This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2017 series for most Cambridge IGCSE®, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.
MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘dep’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
<th>Part Marks</th>
</tr>
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<tbody>
<tr>
<td>1(a)</td>
<td>Image at (0, 5), (3, 5), (3, 3)</td>
<td>2</td>
<td>SC1 for translation $\begin{pmatrix} -2 \ k \end{pmatrix}$ or $\begin{pmatrix} k \ 7 \end{pmatrix}$</td>
</tr>
<tr>
<td>1(b)(i)</td>
<td>Image at (2, 2), (5, 2), (5, 4)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1(b)(ii)</td>
<td>Image at (−4, −2), (−7, −2), (−7, −4)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1(b)(iii)</td>
<td>Rotation 180 [centre] (−1, 0)</td>
<td>3</td>
<td>B1 for each</td>
</tr>
<tr>
<td>1(c)</td>
<td>Stretch [factor]2 x-axis oe invariant</td>
<td>3</td>
<td>B1 for each</td>
</tr>
<tr>
<td>2(a)(i)</td>
<td>44</td>
<td>2</td>
<td>M1 for [angle $BAC$ or $DEC =$] $180 - 2 \times 68$, soi by angle $CDE = 44$ or M1 for angle $BAC =$ their angle $CDE$</td>
</tr>
<tr>
<td>2(a)(ii)</td>
<td>isosceles</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2(b)</td>
<td>162</td>
<td>3</td>
<td>M2 for $180 - \frac{360}{20}$ or $\frac{180 \times (20 - 2)}{20}$ or M1 for $\frac{360}{20}$ or $180 \times (20 - 2)$</td>
</tr>
<tr>
<td>2(c)(i)</td>
<td>Angle sum of triangle oe</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2(c)(ii)(a)</td>
<td>similar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2(c)(ii)(b)</td>
<td>5.4</td>
<td>2</td>
<td>M1 for $\frac{5}{3} = \frac{9}{QR}$ oe</td>
</tr>
<tr>
<td>3(a)(i)</td>
<td>6.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3(a)(ii)</td>
<td>4.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3(a)(iii)</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3(b)(i)</td>
<td>Positive</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3(b)(ii)</td>
<td>13</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3(b)(iii)</td>
<td>15.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3(b)(iv)</td>
<td>7.32$t - 55.3$</td>
<td>2</td>
<td>(7.322 to 7.323)$t - (55.25…)$ B1 for $7.32t + k$ or $kt - 55.3$ or SC1 for $7.3t - 55$</td>
</tr>
<tr>
<td>3(b)(v)</td>
<td>Correct line (positive gradient and not below the x-axis)</td>
<td>2</td>
<td>B1 for positive gradient</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td>Marks</td>
<td>Part Marks</td>
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<tr>
<td>4(a)(i)</td>
<td>5 : 4</td>
<td>2</td>
<td>B1 for any other correct ratio</td>
</tr>
<tr>
<td>4(a)(ii)</td>
<td>41.68</td>
<td>2</td>
<td>M1 for 0.16 \times 260.5[0] oe</td>
</tr>
<tr>
<td>4(a)(iii)</td>
<td>12.5[0]</td>
<td>3</td>
<td>M2 for 11.25 ÷ 0.9 oe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M1 for recognising 11.25 as 90%</td>
</tr>
<tr>
<td>4(a)(iv)</td>
<td>300 nfww</td>
<td>3</td>
<td>M2 for \frac{200 \times 2 \times 25}{100} + 200 \text{ oe}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or M1 for \frac{200 \times 2 \times 25}{100} \text{ oe} (implied by 100 nfww)</td>
</tr>
<tr>
<td>4(a)(v)</td>
<td>311.72</td>
<td>3</td>
<td>M2 for 190 \times 1.02^{25} oe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or M1 for 190 \times 1.02^n oe where n &gt; 1</td>
</tr>
<tr>
<td>4(b)</td>
<td>17</td>
<td>3</td>
<td>B2 for 16.5 or 16.52 to 16.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or M2 for \log \left( \frac{300}{120} \right) \text{ or appropriate sketch}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or 120 \times 1.057^n = 300 \text{ and at least 2 trials}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>which reach from 250 to 350</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or M1 for 120 \times 1.057^n [= 300]</td>
</tr>
<tr>
<td>5(a)</td>
<td>804 or 804.2 to 804.4</td>
<td>3</td>
<td>M1 for \frac{1}{3} \times 8^2 \times 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M1 for \frac{4}{3} \times 4^3</td>
</tr>
<tr>
<td>5(b)</td>
<td>450 or 449.5 to 449.6…</td>
<td>3</td>
<td>M2 for \pi \times 8 \times \sqrt{8^2 + 16^2}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or M1 for \sqrt{8^2 + 16^2} \text{ or } \pi \times 8 \times \text{their l}</td>
</tr>
</tbody>
</table>
### Question 5(c)

**Answer:** 8.94 or 8.944...

**Marks:** 4

**Part Marks:**

- **B2** for \( PV = 8 \) nfww
- or **M1** for \( \frac{8}{4} = \frac{16}{PV} \) oe
- **M1** for \( OV^2 = 4^2 + PV^2 \)

**OR**

- **B2** for \( l = \sqrt{320} \) oe
- or **M1** for \( l^2 = 8^2 + 16^2 \)
- **M1** for \( \frac{8}{4} = \frac{l}{OV} \) soi

**OR**

- \( x \) is semi-vertical angle of cone
- **M1** for \( \tan x = \frac{8}{16} \) oe
- **M2** for \( \frac{4}{\sin x} \)
- or **M1** for \( \frac{4}{OV} = \sin x \)

### Question 6(a)

**Answer:** Correct sketch

**Marks:** 2

**Part Marks:**

- **B1** for correct shape

### Question 6(b)

**Answer:** (2.17, 0.488) or (2.171..., 0.4877...)

**Marks:** 2

**Part Marks:**

- **B1** for each

### Question 6(c)

**Answer:** 0.488 \( \leq f(x) \leq 1.51 \)

**Marks:** 2

**Part Marks:**

- **FT their** 0.488
- **B1** for 0.488 \( \leq f(x) \) oe or \( f(x) \leq 1.51 \) oe

### Question 6(d)

**Answer:** 0.502 or 0.5015...

**Marks:** 2

**Part Marks:**

- **B1** for each

### Question 6(e)

**Answer:** 0.502 \( < x < 5.83 \)

**Marks:** 1

**Part Marks:**

- **FT their** (d)

### Question 6(f)(i)

**Answer:** 15.0 or 15.00...

**Marks:** 1

**Part Marks:**

- 25.0 or 25.00...
- 35.0 or 35.00...

### Question 6(f)(ii)

**Answer:** [an] asymptote oe

**Marks:** 1
<table>
<thead>
<tr>
<th>Question</th>
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<th>Part Marks</th>
</tr>
</thead>
</table>
| 7(a) | 9.77 or 9.766… | 3 | M2 for \(\frac{8}{\cos 35}\) oe  
or M1 for \(\cos 35 = \frac{8}{AB}\) oe |
| 7(b) | 60.6 or 60.61… | 3 | M2 for \(\frac{6^2 + 9^2 - 8^2}{2 \times 6 \times 9}\)  
or M1 for \(8^2 = 6^2 + 9^2 - 2 \times 6 \times 9 \cos C\) |
| 8(a) | 10 | 1 | |
| 8(b) | 4 | 2 | M1 for \([h(1) = \frac{1}{2}\) or for  
\([gh(x) = 3 + 2\left(\frac{1}{x+1}\right)\) |
| 8(c) | 5x^2 + 12x + 11 | 3 | M1 for \((3+2x)^2 + 1 + x^2 + 1\)  
B1 for \(9 + 6x + 6x + 4x^2\) or better for \((3+2x)^2\) |
| 8(d) | \(\frac{1}{x} - 1\) or \(\frac{1-x}{x}\) oe final answer | 3 | M1 correct first step  
M1 correct second step |
| 8(e)(i) | - 1 | 2 | M1 for \(3 + 2x = 1\) |
| 8(e)(ii) | 5 | 1 | |
| 9(a) | 15, 7, 12 correctly placed | 2 | B1 for two correctly placed  
or M1 for \(41 - (40 - 6)\) seen oe or correct equation |
| 9(b)(i) | 7 | 1 | FT their Venn diagram |
| 9(b)(ii) | 28 | 1 | FT their Venn diagram |
| 9(c) | 15 | 1 | FT their Venn diagram |
| 9(d) | \(\frac{462}{1560}\) oe | 2 | M1 for \(\frac{22}{40} \times \frac{21}{39}\) |
| 9(e)(i) | \(\frac{7}{19}\) | 1 | FT their Venn diagram |
| 9(e)(ii) | \(\frac{168}{342}\) oe | 3 | M2 for \(\frac{7}{19} \times \frac{12}{18} + \frac{12}{19} \times \frac{7}{18}\) oe  
or M1 for one of these products |
| 9(f) | 8 | 3 | M2 for \(\frac{7+n}{40+n} = \frac{5}{16}\) oe  
or M1 for at least two trials |
### Question 9(g)

![Diagram](image)

**Answer**

1

**Marks**

1

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### Question 10(a)(i)

**Answer**

3.0875

**Marks**

2

**Part Marks**

M1 for 2.75, 3.125, 3.5 soi

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### Question 10(a)(ii)

**Answer**

Correct histogram

**Marks**

3

**Part Marks**

B1 correct widths

B1 for two correct heights

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### Question 10(b)(i)

**Answer**

\[
\frac{200}{x} - \frac{200}{x+10} = \frac{20}{60} \quad \text{oe}
\]

**Marks**

B2

**Part Marks**

B1 for \( \frac{200}{x} \) or \( \frac{200}{x+10} \)

M1 i.e. correctly clearing fractions or all over common denominator

\[60 \times 200(x + 10) - 60 \times 200x = 20x(x + 10) \quad \text{oe}\]

\[x^2 + 10x - 6000 = 0 \]

**Marks**

A1

**Part Marks**

completion with at least one interim line and without any errors or omissions

---

### Question 10(b)(ii)

**Answer**

2 h 45 min

**Marks**

4

**Part Marks**

B2 for 72.6 or 72.62…

or M1 for correct use of formula or correct sketch

M1 for \(200 \div \text{their positive } x\), implied by 2.75…..

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### Question 11(a)(i)

**Answer**

\(-a + b\) oe

**Marks**

1

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### Question 11(a)(ii)

**Answer**

\[-\frac{1}{4}a + \frac{1}{4}b\] oe

**Marks**

1

**Part Marks**

FT their (i)

---

### Question 11(a)(iii)

**Answer**

\[\frac{3}{4}a + \frac{1}{4}b\] oe

**Marks**

2

**Part Marks**

B1 for correct unsimplified answer or a correct route

---

### Question 11(b)

**Answer**

\((6.5, 1.5)\)

**Marks**

3

**Part Marks**

FT their (a)(iii)

B2 for \(\begin{pmatrix} 6.5 \\ 1.5 \end{pmatrix}\)

or M1 for \(\frac{3}{4} \times \begin{pmatrix} 8 \\ 0 \end{pmatrix} + \frac{1}{4} \times \begin{pmatrix} 2 \\ 6 \end{pmatrix}\)

OR

B2 for \((5, 3)\) at \(M\) or \([\overline{OM} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}\)

or B1 for \((k, 3)\) or \((5, k)\) at \(M\)

or \([\overline{OM} = \begin{pmatrix} k \\ 3 \end{pmatrix}\) or \(\begin{pmatrix} 5 \\ k \end{pmatrix}\)