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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 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
### Abbreviations
- awrt: answers which round to
- cao: correct answer only
- dep: dependent
- FT: follow through after error
- isw: ignore subsequent working
- oe: or equivalent
- SC: Special Case
- nfww: not from wrong working
- soi: seen or implied

### Question Answer Mark Part Marks

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a) (i)</td>
<td>16000</td>
<td>3 M2</td>
<td>M2 for $13600 \div 0.85$ oe&lt;br&gt;or M1 for $13600 \times 0.85$</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>M1 for $13600 \times 0.89^k$, $k &gt; 1$ oe</td>
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<tr>
<td>(ii)</td>
<td>9590 or 9587 to 9588</td>
<td>3 M2</td>
<td>M2 for $13600 \times 0.89^3$ oe&lt;br&gt;or M1 for $13600 \times 0.89^k$, $k &gt; 1$ oe</td>
</tr>
<tr>
<td>(b)</td>
<td>9 years nfww</td>
<td>3</td>
<td>M2 for $\log\left(\frac{11500}{23000}\right)$&lt;br&gt;or $23000 \times 0.92^n = 11500$ and appropriate&lt;br&gt;sketch or at least 2 valid trials&lt;br&gt;or M1 for $23000 \times 0.92^n = 11500$</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>If 0 scored SC2 for 8 nfww or 8.3(1295..) nfww</td>
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<tr>
<td>2 (a)</td>
<td>$300 \frac{L}{L}$ oe</td>
<td>3 M1</td>
<td>M1 for $f = \frac{k}{L}$ soi oe&lt;br&gt;M1 (Dep on 1st M1) for substituting $f = 93.7$ and $L = 3.2$ soi by 299.8 or 299.84</td>
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<tr>
<td>(b)</td>
<td>107 or 107.0 to 107.1 ...</td>
<td>1FT</td>
<td>FT $\frac{their \ k}{L}$ oe only</td>
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<tr>
<td>(c)</td>
<td>857 or 856.5 to 857.1 ...</td>
<td>2FT</td>
<td>FT $\frac{their \ k}{L}$ oe only&lt;br&gt;M1 for $0.35 = \frac{their \ k}{L}$</td>
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<tr>
<td>3 (a) (i)</td>
<td>Quadrilateral drawn at&lt;br&gt;(–1, –1), (–1, –2), (–3, –1), (–3, –3)</td>
<td>3 M2</td>
<td>M2 for 3 pts correct&lt;br&gt;or M1 for correct reflection of $A$ in $y$-axis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or M1 for correct reflection of $A$ in $y$-axis</td>
</tr>
<tr>
<td>(ii)</td>
<td>Reflection $y = –x$ oe</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>(b) (i)</td>
<td>Quadrilateral drawn at&lt;br&gt;(3, 1), (6, 1), (3, 3), (9, 3)</td>
<td>2 B1</td>
<td>B1 for any stretch with $y$-axis invariant or with&lt;br&gt;stretch factor 3</td>
</tr>
<tr>
<td>(ii)</td>
<td>Stretch, $y$-axis oe invariant&lt;br&gt;(stretch factor) $\frac{1}{3}$</td>
<td>2 B1</td>
<td>B1 for any 2 correct</td>
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<tr>
<td>Question</td>
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</table>
| 4 (a)    | 66000 or 65970 to 65982 | 4    | M1 for \(\frac{4}{3} \times \pi \times 15^3\)  
M1 for \(\pi \times 15^2 \times 40\)  
M1 for \(\pi \times 25^2 \times 12\) |
| (b) (i)  | 16.4   | 1    |              |
| (ii)     | 120    | 3    | M2 for \(15000 \div 5^3\) oe  
or M1 for \(5^3\) or \(\frac{1}{2}^3\) seen |
| 5 (a)    | 4 points plotted correctly | 2    | B1 for 2 or 3 correct |
| (b)      | Positive | 1    | Ignore comments on strength |
| (c) (i)  | 75     | 1    |              |
| (ii)     | 16.6   | 1    |              |
| (d) (i)  | \(0.168t + 3.96\) | 2    | B1 for \(n = mt + c\) with either \(m\) or \(c\) correct  
or SC1 for \(0.17t + 4[.0]\) |
| (ii)     | 18     | 1FT  | FT from their equation with \(t = 85\), answer  
rounded or truncated to nearest whole number |
| 6 (a)    | \(3n + 2\) oe final answer | 2    | B1 for \(3n + k\) or \(kn + 2\) oe |
| (b)      | \(-3, 4, 15, 30\) | 2    | B1 for 2 or 3 correct in correct place or \(-6, -3, 4, 15\) |
| (c)      | \(2n - 3\) oe final answer | 3    | M2 for \((2n - 3)(n + 2)\)  
or SC1 for \((2n + a)(n + b)\) where \(ab = -6\) or \(a + 2b = 1\)  
OR  
B1 for \(-1, 1, 3, 5\)  
B1 for answer \(2n + k\) or \(kn - 3\)  
Dependent on \(5n - 1\)  
M1dep for their \((3n + 2) + their\ (2n -3) = 501\) oe  
Dep on \(5n - 1\) |
| (d)      | No and e.g. 502 not a multiple of 5 oe  
nfww | 2    | Dep on \(5n - 1\)  
M1dep for their \((3n + 2) + their\ (2n -3) = 501\) oe  
Dependent on (a) and (c) linear |
| 7 (a)    | 19.9 or 19.89 to 19.90 | 3    | M2 for \(36^2 - 30^2\) soi by 396  
or M1 for \(AD^2 + 30^2 = 36^2\) oe |
| (b)      | \(30 \div \tan 68\) oe | M2   | M1 for \(\tan 68 = \frac{30}{AC}\) oe |
|          | 12.12... | A1   |          |
| (c)      | 301 or 301.3 to 301.4  
or 239 or 238.6 to 238.7 | 3    | B2 for 31.3 or 31.30 to 31.35  
or M1 for \(\tan = 12.1 \div their\ (a)\) oe |
### Question 8
#### (a) (i)
Correct sketch

- **Mark**: 2
  - **Part Marks**: B1 RH branch through (0, 0), with asymptote \( x = a \) (–ve \( a \))
  - **Part Marks**: B1 for LH branch symmetrical, with asymptote \( x = a \) (–ve \( a \))

#### (ii)

- **Mark**: 1

#### (iii)

- **Mark**: 1

#### (b) (i)
Correct sketch

- **Mark**: 2
  - **Part Marks**: B1 for correct shape

#### (ii)

- **Mark**: 1

#### (iii)

- **Mark**: 1
  - **Part Marks**: Independent

### Question 9
#### (a)
1 hour 20 minutes cao

- **Mark**: 3
  - **Part Marks**: M1 for 65 ÷ 48.75
  - **Part Marks**: M1 for correctly converting their time in hours to hours and mins

#### (b)
140 or 140.4 to 140.5

- **Mark**: 5
  - **Part Marks**: M1 for 632 ÷ 65 [km] soi by 697
  - **Part Marks**: M1 for their 697 ÷ 119.5 soi by 5.83...
  - **Part Marks**: M1 for subtracting their 1.33...(from (a))
  - **Part Marks**: M1 for 632 ÷ (their 4.4993)

#### (c)
27.9

- **Mark**: 3
  - **Part Marks**: M2 for \( \frac{800 + 130}{120 \times \frac{1000}{60 \times 60}} \) oe
  - **Part Marks**: or M1 for distance ÷ speed
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| 10 (a)   | 8.94 or 8.944... or $4\sqrt{5}$ | 3 | M2 for $8^2 + 4^2$  
M1 for 8 and 4 seen |
|          | (b) Gradient of $AB = \frac{1}{2}$ oe | 1 |  |
|          | Gradient of perpendicular = $-2$ oe  
y = (their $-2)x + c$  
midpoint (2, 1)  
Substitute (2, 1) to reach $c = 5$ | 1FT | May be on diagram |
|          | OR $(x + 2)^2 + (y + 1)^2$ oe  
$(x - 6)^2 + (y - 3)^2$ oe  
equating above two expressions  
3 correct expansions  
correct completion with no errors or omissions | B1 |  |
|          | (c) $\left(\frac{5}{3}, \frac{5}{3}\right)$ oe | 2 | M1 for $x + 2x = 5$ oe |
| 11 (a)   | $9^2 = (3x - 1)^2 + (2x)^2$  
$-2(2x)(3x - 1) \cos 60$ oe  
$81 = 9x^2 - 6x + 1 + 4x^2 - 6x^2 + 2x$ oe | M1 |  |
|          | $7x^2 - 4x - 80 = 0$  
$x = 3.68$ or $3.678...$  
or $-3.11$ or $-3.107$ to $-3.106$  
$\frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 7 \times (-80)}}{2 \times 7}$ oe | A2 | or B1 for $9x^2 - 3x - 3x + 1$  
A1 | Completion with no errors or omissions |
|          | (b) (i) $[-4] \pm \sqrt{(-4)^2 - 4 \times 7 \times (-80)}$ oe | M1 | or sketch of quadratic graph (any relevant one) with 1 positive root and 1 negative root |
|          | $x = 3.68$ or $3.678...$  
or $-3.11$ or $-3.107$ to $-3.106$ | B2 | B1 for either |
|          | (ii) $[AB =] 7.36$ or $7.356$ to $7.357$  
$[BC =] 10[.0]$ or $10.03$ to $10.04$ | 1FT | FT 2 x a positive root |
<p>|          | (c) $31.9$ or $32[.0]$ or $31.85$ to $32[.00]$ | 2FT | M1 for $\frac{1}{2} \times their AB \times their BC \sin 60$ oe |</p>
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<tbody>
<tr>
<td>12 (a)</td>
<td>63.6</td>
<td>2</td>
<td>M1 for midpoints (47.5, 52.5, 57.5, 62.5, 67.5, 72.5, 77.5) soi</td>
</tr>
<tr>
<td>(b)</td>
<td>Correct Curve</td>
<td>5</td>
<td>B4 for 5 points correct and joined or for 6 points correct or B3 for at least 3 correct points or B2 for all correct cfs 5, 24, 58, 116, 162, 191, 200 seen or B1 for at least 3 correct cfs or for increasing curve with 6 points plotted at upper bounds</td>
</tr>
<tr>
<td>(c) (i)</td>
<td>63 to 64</td>
<td>1</td>
<td>Dependent on increasing curve</td>
</tr>
<tr>
<td>(ii)</td>
<td>8.5 to 10.5</td>
<td>2</td>
<td>B1 for [l.qtile. = ] 58.5 to 59.5 or [u.qtile. = ] 68 to 69 Dependent on increasing curve</td>
</tr>
<tr>
<td>(d) (i)</td>
<td>12 to 16</td>
<td>1FT</td>
<td>FT (their 'read off' at 53)/200 dep on increasing cfs</td>
</tr>
<tr>
<td>(ii)</td>
<td>72/39800 oe</td>
<td>2</td>
<td>M1 for ( \frac{k}{200} \times \frac{k-1}{199} ) where ( k = 8, 9 ) or 10</td>
</tr>
<tr>
<td>13 (a) (i)</td>
<td>2.25 oe</td>
<td>2</td>
<td>M1 for ( 1 = 2(5 - 2x) ) or ( 5 - 2x = \frac{1}{2} ) oe</td>
</tr>
<tr>
<td>(ii)</td>
<td>(-5 + 4x ) final answer</td>
<td>2</td>
<td>B1 for ( 5 - 2(5 - 2x) )</td>
</tr>
<tr>
<td>(iii)</td>
<td>( \frac{5-x}{2} ) oe final answer</td>
<td>2</td>
<td>M1 for ( 2x = 5 - y ) or ( x = 5 - 2y ) or ( \frac{y}{2} = \frac{5}{2} - x )</td>
</tr>
</tbody>
</table>