Simplify \( 3x^2 - x^2 \) \( 2x^2 \)
   g) Simplify \( 5t + 8d - 2t - 3d \) \( 3t + 5d \)
   h) Simplify \( 4t \times 2q \) \( 8tq \)

7) a) Simplify \( 2(p + p) \) \( 2p \)
   b) Simplify \( 2p \times p \) \( 3p + 2p \)
   c) Simplify \( 3p + 2p \) \( 2 + 2p \)
   d) Simplify \( 2p + 2p \) \( 2p + 2p \)

8) The table shows some expressions.

<table>
<thead>
<tr>
<th>2(p + p)</th>
<th>2p \times p</th>
<th>3p + 2p</th>
<th>2 + 2p</th>
<th>2p + 2p</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Two of the expressions always have the same value as 4p. Tick the boxes underneath the two expressions.

9) Simplify
   a) \( 5x + 5y \)
   b) \( 16x + 9y \)
   c) \( 11x + 2y \)
   d) \( 4c + d \)
   e) \( 2p + 7q \)
   f) \( 14x - 2y \)
   g) \( 2x - 8y \)

10) Expand and simplify
    (i) \( 4(x + 5) + 3(x - 6) \) \( 7x + 2 \)
    (ii) \( 3(2x - 1) - 2(x - 4) \) \( 4x + 5 \)
    (iii) \( 5(2y + 2) - (y + 3) \) \( 9y + 7 \)
1) Expand these brackets
   a) 2(x + 3) \quad 2x + 6
   b) 3(2x + 4) \quad 6x + 12
   c) 5(3p - 2q) \quad 15p - 10q
   d) 4(x^2 + 2y^2) \quad 4x^2 + 8y^2
   e) r(r - r^3) \quad r^2 - r^3

2) Expand and simplify
   a) (x + 1)(x + 2) \quad x^2 + 3x + 2 \quad x^2 + 1x + 2x + 2
   b) (x + 3)(2x + 4) \quad 2x^2 + 10x + 12 \quad 2x^2 + 6x + 4x + 12
   c) (2x + 1)(3x + 2) \quad 6x^2 + 7x + 2 \quad 6x^2 + 3x + 4x + 2

3) Expand and simplify
   a) (x + 3)(x - 2) \quad x^2 + x - 6 \quad x^2 + 3x - 2x - 6
   b) (x - 1)(x + 4) \quad x^2 + 3x - 4 \quad x^2 - 1x + 4x - 4
   c) (x - 3)(x - 2) \quad x^2 - 5x + 6 \quad x^2 - 3x - 2x + 6

4) Expand and simplify
   a) (2p + 3)(p - 2) \quad 2p^2 - p - 6 \quad 2p^2 + 3p - 4p - 6
   b) (3t - 2)(2t + 3) \quad 6t^2 + 5t - 6 \quad 6t^2 - 4t + 9t - 6
   c) (2x - 5)(3x - 2) \quad 6x^2 - 19x + 10 \quad 6x^2 - 15x - 4x + 10

5) Expand and simplify
   a) (x + 3y)(x + 4y) \quad x^2 + 7xy + 12y^2 \quad x^2 + 3xy + 4xy + 12y^2
   b) (2p + q)(3p + 2q) \quad 6p^2 + 7pq + 2q^2 \quad 6p^2 + 3pq + 4pq + 2q^2

6) Expand and simplify
   a) (2x + 1)^2 \quad 4x^2 + 4x + 1 \quad (2x + 1)(2x + 1) = 4x^2 + 2x + 2x + 1
   b) (3x - 2)^2 \quad 9x^2 - 12x + 4 \quad (3x - 2)(3x - 2) = 9x^2 - 6x - 6x + 4
   c) (2p + q)^2 \quad 4p^2 + 4pq + q^2 \quad (2p + q)(2p + q) = 4p^2 + 2pq + 2pq + q^2
Factorisation

1) Factorise
   a) 2x + 4  \quad 2(x + 2)
   b) 2y + 10  \quad 2(y + 5)
   c) 3x + 12  \quad 3(x + 4)
   d) 3x − 6  \quad 3(x − 2)
   e) 5x − 15  \quad 5(x − 3)

2) Factorise
   a) \quad p^2 + 7p  \quad p(p + 7)
   b) \quad x^2 + 4x  \quad x(x + 4)
   c) \quad y^2 − 2y  \quad y(y − 2)
   d) \quad p^2 − 5p  \quad p(p − 5)
   e) \quad x^2 + x  \quad x(x + 1)

3) Factorise
   a) \quad 2x^2 + 6x  \quad 2x(x + 3)
   b) \quad 2y^2 − 8y  \quad 2y(y − 4)
   c) \quad 5p^2 + 10p  \quad 5p(p + 2)
   d) \quad 7c^2 − 21c  \quad 7c(c − 3)
   e) \quad 6x^2 + 9x  \quad 3x(2x + 3)

4) Factorise
   a) \quad 2x^2 − 4xy  \quad 2x(x − 2y)
   b) \quad 2t^2 + 10tu  \quad 2t(t + 5u)
   c) \quad 6x^2 − 8xy  \quad 2x(3x − 4y)
   d) \quad 3x^3y^2 + 9xy  \quad 3xy(xy + 3)
Solve the following equations

1) \[2p - 1 = 13\]  \[p = 7\]
   \[2p = 13 + 1\]
   \[2p = 14\]
   \[p = 7\]

2) \[4y + 1 = 21\]  \[y = 5\]
   \[4y = 21 - 1\]
   \[4y = 20\]
   \[y = 5\]

3) \[6x - 7 = 32\]  \[x = 6.5\]
   \[6x = 32 + 7\]
   \[6x = 39\]
   \[x = 6.5\]

4) \[x + x + x + x = 20\]  \[x = 5\]
   \[4x = 20\]
   \[x = 5\]

5) \[x + 3x = 40\]  \[x = 10\]
   \[4x = 40\]
   \[x = 10\]

6) \[5(t - 1) = 20\]  \[t = 5\]
   \[5t - 5 = 20\]
   \[5t = 20 + 5\]
   \[5t = 25\]
   \[t = 5\]

7) \[4(5y - 2) = 52\]  \[y = 3\]
   \[20y - 8 = 52\]
   \[20y = 52 + 8\]
   \[20y = 60\]
   \[y = 3\]

8) \[4(y + 3) = 24\]  \[y = 3\]
   \[4y + 12 = 24\]
   \[4y = 24 - 12\]
   \[4y = 12\]
   \[y = 3\]

9) \[20x - 15 = 18x - 7\]  \[x = 4\]
   \[20x - 18x = -7 + 15\]
   \[2x = 8\]
   \[x = 4\]

10) \[4y + 3 = 2y + 10\]  \[y = 3.5\]
    \[4y - 2y = 10 - 3\]
    \[2y = 7\]
    \[y = 3.5\]

11) \[2x + 17 = 5x - 4\]  \[x = 7\]
    \[4 + 17 = 5x - 2x\]
    \[21 = 3x\]
    \[7 = x\]

12) \[2x + 7 = 16 - 4x\]  \[x = 1.5\]
    \[2x + 4x = 16 - 7\]
    \[6x = 9\]
    \[x = 1.5\]

13) \[5(x + 3) = 2(x + 6)\]  \[x = -1\]
    \[5x + 15 = 2x + 12\]
    \[5x - 2x = 12 - 15\]
    \[3x = -3\]
    \[x = -1\]

14) \[4(2y + 1) = 2(12 - y)\]  \[y = 2\]
    \[8y + 4 = 24 - 2y\]
    \[8y + 2y = 24 - 4\]
    \[10y = 20\]
    \[y = 2\]

15) \[7 - 3x = 2(x + 1)\]  \[x = 1\]
    \[7 - 3x = 2x + 2\]
    \[7 - 2 = 2x + 3x\]
    \[5 = 5x\]
    \[1 = x\]

16) \[\frac{x - 3}{2} = 5\]  \[x = 13\]
    \[x - 3 = 5 \times 2\]
    \[x - 3 = 10\]
    \[x = 13\]

17) \[\frac{2x + 4}{3} = 7\]  \[x = 8.5\]
    \[2x + 4 = 21\]
    \[2x = 17\]
    \[x = 8.5\]

18) \[\frac{40 - x}{3} = 4 + x\]  \[x = 7\]
    \[40 - x = (4 + x) \times 3\]
    \[40 - x = 12 + 3x\]
    \[40 - 12 = 3x + x\]
    \[28 = 4x\]
    \[7 = x\]
1) The width of a rectangle is $x$ centimetres. The length of the rectangle is $(x + 5)$ centimetres.

[Diagram of a rectangle with labels $x$, $x + 5$, and $P = 4x + 10$]

- **a)** Find an expression, in terms of $x$, for the perimeter of the rectangle. Give your answer in its simplest form. $4x + 10$
- **b)** Work out the length of the rectangle. **Length is 12 cm**

2) The sizes of the angles, in degrees, of the quadrilateral are:

- $x + 10$
- $2x$
- $x + 80$
- $x + 30$

**Diagram NOT accurately drawn**

- **a)** Use this information to write down an equation in terms of $x$. $5x + 120 = 360$
- **b)** Use your answer to part (a) to work out the size of the smallest angle of the quadrilateral. **Smallest angle is 58°**

3) Sarah buys 6 cups and 6 mugs

- A cup costs £$x$
- A mug costs £$(x + 3)$

- **a)** Write down an expression, in terms of $x$, for the total cost, in pounds, of 6 cups and 6 mugs. $12x + 18$
- **b)** If the total cost of 6 cups and 6 mugs is £48, write an equation in terms of $x$. $12x + 18 = 48$
- **c)** Solve your equation to find the cost of a cup and the cost of a mug. **A cup costs £2.50 and a mug costs £5.50**
1) Make \( c \) the subject of the formula.
\[
a = b + cd \quad \Rightarrow \quad c = \frac{a - b}{d}
\]

2) Make \( t \) the subject of the formula.
\[
u = v + 2t \quad \Rightarrow \quad t = \frac{u - v}{2}
\]

3) Make \( n \) the subject of the formula.
\[
M = 3n + 5 \quad \Rightarrow \quad n = \frac{M - 5}{3}
\]

4) Make \( z \) the subject of the formula.
\[
x = 3y + z \quad \Rightarrow \quad z = x - 3y
\]

5) \( r = 5s + 3t \)
   a) Make \( t \) the subject of the formula.
   \[
   t = \frac{r - 5s}{3}
   \]
   b) Make \( s \) the subject of the formula.
   \[
   s = \frac{r - 3t}{5}
   \]

6) Rearrange \( y = 3x + 1 \) to make \( x \) the subject.
\[
x = \frac{y - 1}{3}
\]

7) Rearrange \( y = \frac{1}{2}x + 2 \) to make \( x \) the subject.
\[
x = 2(y - 2) \quad \text{or} \quad x = 2y - 4
\]

8) Rearrange \( y = \frac{1}{3}x + 1 \) to make \( x \) the subject.
\[
x = 3(y - 1) \quad \text{or} \quad x = 3y - 3
\]
1) Represent this inequality on the number line

\[-3 < x \leq 2\]

2) Represent this inequality on the number line

\[-1 \leq x < 5\]

3) Write down the inequality shown

\[-4 < x < 4\]

4) Write down the inequality shown

\[-5 \leq x < 3\]

5) If y is an integer, write down all the possible values of

\[-2 < y \leq 5\]

\[-1, 0, 1, 2, 3, 4, 5\]

6) If x is an integer, write down all the possible values of

\[-9 < x < -5\]

\[-8, -7, -6\]
Solving Inequalities

1) Solve

a) \(3x - 1 > 5\)
\[x > 2\]

b) \(7y + 2 \leq 30\)
\[y \geq -4\]

c) \(\frac{x}{2} - 3 \geq 2\)
\[x \geq 10\]

d) \(5 + 2x > 7\)
\[x > 1\]

e) \(8 < 5p - 2\)
\[2 < p\]

f) \(\frac{y}{3} + 5 \geq 3\)
\[y \geq -6\]

g) \(\frac{2x}{3} - 5 \geq -3\)
\[x \geq 3\]

h) \(6x - 5 > 2x + 3\)
\[x > 2\]

i) \(3p - 9 < 6 - 2p\)
\[p < 3\]

j) \(5 - 3y < 2y - 10\)
\[3 < y\]

2) a) Solve the inequality
\[2z > 7 - 2\]
\[2z + 2 \geq 7\]
\[z \geq 5\]

b) Write down the smallest integer value of \(z\) which satisfies the inequality
\[z = 3\]

3) \(5x + 2y < 10\)
\(x\) and \(y\) are both integers.

Write down two possible pairs of values that satisfy this inequality.

\[x = \ldots 1\ldots , y = \ldots 1\ldots \]
\[5 \times 1 + 2 \times 1 = 7\]

and

\[x = \ldots 1\ldots , y = \ldots 2\ldots \]
\[5 \times 1 + 2 \times 2 = 9\]

other pairs of values are possible.
1) The equation

\[ x^3 - x = 29 \]

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place. \( x = 3.15 \)

You must show all your working.

\[
\begin{array}{ccc}
3^3 - 3 & = 24 & \text{too low} \\
4^3 - 4 & = 60 & \text{too high} \\
3.1^3 - 3.1 & = 26.691 & \text{too low} \\
3.2^3 - 3.2 & = 29.568 & \text{too high} \\
3.15^3 - 3.15 & = 28.105875 & \text{too low}
\end{array}
\]

Therefore, \( x = 3.2 \) to 1 decimal place.

2) The equation

\[ x^3 - 4x = 25 \]

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place. \( x = 3.4 \)

You must show all your working.

\[
\begin{array}{ccc}
3^3 - 4 \times 3 & = 15 & \text{too low} \\
4^3 - 4 \times 4 & = 48 & \text{too high} \\
3.4^3 - 4 \times 3.4 & = 25.704 & \text{too high} \\
3.3^3 - 4 \times 3.3 & = 22.737 & \text{too low} \\
3.35^3 - 4 \times 3.35 & = 24.195375 & \text{too low}
\end{array}
\]

Therefore, \( x = 3.4 \) to 1 decimal place.

3) The equation

\[ x^3 - 2x = 68 \]

has a solution between 4 and 5

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place. \( x = 4.25 \)

You must show all your working.

\[
\begin{array}{ccc}
4^3 - 2 \times 4 & = 56 & \text{too low} \\
5^3 - 2 \times 5 & = 115 & \text{too high} \\
4.2^3 - 2 \times 4.2 & = 65.688 & \text{too low} \\
4.3^3 - 2 \times 4.3 & = 70.907 & \text{too low} \\
4.25^3 - 2 \times 4.25 & = 68.265625 & \text{too high}
\end{array}
\]

Therefore, \( x = 4.2 \) to 1 decimal place.

4) The equation

\[ x^3 + 4x = 101 \]

has one solution which is a positive number.

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place. \( x = 4.35 \)

You must show all your working.

\[
\begin{array}{ccc}
3^3 + 4 \times 3 & = 39 & \text{too low} \\
4^3 + 4 \times 4 & = 80 & \text{too low} \\
5^3 + 4 \times 5 & = 145 & \text{too high} \\
4.2^3 + 4 \times 4.2 & = 90.888 & \text{too low} \\
4.3^3 + 4 \times 4.3 & = 96.707 & \text{too low} \\
4.4^3 + 4 \times 4.4 & = 102.784 & \text{too high} \\
4.35^3 + 4 \times 4.35 & = 99.712875 & \text{too low}
\end{array}
\]

Therefore, \( x = 4.4 \) to 1 decimal place.
1) Write as a power of 8
   a) \(8^4 \times 8^3\)  \(8^7\)  
b) \(8^{12} \div 8^7\)  \(8^5\)

2) Write as a power of 3
   a) \(3^2 \times 3^9\)  \(3^{11}\)  
b) \(3^{10} \div 3^3\)  \(3^7\)

3) Simplify
   a) \(k^5 \times k^2\)  \(k^7\)
   b) \(x^4 \div x^2\)  \(x^2\)
   c) \(\frac{k^{11}}{k^6}\)  \(k^5\)
   d) \((k^8)^2\)  \(k^{16}\)

4) Simplify
   eg. \((2xy^3)^4 = 2xy^3 \times 2xy^3 \times 2xy^3 \times 2xy^3 = 16x^4y^{12}\)
   a) \((2xy^3)^3\)  \(8x^3y^{15}\)
   b) \((2x^2y^2)^3\)  \(8x^6y^6\)
   c) \((4xy^4)^2\)  \(16x^2y^8\)
   d) \((3xy^2)^4\)  \(81x^4y^8\)

5) \(2^x \times 2^y = 2^{10}\)
    and \(2^x \div 2^y = 2^2\)

   Work out the value of \(x\) and the value of \(y\).
   \(x = 6\) and \(y = 4\)

6) \(5^x \times 5^y = 5^{12}\)
    and \(5^x \div 5^y = 5^6\)

   Work out the value of \(x\) and the value of \(y\).
   \(x = 9\) and \(y = 3\)

7) \(a = 2^x\), \(b = 2^y\)
    Express in terms of \(a\) and \(b\)
    a) \(2^{x+y}\)  \(ab\)
    b) \(2^{2x}\)  \(a^2\)
    c) \(2^{3y}\)  \(b^3\)
    d) \(2^{x+2y}\)  \(ab^2\)
1. Write down the first 5 terms and the 10th term of the following sequences:

   eg. $2n + 1$  
   $3, 5, 7, 9, 11,..., 21$

   a) $2n + 2$  
   $4, 6, 8, 10, 12,..., 22$

   b) $3n + 1$  
   $4, 7, 10, 13, 16,..., 31$

   c) $n + 3$  
   $4, 5, 6, 7, 8,..., 13$

   d) $7n$  
   $7, 14, 21, 28, 35,..., 70$

   e) $3n - 1$  
   $2, 5, 8, 11, 14,..., 29$

   f) $7n - 3$  
   $4, 11, 18, 25, 32,..., 67$

2. Find the $n^{th}$ term of the following sequences:

   a) $5, 10, 15, 20...$  
   $5n$

   b) $5, 8, 11, 14...$  
   $3n + 2$

   c) $1, 8, 15, 22...$  
   $7n - 6$

   d) $22, 18, 14, 10...$  
   $-4n + 26$

   e) $-3, 3, 9, 15...$  
   $6n - 9$

   f) $4, -1, -6, -11...$  
   $-5n + 9$

3. Here are some patterns made from sticks.

   a) Draw pattern 4 in the space, below..

   b) How many sticks are used in

   (i) pattern 10  
   51 sticks

   (ii) pattern 20  
   101 sticks

   (iii) pattern 50  
   251 sticks

   c) Find an expression, in terms of $n$, for the number of sticks in pattern number $n$.  
   $5n + 1$

   d) Which pattern number can be made using 301 sticks?  
   Pattern 60
1) a) Complete the table of values for $y = 2x - 3$

<table>
<thead>
<tr>
<th>$x$</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>-5</td>
<td>-3</td>
<td>-1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

b) Using the axes on the right draw the graph of $y = 2x - 3$

c) Use your graph to work out the value of $y$ when $x = 2.5$ \[ y = 2 \]
d) Use your graph to work out the value of $x$ when $y = 4.5$ \[ x = 3.75 \]

2) a) Complete the table of values for $y = 2 - x$

<table>
<thead>
<tr>
<th>$x$</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>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>-1</td>
<td>-2</td>
</tr>
</tbody>
</table>

b) Using the axes on the right, again, draw the graph of $y = 2 - x$

3) a) Complete the table of values for $y = \frac{1}{2}x - 1$

<table>
<thead>
<tr>
<th>$x$</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>-1.5</td>
<td>-1</td>
<td>-0.5</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
</tr>
</tbody>
</table>

b) Draw the graph of $y = \frac{1}{2}x - 1$

c) Use your graph to find the value of $y$ when $x = 3.5$ \[ x = 0.75 \]
1) Find the equations of lines A, B and C on the axes below

Line A: \( y = 2x + 1 \)
Line B: \( y = \frac{1}{2}x + 4 \)
Line C: \( y = -x + 8 \)

or Line C: \( y = 8 - x \)

2) Find the equations of lines A, B and C on the axes below

Line A: \( y = 2x - 2 \)
Line B: \( y = -\frac{1}{2}x + 4 \)
Line C: \( y = -x \)
1) On the axes below, the graphs of $y = x + 2$ and $y = 6 - x$ have been drawn.

Use the graphs to solve the simultaneous equations $y = x + 2$ and $y = 6 - x$

$x = 2$ and $y = 4$

2) On the axes below draw the graphs of $y = 2x + 1$ and $y = 7 - x$

Use your graphs to solve the simultaneous equations $y = 2x + 1$ and $y = 7 - x$

$x = 2$ and $y = 5$
1) a) Complete the table of values for \( y = 2x^2 - 3x \)

<table>
<thead>
<tr>
<th>x</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>14</td>
<td>5</td>
<td>0</td>
<td>-1</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

b) On the grid, draw the graph of \( y = 2x^2 - 3x \) for values of \( x \) from -2 to 3

\[ y = 2x^2 - 3x \]

\[ x = -0.85 \text{ or } x = 2.33 \]

c) Use the graph to find the value of \( y \) when \( x = -1.5 \) \( y = 9 \)

d) Use the graph to find the values of \( x \) when \( y = 4 \) \( x = -0.85 \text{ or } x = 2.33 \)

2) a) Complete the table of values for \( y = x^2 - 2x \)

<table>
<thead>
<tr>
<th>x</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>8</td>
<td>3</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

b) On the grid, draw the graph of \( y = x^2 - 2x \) for values of \( x \) from -2 to 3

\[ y = x^2 - 2x \]

\[ x = -0.89 \text{ or } x = 2.9 \]

c) (i) On the same axes draw the straight line \( y = 2.5 \)

(ii) Write down the values of \( x \) for which \( x^2 - 2x = 2.5 \) \( x = -0.89 \text{ or } x = 2.9 \)
1) Sarah travelled 20 km from home to her friend’s house. She stayed at her friend’s house for some time before returning home. Here is the travel graph for part of Sarah’s journey.

a) At what time did Sarah leave home? **10 10**

b) How far was Sarah from home at 1030? **13.5 km**

Sarah left her friend’s house at 11 10 to return home.

c) Work out the time in minutes Sarah spent at her friend’s house. **30 minutes**

Sarah returned home at a steady speed.

She arrived home at 11 50

d) Complete the travel graph.

e) Work out Sarah’s average speed on her journey from her home to her friend’s house.

Give your answer in kilometres per hour. **40 km/h**

f) Work out Sarah’s average speed on her journey home from her friend’s house.

Give your answer in kilometres per hour. **30 km/h**
Pythagoras’ Theorem

1) Find the length of side AC. \(13.9\text{cm}\)
   Give your answer to 1 decimal place.

   \[
   \begin{align*}
   12^2 &= 144 \\
   7^2 &= 49 \\
   \frac{193}{193} &= 13.9 \\
   \sqrt{193} &= 13.9
   \end{align*}
   \]

2) Find the length of side QR \(5.9\text{cm}\)
   Give your answer to 1 decimal place.

   \[
   \begin{align*}
   7.6^2 &= 57.76 \\
   4.8^2 &= 23.04 \\
   \frac{34.72}{34.72} &= 5.9 \\
   \sqrt{34.72} &= 5.9
   \end{align*}
   \]

3) Find the length of side SU \(18.2\text{cm}\)
   Give your answer to 1 decimal place.

   \[
   \begin{align*}
   23^2 &= 529 \\
   14^2 &= 196 \\
   \frac{333}{333} &= 18.2 \\
   \sqrt{333} &= 18.2
   \end{align*}
   \]

4) Below is a picture of a doorway. \(2.2\text{m}\)
   Find the size of the diagonal of the doorway.
   Give your answer to 1 decimal place.

   \[
   \begin{align*}
   2.1^2 &= 4.41 \\
   0.8^2 &= 0.64 \\
   \frac{5.05}{5.05} &= 2.2 \\
   \sqrt{5.05} &= 2.2
   \end{align*}
   \]

5) In the sketch of the rectangular field, below, James wants to walk from B to D.

   Which of the following routes is shorter and by how much? B to C to D or straight across the field from B to D. \(110\text{m} - 78\text{m} = 32\text{m}\)
   Give your answer to the nearest metre.

   \[
   \begin{align*}
   60^2 &= 3600 \\
   50^2 &= 2500 \\
   6100 &= 78
   \end{align*}
   \]

6) Fiona keeps her pencils in a cylindrical beaker as shown below.
   The beaker has a diameter of 8cm and a height of 17cm.
   Will a pencil of length 19cm fit in the beaker without poking out of the top? \textit{No. The diagonal is only 18.8cm.}

   \[
   \begin{align*}
   17^2 &= 289 \\
   8^2 &= 64 \\
   \frac{353}{353} &= 18.79 \\
   \sqrt{353} &= 18.79
   \end{align*}
   \]
1) Points P and Q have coordinates (1, 4) and (5, 2).
Calculate the shortest distance between P and Q.
Give your answer correct to 1 decimal place. 4.5

2) Points A and B have coordinates (-4, 3) and (3, -2).
Calculate the shortest distance between A and B.
Give your answer correct to 1 decimal place. 8.6
1) A cuboid lies on the coordinate axes.

The point Q has coordinates \((5, 3, 4)\)

a) Write down the coordinates of the point P \((5, 3, 0)\)
b) Write down the coordinates of the point T \((5, 0, 0)\)
c) Write down the coordinates of the point S \((5, 0, 4)\)
d) Write down the coordinates of the point R \((0, 0, 4)\)
e) Write down the coordinates of the point U \((0, 3, 0)\)

2) A cuboid lies on the coordinate axes.

Point P lies half way between A and B and has coordinates \((3, 4, 5)\)

a) Write down the coordinates of B. \((6, 4, 5)\)
b) Write down the coordinates of C. \((6, 4, 0)\)
1) Find the surface area of this cube and cuboid.

**Cube**
- Surface area = 96 cm²
- 4 cm

**Cuboid**
- Surface area = 280 cm²
- 6 cm
- 10 cm

2) Find the surface area of this cuboid.
- Surface area = 14.22 m²

3) A water tank measures 2 m by 3 m by 4 m. It has no top. The outside of the tank, including the base, has to be painted. Calculate the surface area which will be painted.
- Surface area = 40 m²

4) A water tank measures 2 m by 5 m by 6 m. It has no top. The outside of the tank, including the base, has to be painted. A litre of paint will cover an area of 4.3 m². Paint is sold in 5 litre tins and each tin costs £13.50.

How much will it cost to paint the tank? **£54**
- You must show all your working.

Surface area to be painted:
- 5 × 2 = 10 m²
- 5 × 2 = 10 m²
- 6 × 2 = 12 m²
- 6 × 2 = 12 m²
- 6 × 5 = 30 m²

74 m² in total

Litres of paint needed:
74 ÷ 4.3 = 17.2 litres
3 tins is only 15 litres so 4 tins must be bought.
4 × £13.50 = £54
1) The diagram shows a cuboid.

Work out the volume of the cuboid.

\[ V = 22500 \text{ cm}^3 \]

2) Calculate the volume of this triangular prism.

\[ V = 54 \text{ cm}^3 \]

3) An ice hockey puck is in the shape of a cylinder with a radius of 3.8 cm and a thickness of 2.5 cm.

Take \( \pi \) to be 3.14

Work out the volume of the puck.

\[ V = 113.354 \text{ cm}^3 \]

4) A cuboid has:

- a volume of 80cm\(^3\)
- a length of 5 cm
- a width of 2 cm

\[ 80 \div 5 \div 2 = H \]

Work out the height of the cuboid.

\( H = 8 \text{ cm} \)

5) Work out the maximum number of boxes which can fit in the carton.

160 boxes will fit.

\[ 1600000 \div 10000 = 160 \]
1) The diagram shows two quadrilaterals that are mathematically similar.

![Diagram of quadrilaterals]

a) Calculate the length of AB \(28\) cm \(AB = PQ \times 3.5\)
b) Calculate the length of PS \(6\) cm \(PS = AD \div 3.5\)

2) SV is parallel to TU.

RST and RVU are straight lines.

RS = 9 cm, ST = 3 cm, TU = 7 cm, RV = 6 cm

Calculate the length of VU. \(2\) cm

\[RU = 1.333333 \times 6\]
\[RU = 8\]
\[VU = RU - RV\]
\[VU = 8 - 6\]

3) BE is parallel to CD.

ABC and AED are straight lines.

AB = 4 cm, BC = 6 cm, BE = 5 cm, AE = 4.4 cm

Scale factor = 2.5 \((10 \div 4)\)
a) Calculate the length of CD. \(12.5\) cm
b) Calculate the length of ED. \(6.6\) cm
1) The table shows some expressions. The letters a, b, c and d represent lengths. $\pi$ and 3 are numbers that have no dimensions.

Underneath each one write
L if it is a length
A if it is an area
V if it is a volume
N if it is none of the above.

<table>
<thead>
<tr>
<th>$\pi$ abc $\frac{3d}{3d}$</th>
<th>$\pi$ a$^3$</th>
<th>3a$^2$</th>
<th>$\pi$a$^2$ + b</th>
<th>$\pi$(a + b)</th>
<th>3(c$^2$ + d$^2$)</th>
<th>3ad$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>V</td>
<td>A</td>
<td>N</td>
<td>L</td>
<td>A</td>
<td>V</td>
</tr>
</tbody>
</table>

2) The table shows some expressions. The letters a, b, c and d represent lengths. $\pi$ and 2 are numbers that have no dimensions.

Underneath each one write
L if it is a length
A if it is an area
V if it is a volume
N if it is none of the above.

<table>
<thead>
<tr>
<th>2a$^2$</th>
<th>$\pi$ab$^3$</th>
<th>$\pi$ bc</th>
<th>ac + bd</th>
<th>$\pi$d(a + b)</th>
<th>2(c + d)$^3$</th>
<th>2$\pi$bc$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>V</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>V</td>
<td>V</td>
</tr>
</tbody>
</table>
1. A silver necklace has a mass of 123 grams, correct to the nearest gram.
   a) Write down the least possible mass of the necklace. \(122.5\) g
   b) Write down the greatest possible mass of the necklace. \(123.5\) g

2. Each of these measurements was made correct to one decimal place.
   Write the maximum and minimum possible measurement in each case.
   a) \(4.6\) cm
      - max: \(4.65\) cm
      - min: \(4.55\) cm
   b) \(0.8\) kg
      - max: \(0.85\) kg
      - min: \(0.75\) kg
   c) \(12.5\) litres
      - max: \(12.55\) L
      - min: \(12.45\) L
   d) \(25.0\) km/h
      - max: \(25.05\) km/h
      - min: \(24.95\) km/h
   e) \(10.3\) s
      - max: \(10.35\) s
      - min: \(10.25\) s
   f) \(36.1\) m
      - max: \(36.15\) m
      - min: \(36.05\) m
   g) \(136.7\) m/s
      - max: \(136.75\) m/s
      - min: \(136.65\) m/s
   h) \(0.1\) g
      - max: \(0.15\) g
      - min: \(0.05\) g

3. Each side of a regular octagon has a length of \(20.6\) cm, correct to the nearest millimetre.
   a) Write down the least possible length of each side. \(20.55\) cm
   b) Write down the greatest possible length of each side. \(20.65\) cm
   c) Write down the greatest possible perimeter of the octagon. \(165.2\) cm

4. A girl has a pencil that is of length \(12\) cm, measured to the nearest centimetre.
   Her pencil case has a diagonal of length \(12.3\) cm, measured to the nearest millimetre.
   Explain why it might not be possible for her to fit the pen in the pencil case.
   12 cm to the nearest cm has a maximum possible length of 12.5 cm.
   12.3 cm to the nearest mm has a minimum possible length of 12.25 cm.
   A 12.5 cm pencil won't fit into a pencil case with a diagonal length of 12.25 cm.

5. A square has sides of length \(7\) cm, correct to the nearest centimetre.
   a) Calculate the lower bound for the perimeter of the square. \(26\) cm
   b) Calculate the upper bound for the area of the square. \(56.25\) cm\(^2\)

\[
\begin{array}{c}
\text{min is 6.5 cm} \\
\text{min is 6.5 cm}
\end{array}
\quad\quad\quad
\begin{array}{c}
\text{max is 7.5 cm} \\
\text{max is 7.5 cm}
\end{array}
\]

Page 117
1) Jane runs 200 metres in 21.4 seconds.
   Work out Jane’s average speed in metres per second.
   Give your answer correct to 1 decimal place.
   \[ S = \frac{200}{21.4} = 9.3 \text{ m/s} \]

2) A car travels at a steady speed and takes five hours to travel 310 miles.
   Work out the average speed of the car in miles per hour.
   \[ S = \frac{310}{5} = 62 \text{ mph} \]

3) A plane flies 1440 miles at a speed of 240 mph.
   How long does it take?
   \[ T = \frac{1440}{240} = 6 \text{ hours} \]

4) A marathon runner runs at 7.6 mph for three and a half hours.
   How many miles has he run?
   \[ D = 7.6 \times 3.5 = 26.6 \text{ miles} \]

5) A car takes 15 minutes to travel 24 miles.
   Find its speed in mph.
   \[ S = \frac{24}{0.25} = 96 \text{ mph} \]

6) A cyclist takes 10 minutes to travel 2.4 miles.
   Calculate the average speed in mph.
   \[ S = \frac{2.4}{0.16} = 15 \text{ mph} \]

7) An ice hockey puck has a volume of 113 cm³.
   It is made out of rubber with a density of 1.5 grams per cm³.
   Work out the mass of the ice hockey puck.
   \[ M = 113 \times 1.5 = 169.5 \text{ g} \]

8) An apple has a mass of 160 g and a volume of 100 cm³.
   Find its density in g/cm³.
   \[ D = \frac{160}{100} = 1.6 \text{ g/cm³} \]

9) A steel ball has a volume of 1500 cm³.
   The density of the ball is 95 g/cm³.
   Find the mass of the ball in kg.
   \[ M = 1500 \times 95 = 142500 \text{ g} \]
   \[ M = 142.5 \text{ kg} \]

10) The mass of a bar of chocolate is 1800 g.
    The density of the chocolate is 9 g/cm³.
    What is the volume of the bar of chocolate?
    \[ V = \frac{1800}{9} = 200 \text{ cm³} \]
1) Using ruler and compasses, bisect line AB.

2) Using ruler and compasses
   a) Bisect line AB
   b) Bisect line BC
   c) Bisect line AC
   d) Place your compass point where your three lines cross*
      Now open them out until your pencil is touching vertex A.
      Draw a circle using this radius.

* If your three lines don’t cross at a point then you have a mistake somewhere or just haven’t been accurate enough.
1) Use ruler and compasses to **construct** the perpendicular to the line segment AB that passes through the point P. You must show all construction lines.

2) Use ruler and compasses to **construct** the perpendicular to the line segment CD that passes through the point P. You must show all construction lines.
1) Using ruler and compasses, bisect angle ABC.

2) The diagram below shows the plan of a park. The border of the park is shown by the quadrilateral RSUV.

There are two paths in the park. One is labelled TR and the other TV. A man walks in the park so that he is always the same distance from both paths. Using ruler and compasses show exactly where the man can walk.
1) ABCD is a rectangle.
Shade the set of points inside the rectangle which are both more than 4 centimetres from the point D and more than 1 centimetre from the line AB.

2) Two radio transmitters, A and B, are situated as below.

Transmitter A broadcasts signals which can be heard up to 3 km from A.
Transmitter B broadcasts signals which can be heard up to 6 km from B.
Shade in the area in which radio signals can be heard from both transmitters. Use a scale of 1 cm = 1 km.
1) Point C is equidistant from points A and B.
Sarah rolls a ball from point C.
At any point on its path the ball is the same distance from point A and point B.
a) On the diagram above draw accurately the path that the ball will take.
b) On the diagram shade the region that contains all the points that are no more than 3cm from point B.

2) The map shows part of a lake.
In a competition for radio-controlled ducks, participants have to steer their ducks so that:
    its path between AB and CD is a straight line
    this path is always the same distance from A as from B
a) On the map, draw the path the ducks should take.

Scale: 1 cm represents 10 m

There is a practice region for competitors.
This is the part of the lake which is less than 30 m from point E.
b) Shade the practice region on the map.
1) School B is due east of school A. C is another school. The bearing of C from A is 065°. The bearing of C from B is 313°. Complete the scale drawing below. Mark with a cross the position of C.

2) In the diagram, point A marks the position of Middlewitch. The position of Middlemarch is to be marked on the diagram as point B. On the diagram, mark with a cross the position of B given that: B is on a bearing of 320° from A and B is 5 cm from A.

3) **Work out** the bearing of
   a) B from P **222°**
   b) P from A **244°**

*Diagram NOT accurately drawn.*
1) Ahmad does a statistical experiment.
   He throws a dice 600 times.
   He scores one, 200 times.
   Is the dice fair? Explain your answer. Two possible answers:
   No, you would expect to score 1 about 100 times.
   Yes, although you would expect 1 about 100 times, you could still get it 200 times.

2) Chris has a biased coin.
   The probability that the biased coin will land on a tail is 0.3
   Chris is going to flip the coin 150 times.
   Work out an estimate for the number of times the coin will land on a tail. 45 times
   \[0.3 \times 150 = 45\]

3) On a biased dice, the probability of getting a six is \(\frac{2}{3}\).
   The dice is rolled 300 times.
   Work out an estimate for the number of times the dice will land on a six. 200 times
   \[\frac{2}{3} \times 300 = 200\]

4) On a biased dice, the probability of getting a three is 0.5
   The dice is rolled 350 times.
   Work out an estimate for the number of times the dice will land on a three. 175 times
   \[0.5 \times 350 = 175\]

5) Jenny throws a biased dice 100 times.
   The table shows her results.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
</tr>
</tbody>
</table>

   a) She throws the dice once more.
      Find an estimate for the probability that she will get a four. \(\frac{24}{100}\) or 0.24

   b) If the dice is rolled 250 times, how many times would you expect to get a five? 45 times
      \[\frac{18}{100} \times 250 = 45\]
1) The number of pens in each pupil’s pencil case in a classroom has been counted. The results are displayed in a table.

<table>
<thead>
<tr>
<th>Number of pens</th>
<th>Number of pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4 × 4</td>
</tr>
<tr>
<td>1</td>
<td>6 × 6</td>
</tr>
<tr>
<td>2</td>
<td>7 × 7</td>
</tr>
<tr>
<td>3</td>
<td>5 × 5</td>
</tr>
<tr>
<td>4</td>
<td>3 × 3</td>
</tr>
<tr>
<td>5</td>
<td>1 × 1</td>
</tr>
</tbody>
</table>

a) Work out the total number of pens in the classroom. 52 pens
b) Write down the modal number of pens in a pencil case. 2 pens
c) Work out the mean number of pens in a pencil case. 2 pens \( \frac{52}{26} \)
d) Work out the range of the number of pens in a pencil case. 5 pens 5 - 0

2) Thomas is analysing the local football team. He records the number of goals scored in each football match in the past twelve months.

<table>
<thead>
<tr>
<th>Goals scored</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7 ( 0 \times 7 ) 0</td>
</tr>
<tr>
<td>1</td>
<td>5 ( 1 \times 5 ) 5</td>
</tr>
<tr>
<td>2</td>
<td>3 ( 2 \times 3 ) 6</td>
</tr>
<tr>
<td>3</td>
<td>6 ( 3 \times 6 ) 18</td>
</tr>
<tr>
<td>4</td>
<td>2 ( 4 \times 2 ) 8</td>
</tr>
<tr>
<td>5</td>
<td>1 ( 5 \times 1 ) 5</td>
</tr>
<tr>
<td>6</td>
<td>1 ( 6 \times 1 ) 6</td>
</tr>
</tbody>
</table>

a) Thomas said that the mode is 7
Thomas is wrong. Thomas gave the highest frequency instead of giving the number of “goals scored” associated with it.
b) Calculate the mean number of goals scored. 1.92 goals \( \frac{48}{25} \)

3) Tina recorded how long, in minutes, she watched TV for each day during a month.

<table>
<thead>
<tr>
<th>Time (t in minutes)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 &lt; t \leq 20</td>
<td>5</td>
</tr>
<tr>
<td>20 &lt; t \leq 30</td>
<td>9</td>
</tr>
<tr>
<td>30 &lt; t \leq 45</td>
<td>8</td>
</tr>
<tr>
<td>45 &lt; t \leq 60</td>
<td>6</td>
</tr>
<tr>
<td>60 &lt; t \leq 90</td>
<td>3</td>
</tr>
</tbody>
</table>

a) Find the class interval in which the median lies. 30 < t < 45
b) Work out an estimate for the mean amount of time Tina watched TV each day of this month. Give your answer to the nearest minute.
37 minutes \( \frac{1140}{31} \)
1) A survey into how people communicate with each other is carried out. A questionnaire is designed and two of the questions used are shown below. The questions are not suitable. For each question, write down a reason why.

   a) Do you prefer to communicate with your friend by phone (voice call) or by text message?
      
      Yes [ ] No [ ]
   
      Reason.................................................................................................................
      .................................................................................................................

   b) How many text messages do you send?
      
      1 [ ] 2 [ ] 3 [ ] 4 [ ]
   
      Reason.................................................................................................................
      .................................................................................................................

2) A restaurant owner has made some changes. He wants to find out what customers think of these changes. He uses this question on a questionnaire.

   “What do you think of the changes in the restaurant?”
   
   Excellent [ ] Very good [ ] Good [ ]
   
   a) Write down what is wrong with this question.
      
      There is no negative or neutral response box.

   This is another question on the questionnaire.

   “How often do you come to the restaurant?”
   
   Very often [ ] Not often [ ]
   
   b) i) Write down one thing that is wrong with this question.
       
       Question needs a time frame eg per week, per month.
       Response boxes need to be more specific eg once a week, twice a week.
   
   ii) Design a better question to use.
       You should include some response boxes.
       
       How many times do you visit this restaurant per month?
       
       None [ ] Once [ ] Twice [ ] More than twice [ ]
INDEX

numbers refer to pages, not to clips

A
Addition and subtraction 16
Addition and subtraction of fractions 51
Algebraic simplification 94, 95
Alternate angles 62
Angle sum of triangles 63, 64
Angles - alternate 62
Angles - names of 31
Angles measuring and drawing 74
Angles of regular polygons 65
Area of circles 66
Area of compound shapes 68
Area of rectangles, triangles, parallelograms 33
Averages 41
Averages from a table 126

B
Bearings 124
Bisecting a line 119
Bisecting an angle 121
BODMAS 54
Bounds 117

C
Calculator questions 58
Change a fraction to a decimal 53
Change to a percentage with a calculator 49
Change to a percentage without a calculator 49
Changing the subject of a formula 99
Circles - area of 66
Circles - circumference of 67
Circumference of circles 67
Compound measures 118
Compound shapes - area of 68
Congruent and similar shapes 32
Constructions - bisecting a line 119
Constructions - bisecting an angle 121
Constructions - drawing angles 74
Constructions - drawing nets 77
Constructions - drawing triangles 75
Constructions - perpendicular to a line 120
Constructions - plans and elevations 76
Conversion graphs 43
Converting metric measures 35
Coordinates 28
Coordinates in 3 dimensions 112
Correlation 82
Cube numbers 9
Cube root 45
Cuboids - find the volume of 34
Cuboids - surface area 113

D
Data collection 79
Decimal places and significant figures 20
Decimals - dividing by 92
Decimals - multiplication and division 19
Decimals and percentages 10
Dimensions 116

Distance tables 24
Divide by powers of 10 5
Division 18
Division of fractions 52
Division with decimals 19
Division with negatives 7
Drawing - isometric 39
Drawing a perpendicular to a line 120
Drawing angles 74
Drawing quadratic graphs 108
Drawing straight line graphs 105
Drawing triangles 75

E
Enlargements 71
Equation of a straight line 106
Equations - forming and solving 98
Equations - solving 97
Equivalent fractions 46
Estimate of the mean 126
Estimating answers 93
Estimation 14
Evaluate powers, squares, cubes & roots 45
Expanding and simplifying brackets 94, 95
Experimental probabilities 125

F
Factorisation - simple 96
Factors, multiples and primes 44
Find a percentage with a calculator 48
Find a percentage without a calculator 48
Find the mid-point of a line 73
Finding the equation of a straight line 106
Forming equations 98
Four rules of negatives 92
Fraction of an amount 8, 50
Fraction to a decimal 53
Fractions - adding and subtracting 51
Fractions - change to a decimal 53
Fractions - multiply and divide 52
Fractions - putting in order 46
Fractions - shading 12
Fractions - simplifying 46
Fractions, decimals and percentages 10
Frequency diagrams 83
Frequency polygons 83

G
Graphs - straight lines 105
Graphs - travel graphs 109

H
Half-way values 21
Hard calculator questions 58
Highest common factor 89
<table>
<thead>
<tr>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial measures 35</td>
</tr>
<tr>
<td>Increase/decrease by a percentage 87</td>
</tr>
<tr>
<td>Index notation for multiplication and division 103</td>
</tr>
<tr>
<td>Indices 26, 45, 90, 103</td>
</tr>
<tr>
<td>Inequalities - on a line 100</td>
</tr>
<tr>
<td>Inequalities - solving 101</td>
</tr>
<tr>
<td>Isometric drawing 39</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>Limits of accuracy - grade C questions 117</td>
</tr>
<tr>
<td>Line graphs 27</td>
</tr>
<tr>
<td>List of outcomes 85</td>
</tr>
<tr>
<td>Loci 122, 123</td>
</tr>
<tr>
<td>Long division 18</td>
</tr>
<tr>
<td>Long multiplication 17</td>
</tr>
<tr>
<td>Long multiplication of decimals 55</td>
</tr>
<tr>
<td>Lowest common multiple 89</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>Mean 41</td>
</tr>
<tr>
<td>Measuring and drawing angles 74</td>
</tr>
<tr>
<td>Median 41</td>
</tr>
<tr>
<td>Metric measures 35</td>
</tr>
<tr>
<td>Mid-point of a line 73</td>
</tr>
<tr>
<td>Mixed numbers 51</td>
</tr>
<tr>
<td>Mode 41</td>
</tr>
<tr>
<td>Money - value for 47</td>
</tr>
<tr>
<td>Money questions - grade D 59</td>
</tr>
<tr>
<td>Money questions - grades E to G 11</td>
</tr>
<tr>
<td>Multiples 44</td>
</tr>
<tr>
<td>Multiplication 17</td>
</tr>
<tr>
<td>Multiplication &amp; division with negatives 7</td>
</tr>
<tr>
<td>Multiplication and division of fractions 52</td>
</tr>
<tr>
<td>Multiplication and division with decimals 19</td>
</tr>
<tr>
<td>Multiplication of decimals 55</td>
</tr>
<tr>
<td>Multiply and divide by powers of 10 5</td>
</tr>
<tr>
<td>Mutually exclusive events 85</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>Names of solids 37</td>
</tr>
<tr>
<td>Negatives - four rules of 92</td>
</tr>
<tr>
<td>Negatives in real life 6</td>
</tr>
<tr>
<td>Nets 77</td>
</tr>
<tr>
<td>Nth term 60, 104</td>
</tr>
<tr>
<td>Number machines 30</td>
</tr>
<tr>
<td>Number sequences 29, 60, 104</td>
</tr>
<tr>
<td>O</td>
</tr>
<tr>
<td>Ordering fractions 46</td>
</tr>
<tr>
<td>Ordering fractions, percentages &amp; decimals 13</td>
</tr>
<tr>
<td>Ordering numbers 2</td>
</tr>
<tr>
<td>Outcomes - listing 85</td>
</tr>
<tr>
<td>Overview of percentages 86</td>
</tr>
<tr>
<td>P</td>
</tr>
<tr>
<td>Parallelograms - find area and perimeter 33</td>
</tr>
<tr>
<td>Patterns - find the nth term 60</td>
</tr>
<tr>
<td>Patterns - number 29</td>
</tr>
<tr>
<td>Percentages - change by a percentage 87</td>
</tr>
<tr>
<td>Percentages - change to, with calculator 49</td>
</tr>
<tr>
<td>Percentages - change to, without calculator 49</td>
</tr>
<tr>
<td>Percentages - find with calculator 48</td>
</tr>
<tr>
<td>Percentages - find without calculator 48</td>
</tr>
<tr>
<td>Percentages - mixture of questions 86</td>
</tr>
<tr>
<td>Percentages to decimals and fractions 10</td>
</tr>
<tr>
<td>Perimeter and areas 33</td>
</tr>
<tr>
<td>Perpendicular to a line 120</td>
</tr>
<tr>
<td>Pictograms 42</td>
</tr>
<tr>
<td>Pie charts 81</td>
</tr>
<tr>
<td>Place value 1</td>
</tr>
<tr>
<td>Place value when multiplying 15</td>
</tr>
<tr>
<td>Planes of symmetry 78</td>
</tr>
<tr>
<td>Plans and elevations 76</td>
</tr>
<tr>
<td>Polygons - features of 36</td>
</tr>
<tr>
<td>Polygons - interior and exterior angles 65</td>
</tr>
<tr>
<td>Powers 26, 45, 103</td>
</tr>
<tr>
<td>Prime factors 89</td>
</tr>
<tr>
<td>Primes 44</td>
</tr>
<tr>
<td>Probability - experimental 125</td>
</tr>
<tr>
<td>Probability - mutually exclusive events 85</td>
</tr>
<tr>
<td>Probability scale 40</td>
</tr>
<tr>
<td>Product of prime factors 89</td>
</tr>
<tr>
<td>Proportion 23</td>
</tr>
<tr>
<td>Pythagoras 110</td>
</tr>
<tr>
<td>Pythagoras - line on a graph 111</td>
</tr>
<tr>
<td>Q</td>
</tr>
<tr>
<td>Quadratic graphs 108</td>
</tr>
<tr>
<td>Quadrilaterals 36</td>
</tr>
<tr>
<td>Questionnaires 127</td>
</tr>
<tr>
<td>Questionnaires and data collection 79</td>
</tr>
<tr>
<td>R</td>
</tr>
<tr>
<td>Range 41</td>
</tr>
<tr>
<td>Ratio 56, 88</td>
</tr>
<tr>
<td>Ratio - recipe questions 57</td>
</tr>
<tr>
<td>Reading scales 4</td>
</tr>
<tr>
<td>Real-life graphs 109</td>
</tr>
<tr>
<td>Real-life money questions 59</td>
</tr>
<tr>
<td>Recipe type ratio questions 57</td>
</tr>
<tr>
<td>Reciprocals 22</td>
</tr>
<tr>
<td>Rectangles - find area and perimeter 33</td>
</tr>
<tr>
<td>Recurring decimals into fractions 91</td>
</tr>
<tr>
<td>Reflections 70</td>
</tr>
<tr>
<td>Roots 45</td>
</tr>
<tr>
<td>Rotational symmetry 78</td>
</tr>
<tr>
<td>Rotations 69</td>
</tr>
<tr>
<td>Rounding 3</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>Scatter graphs 82</td>
</tr>
<tr>
<td>Sequences 29</td>
</tr>
<tr>
<td>Shading fractions 12</td>
</tr>
<tr>
<td>Significant figures 20</td>
</tr>
<tr>
<td>Similar shapes 32, 115</td>
</tr>
</tbody>
</table>
Simplifying algebraic expressions 94
Simplifying and ordering fractions 46
Simplifying brackets 95
Simultaneous equations graphically 107
Solids 37
Solving equations 97
Solving inequalities 101
Solving simultaneous equations graphically 107
Square and cube numbers 9
Square roots 45
Squares, cubes & roots 45
Standard form - changing to, etc 90
Stem and leaf diagrams 84
Straight line graphs - drawing 105
Straight line graphs - finding the equation 106
Subject of a formula 99
Substitution 61
Surface area of cuboids 113
Symmetries 78

T
Tessellations 38
Timetables 25
Transformation - enlargement 71
Transformation - reflection 70
Transformation - rotation 69
Transformation - translation 72
Translations 72
Trial and improvement 102
Triangles - find area and perimeter 33
Triangles, quadrilaterals, polygons 36
Two-way tables 80

U
Units of measurement 35
Upper and lower bounds 117

V
Value for money 47
Volume of a prism 114
Volume of cuboids 34

Y
Y = mx + c 106