GCSE Bitesize examinations
General Certificate of Secondary Education

MATHEMATICS
Higher Tier

Paper 2 Calculator

Marking scheme

Unless otherwise stated, correct answers only should be accepted.
Answer all questions in the spaces provided.

1. \[ 19.9 \]
   2 marks for showing 19.87 or 19.870
   2 marks for \( 16.27026787 + 3.6 \)
   1 mark for showing \( \frac{41.421736 + 2.507987241 + 3.6}{2.7} \)

2. \[ 245g \]
   (2 marks)
   (1 mark for \( \frac{140}{12} \times 21 \))

3. (a)
   (i) \[ 156700000 = 1.567 \times 10^8 \]
   (ii) \[ 0.000341 = 3.41 \times 10^{-4} \]
   (1 mark)

   (b)
   (i) \[ 2.6 \times 10^5 = 260000 \]
   (ii) \[ 9.02 \times 10^{-3} = 0.00902 \]
   (1 mark)

   (c) \[ \frac{2.76 \times 10^3}{6.9 \times 10^{-2}} = 4 \times 10^4 \]
   (2 marks)
   1 mark for showing \( 6.81122449 \times 10^7 \) or \( 0.681122449 \times 10^8 \)

4. \[ c = 2a - b \]
   (3 marks)
   1 mark for showing \( 3c + b = 2c + 2a \)

5. \[ 1.05 \text{ km} \]
   (3 marks)
   2 marks for showing an un-rounded number
   1 mark for correct diagram, and 1 mark for showing \( 3.4 \times \cos 72^\circ \) or \( 3.4 \times \sin 18 \)

6. (a) \[ 0.004 \text{ km} \]
   (1 mark)

   (b) \[ 30 \text{,}000 \text{ ml} \]
   (1 mark)

   (c) \[ 800 \text{ mm}^2 \]
   (2 marks)
7. £194.05
   2 marks for showing £1793.05, or 1 mark for showing £267.05

8. (a) 27x^6y^9
   1 mark if 27 or x^6 or y^9 seen

(b) \( \frac{x}{x-1} \)
   1 mark for x(x + 4)
   1 mark for (x + 4)(x – 1)

9. Fast Coach is better.

   (i) It has a lower average journey time, so the trains get to Manchester quicker.
   (1 mark)

   (ii) It has a lower inter-quartile range of journey times, so it is more reliable.
   (1 mark)

10. (a) 58.8816
(2 marks)

(b) 57.4425
   1 mark if 2 of 10.35, 10.44, 5.55, 5.64 seen
   2 marks if 3 or 4 of 10.35, 10.44, 5.55, 5.64 seen

11. 3.8
   2 marks for working shown but incorrect conclusion.
   If no working shown, then only award 1 mark for answer)
12. (a) (3 marks)

3 marks for all correct, 2 marks for one error, and 1 mark for two errors.

1st marble 2nd marble

\[ R = \frac{3}{7} \quad \Rightarrow \quad RR = \frac{9}{49} \]

\[ B = \frac{4}{7} \quad \Rightarrow \quad RB = \frac{12}{49} \]

\[ R = \frac{3}{7} \quad \Rightarrow \quad BR = \frac{12}{49} \]

\[ B = \frac{4}{7} \quad \Rightarrow \quad BB = \frac{16}{49} \]

(b) \( \frac{25}{49} \) (2 marks)

1 mark for showing \( \frac{9}{49} + \frac{16}{49} \)
13.  Midpoint $\left(\frac{3}{2}, 2\right)$  

1 mark for showing $\left(-\frac{2 + 5}{2}, \frac{1 + 3}{2}\right)$  

Length 7.28  

1 mark for showing $\sqrt{7^2 + 2^2}$

14.  $22.3^\circ$  

1 mark each for showing correct substitution into cosine rule and/or correct simplification of cosine rule and/or $\cos A = 0.8$  

1 mark for $\cos A = \frac{80^2 + 100^2 - 60^2}{2 \times 80 \times 100}$  

1 mark for $\cos A = 0.8$
15. (a) Fill in the following table for the function: \( y = x^2 - 3x - 3 \) (3 marks)

<table>
<thead>
<tr>
<th>x</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>7</td>
<td>1</td>
<td>-3</td>
<td>-5</td>
<td>-5</td>
<td>-3</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

(b) Plot the graph
1 mark for one error, 0 marks for more errors.

(c) 3.8, -0.8
Accept answers ±0.2 (3 marks)

(d) -1.4, 4.4
Accept answers ±0.2 (3 marks)
16.

<table>
<thead>
<tr>
<th>Ice-Cream Stall</th>
<th>Weather</th>
<th>Profit</th>
<th>Break even</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.78</td>
<td>0.07</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Sunny</td>
<td>0.32</td>
<td>Dull</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2 marks)

(b) No. They are not independent. The profit on ice-cream depends on good weather.
For 2 marks must show 'No' and 'not independent'

(2 marks)

17. (a)

<table>
<thead>
<tr>
<th></th>
<th>No. of those to survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>66</td>
</tr>
<tr>
<td>Administrative</td>
<td>120</td>
</tr>
<tr>
<td>Clerical</td>
<td>180</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>72</td>
</tr>
<tr>
<td>Un-skilled</td>
<td>162</td>
</tr>
</tbody>
</table>

(4 marks)

4 marks for showing actual number of those to be surveyed (column 1)
3 marks for showing these not rounded to a whole number
1 mark for showing the worked out percentages (column 2) or
1 mark for showing 12628 x 11/100 x 5/100

(b) Conduct the survey on-the-job to ensure that responses are in the context of the work.
1 mark for any sensible equivalent e.g. question people off-the-job so people are not scared of being overheard.

(1 mark)
18. (a) \[ \frac{2x^2 + 8x + 3}{3x} \]  
1 mark for showing:
\[ \frac{9x + 3}{3x} + \frac{2x^2 - x}{3x} \]

b) \[ x = -8.32 \text{ and } x = -0.18 \]  
1 mark for substitution into formula
\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
and showing \( a = 2 \quad b = 17 \quad \text{and} \quad c = 3 \)  
1 mark for - 8.3197 AND – 0.1803

19. \[ 2a \]  
(1 mark)

If the top angle is \( a \) then \( x = 2a \)  
If \( x = 2a \) then \( y = 360 - 2a \) because they make a full turn.  
(1 mark)

Then \( z = \) half of this so \( 180 - a \)  
So, \( a + z = a + 180 - a = 180. \)  
So opposite angles add up to 180°  
(1 mark)

20. (a) Mid-price game: £ 12.49  
(2 marks)
(b) Full-price game: £ 27.99  
(2 marks)
1 mark for showing \( 3m + 2f = £93.45 \) AND \( 5m + 3f = £146.42 \)  
1 mark for showing successful setting out to add or subtract.
21. (5 marks)

1 mark for each correct line
1 mark for shading
1 mark for complete accuracy
22. \[ A = \frac{35.4}{s^2} \] (3 marks)

2 marks for not rounding the answer.

1 mark for showing \[ 6.7 = \frac{k}{2.3^2} \] and/or 1 mark for showing \( k = 35.4 \)

(b) \( s = 2.61 \text{cm} \) (3 marks)

2 marks if not rounded to 2 significant figures.

1 mark for showing \[ 5.2 = \frac{35.4}{s^2} \] and/or 1 mark for \( s^2 = \frac{35.4}{5.2} \)

23. (a) 600 (1 mark)

(b) \( 160 < h \leq 170 \) (1 mark)

(c) \( 160 < h \leq 170 \) (2 marks)

(d) 160.5 cm (3 marks)

1 mark for using midpoints (135, 145, 155, etc)

(e)

<table>
<thead>
<tr>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>280</td>
</tr>
<tr>
<td>480</td>
</tr>
<tr>
<td>570</td>
</tr>
<tr>
<td>600</td>
</tr>
</tbody>
</table>

1 mark if 3 correct (2 marks)

(f) Definite points should be plotted at (130, 0), (140, 40), (150, 100), (160, 280), (170, 480), (180, 570) and (190, 600) and joined with a smooth curve. (2 marks)

(g) 400 (380 – 420 acceptable) (1 mark)