Method marks (M) are awarded for a correct method which could lead to a correct answer

Accuracy marks (A) are awarded for a correct answer, having used a correct method, although this can be implied

(B) marks are awarded independent of method
1 litre = 1000 ml
1000 ÷ 8 = 125 ml

<table>
<thead>
<tr>
<th></th>
<th>12.5 ml</th>
<th>100 ml</th>
<th>125 ml</th>
<th>150 ml</th>
</tr>
</thead>
</table>

B1 Total 1

2 (a) $3 \times \left( \begin{array}{c} 2 \\ -5 \end{array} \right) = \left( \begin{array}{c} 6 \\ -15 \end{array} \right)$

\[
\begin{pmatrix}
6 \\
-15
\end{pmatrix}
\begin{pmatrix}
5 \\
-2
\end{pmatrix}
\begin{pmatrix}
5 \\
-2
\end{pmatrix}
\begin{pmatrix}
6 \\
-5
\end{pmatrix}
\]

B1

(b) $\left( \begin{array}{c} 2 \\ -5 \end{array} \right) - \left( \begin{array}{c} 4 \\ 12 \end{array} \right) = \left( \begin{array}{c} -2 \\ -17 \end{array} \right)$

\[
\begin{pmatrix}
-2 \\
-2
\end{pmatrix}
\begin{pmatrix}
-7 \\
-21
\end{pmatrix}
\begin{pmatrix}
-2 \\
-17
\end{pmatrix}
\begin{pmatrix}
-2 \\
-27
\end{pmatrix}
\]

B1 Total 2

3 $360 ÷ 8 = 45^\circ$

<table>
<thead>
<tr>
<th></th>
<th>45°</th>
<th>60°</th>
<th>120°</th>
<th>135°</th>
</tr>
</thead>
</table>

B1 Total 1

4 (a) $13.95 ÷ 5 = £2.79$

B1

(b) $500 ÷ 56 = 8.928...$

He can buy 8 bars

M1

(c) $£5.76 ÷ 2$

$= £2.88$

M1

Total 5

5 e.g. $4 \times 330 \text{ ml} = 1320 \text{ ml in 4-can pack}$

Price per ml = $149 ÷ 1320 = 0.1128... \text{ p}$

$6 \times 500 \text{ ml} = 3000 \text{ ml in 6-bottle pack}$

Price per ml = $349 ÷ 3000 = 0.1163... \text{ p}$

2000 ml bottle

Price per ml = $199 ÷ 2000 = 0.0995 \text{ p}$

The large bottle offers the best value

M1

A1 Total 3

6 e.g. $\frac{2}{7} = \frac{4}{14}, \frac{3}{7} = \frac{6}{14}$

\[
\frac{5}{14} \text{ is between } \frac{2}{7} \text{ and } \frac{3}{7}
\]

M1

A1 Total 2
7 (a) \[= 1024 - 625\]  
\[= 399\]  
M1  
A1  
(b) \[= \frac{5.236\ldots}{1.7}\]  
\[= 3.0800\ldots\]  
\[= 3.08\text{ (3sf)}\]  
M1  
A1  
Total 4

8 \[0.2 = \frac{1}{5}\]  
\[\frac{1}{0.2} = 5\]  
0.8 2 5 20  
B1  
Total 1

9 (a) \[= 27 - 16 = 11\]  
B1  
(b) 16 17 18 20 21 22 22 26 27  
M1  
Median = 21  
A1  
(c) Total for 9 days  
\[= 20 + 27 + 16 + 17 + 21 + 22 + 18 + 26 + 22\]  
\[= 189\]  
Total for 10 days = 10 \[\times 21.3 = 213\]  
M1  
Orders on day 10 = 213 - 180 = 24  
M1 A1  
Total 6

10 \[\frac{2}{5} = 0.4\]  
\[P + 0.4P = 1.4P\]  
0.4 \[\times P\] 1.2 \[\times P\] 1.4 \[\times P\] 2.5 \[\times P\]  
B1  
Total 1

11 (a) 10\% of £450 = £45  
\[20\% \text{ of £450} = £90\]  
New price = £450 - £90 = £360  
M1  
A1  
(b) \[\text{Increase} = 214 - 200 = £14\]  
\[\% \text{ increase} = \frac{14}{200} \times 100\%\]  
\[= \frac{14}{2} \% = 7\%\]  
M1  
A1  
Total 4

12 (a) e.g. 160\º represents 32 students  
40\º represents 32 \[\div 4 = 8\] students  
120\º represents 3 \[\times 8 = 24\] students  
24 students were 17 years old  
M1  
A1  
(b) e.g. \[360 - (160 + 120) = 360 - 280 = 80\º\]  
80\º represents 2 \[\times 8 = 16\] students who are 18 or 19  
M1  
No. of 19 year olds = 16 \[\div 4 = 4\]  
M1  
No. of 18 year olds = 3 \[\times 4 = 12\]  
A1  
Total 5
13 (a) e.g. \( \frac{59}{2} = 29.5 \)  
So, \( 29 + 30 = 59 \)  
B1

(b) e.g. \( \frac{45}{3} = 15 \)  
So, \( 14 + 15 + 16 = 45 \)  
M1

(c) Input = sum of 3 consecutive numbers  
\[ \frac{1}{3} \]  
\[ -1 \]  
Output = first of the 3 numbers  
B1

(d) Input = sum of 5 consecutive numbers  
\[ \frac{1}{5} \]  
\[ -2 \]  
Output = first of the 5 numbers  
M1

\[ \text{OR: } -10 \text{ then } \div 5 \]  
Total 6

14 \( \frac{1}{a} + \frac{1}{a} + \frac{1}{a} = \frac{1 + 1 + 1}{a} = \frac{3}{a} \)  
\[ \frac{1}{a^2} \]  
\[ \frac{3}{a^3} \]  
\[ \frac{3}{a} \]  
\[ \frac{1}{a} \]  
B1

Total 1

15 (a) \( 18 \div 3 = 6 \)  
\( 4 + 3 = 7 \)  
\( 7 \times 6 = 42 \text{ books} \)  
M1

(b) If no blue books added then 18 blue  
\( 18 \div 2 = 9 \)  
\( 3 \times 9 = 27 \text{ green books} \)  
New total = \( 18 + 27 = 45 \text{ books} \)  
Least no. of books added = \( 45 - 42 = 3 \)  
A1

Total 4

16 e.g.  
B3

Total 3
17  (a)  When  \( t = 0 \),  \( d = 3 - 0 = 3 \) m  

(b)  \( 4 \) hours = \( 4 \times 60 = 240 \) minutes
When  \( t = 240 \),  \( d = 3 - 0.004 \times 240 \)
\[ = 3 - 0.96 \]
\[ = 2.04 \) m  

(c)  
\[
\text{Depth (metres)}
\]
\[
\text{Time (hours)}
\]  

18  (a)  = 0.4 \times 160 = 64  

(b)  There are now 160 – 10 = 150 sweets in the bag
There are now 64 – 3 = 61 red sweets in the bag

\[
P(\text{red}) = \frac{61}{150}
\]  

19  Let first term be  \( a \) and second term be  \( b \)
First three terms are:  \( a \),  \( b \),  \( a + b \),  ... 
Sum of first three terms = \( a + b + (a + b) = 2a + 2b \)
\[ = 2(a + b) \]
\[ = 2 \times 3^{\text{rd}} \) term

Sum of first three terms = 22 so  \( 3^{\text{rd}} \) term = 11

20  Alezin – a packet lasts 48 ÷ 4 = 12 days
Betadon – a packet lasts 15 + 3 = 5 days
Cannezole – a packet lasts 20 + 2 = 10 days

\[ \text{e.g. Need the LCM of 5, 10 and 12} \]
Multiples of 12:  12, 24, 36, 48, 60 ...
60 is first multiple of 12 divisible by 5 and 10 so is LCM

On the 61\(^{\text{st}} \) day she will again open new packets of all 3
May has 31 days, June has 30 days
10\(^{\text{th}} \) to 31\(^{\text{st}} \) May is 31 – 9 = 22 days
1\(^{\text{st}} \) to 30\(^{\text{th}} \) June is 30 days
60 – (22 + 30) = 8
So 8 days into July she will finish packets of all 3 medicines
On 9\(^{\text{th}} \) July she will again have to open new packets of all 3
21 (a)  
\[
\text{Speed} = \frac{\text{distance}}{\text{time}} \quad \text{so} \quad \text{distance} = \text{speed} \times \text{time}
\]

20 minutes = \(\frac{1}{3}\) hour, 40 minutes = \(\frac{2}{3}\) hour

In first 20 minutes, distance = \(30 \times \frac{1}{3}\) = 10 km  
In last 40 minutes, distance = \(24 \times \frac{2}{3}\) = 16 km

Total distance = 10 + 16 = 26 km  
1 km = 4 \times 250 m

Number of laps = \(26 \times 4 = 104\) laps

(b)  
26 ÷ 2 = 13 km is half-distance

13 km = 10 km in first 20 minutes + 3 km

Time = \[\text{distance} \div \text{speed} = \frac{3}{24} \text{ hour} = \frac{1}{8} \text{ hour} = \frac{1}{8} \times 60 \text{ minutes} = 7\frac{1}{2} \text{ minutes}\]

Time to half-distance = 20 + 7\frac{1}{2} = 27\frac{1}{2} \text{ minutes}

22 (a)  
3.2 m = 320 cm, \ 1.4 m = 140 cm
320 ÷ 2 = 160 tiles in one direction
140 ÷ 2 = 70 tiles in the other direction

Number of tiles = 160 \times 70 = 11200

(b)  
e.g. If you first increase the width and then increase the height you also increase the height of the extra bit from making the tile wider. Hence the area increases by more than 20%.

[Or, e.g. Increasing by 10% gives 1.1 times the original. Doing this to both means the area is 1.1 \times 1.1 \times \text{original which is} 1.21 \times \text{original, a 21% increase.}]

(c)  
320 ÷ 2.2 = 145.4...
140 ÷ 2.2 = 63.6...

Number of tiles or part tiles = 146 \times 64 = 9344

23 (a)  
5x < x + 20  
4x < 20  
x < 5

(b)  
\((p - 2)(p - 6)\)

24  
2100 = \(\frac{55}{\text{area}}\)

2100 \times \text{area} = 55

Area = \(\frac{55}{2100}\) = 0.02619... m²

Area of circle = \(\pi r^2\)

\[
\pi \times r^2 = 0.02619...
\]

\[
r^2 = \frac{0.02619...}{\pi} = 0.008336...
\]

\[
r = \sqrt{0.008336...} = 0.09130... \text{ m}
\]

Radius = 9.13 cm (3sf)

TOTAL FOR PAPER: 80 MARKS