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January 2012
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<th>Answer</th>
<th>Mark</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1. (a)</td>
<td>$\frac{7}{32} \times 100$ oe</td>
<td>21.9</td>
<td>2</td>
<td>M1 A1 (21.875) accept awrt to 21.9</td>
</tr>
<tr>
<td>(b)</td>
<td>$\frac{4}{100} \times 32 (=1.28)$ or $\frac{4}{100} \times 32000000 (=1280000)$ or $32 + &quot;1.28&quot;$ or $32000000 + &quot;1280000&quot;$</td>
<td>33</td>
<td>3</td>
<td>M1 M2 for $32 \times 1.04$ oe or $32000000 \times 1.04$ oe M1 (dep) A1 (33.28) accept 33.3, 33000000, 33300000, 33280000</td>
</tr>
<tr>
<td>2.</td>
<td>$\frac{2}{5} \times 30$</td>
<td>12</td>
<td>2</td>
<td>M1 A1 12 out of 30 = M1A1 12/30 = M1A0</td>
</tr>
<tr>
<td>3.</td>
<td>$\pi \times 7.5^2 \times 26$</td>
<td>4590</td>
<td>3</td>
<td>M2 M1 for $\pi \times 15^2 \times 26$ or 18369 → 18386 inc A1 (4594.579...) accept answers 4592 → 4597 inc</td>
</tr>
<tr>
<td>4.</td>
<td>Arcs of length 6cm from A and B Arc of length 10cm from A or B Arc of length 6cm from correct top vertex Correct rhombus within overlay tolerance</td>
<td>4</td>
<td>4</td>
<td>M1 M1 M1 A1 Dependent on M3 sc B1 for correct rhombus with no construction lines.</td>
</tr>
<tr>
<td>5. (a)</td>
<td>$a(5 - 3a)$</td>
<td>2</td>
<td>B2</td>
<td>B1 for factors which when expanded &amp; simplified give 2 terms for which one is correct.</td>
</tr>
<tr>
<td>(b)</td>
<td>(i) $8 - 6w$</td>
<td>1</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) $y^2 + 10y^2$</td>
<td>2</td>
<td>B2</td>
<td>B1 for $y^2$ or $10y^2$</td>
</tr>
<tr>
<td>(c)</td>
<td>7.168 / 0.64</td>
<td>11.2</td>
<td>2</td>
<td>B2 B1 for 7.168 or 0.64</td>
</tr>
</tbody>
</table>

Total 5 marks

Total 2 marks

Total 3 marks

Total 4 marks

Total 7 marks
6. (a) (i) Does not study Maths
   No student studies (both) German and Maths
   Students who study German do not study Maths etc

(b) 1, 2, 3, 4 2 B2 B1 for any 3 correct with no repetitions or additions.

Total 4 marks

7. (a) 9 to 11 1 B1

(b) (i) \((1 \times 3) + (4 \times 6) + (7 \times 10) + (10 \times 15) + (13 \times 5) + (16 \times 1) = 328\)

\[
328 \div (3+6+10+15+5+1) = 8.2
\]

M2 All products, \( \times \) \( \times \) using \( \frac{1}{2} \) way points correctly, and intention to add.
Award M1 if all products, \( \times \) \( \times \) using their \( \frac{1}{2} \) way points consistently, from 6 to 8 interval onwards and intention to add.
M1 (dep on one at least M1)
A1 Accept 8 with working. 8 without working = M0A0

(ii) Mid-points used as actual data is unknown

1 B1 Mention of mid-points or exact (actual) data is unknown.

Total 6 marks

8. (a) \(x/60\) oe 1 B1 Must be a fraction or 0.016 rec \(x\)

(b) (i) \(2(\frac{x}{60}) = \frac{x+20}{80}\)

\(16(0) \cdot x = 6(0)(x + 20)\)
\(or \ 80 \cdot x = 30(x + 20)\)
\(or 2\times3 = (x + 20)/4\)

M2 (must be an equation) M1 for either \(2(\frac{x}{60})\) or \(\frac{x+20}{80}\)
A1 dep Correct removal of denominators.
Correct removal of denominators.
Simplifying denominators.

(ii) \(8x = 3x + 60\) or \(5x = 60\) or \(60\div 5\)

12 2 M1
A1 Dependent on M1. Can be marked if seen in b(i)

Total 6 marks
9. (a) Use of sine or \( \frac{\sin x}{3.4} = \frac{\sin 90}{5.8} \)
\( \sin "x" = \frac{3.4}{5.8} (=0.586..) \)
\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & M1 \\
& & \text{Sine must be selected for use.} \\
& & M1 \\
& & \text{A1 (35.888...) Use isw on awrt 35.9} \\
35.9 & 3 & \\
& & \\
& & \\
& & B1 accept 5.849 rec \\
& & B1 \\
5.85 & 1 & \\
& & \\
& & \\
& & B1 \\
5.75 & 1 & \\
& & \\
& & Total 5 marks \\
\hline
\end{array} \]

(b) (i) 5.85 1 B1 accept 5.849 rec
(ii) 5.75 1 B1

Total 5 marks

10. \( \frac{6}{100} \times 7500 (=450) \) {Ist Year} or \( 1.06 \times 7500 (=7950) \)
“450” + “477” + “505.62”
\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & M1 \\
& & \text{M2 for 1.06}^2 \times 7500 (=8932.62) \\
& & M1 \\
& & \text{Calculating 6% of previous capital for another 2 years.} \\
& & A1 \\
& & \text{M1A0 for 1350 or 8850} \\
1432.62 & 3 & \\
& & \\
& & \\
& & Total 3 marks \\
\hline
\end{array} \]

11. \( 3y + 6x - 3 = x + 5y \)
\( 5x - 3 = 2y \) oe
\( (5x - 3)/2 \)
\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & M1 \\
& & \text{Multiplying out brackets.} \\
& & M1 \\
& & \text{dep Correctly collecting like terms, (3 terms needed here).} \\
& & A1 oe \\
& & \\
& & \\
& & Total 3 marks \\
\hline
\end{array} \]

12. (a) 6/9 x 12 oe

\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & M1 \\
& & \text{e.g 12 ÷ 1.5} \\
& & A1 \\
& & \\
& & \\
& & Total 7 marks \\
\hline
\end{array} \]

(b) 9/6 (or 12/“8”) x 5

\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & M1 \\
& & A1 cao \\
& & \\
& & \\
& & Total 7 marks \\
\hline
\end{array} \]

(c) 1.5^2 \times 32 (=72) oe
“72” – 32

\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & M1 \\
& & \text{M1 for 1.5}^2 \text{ or } (2/3)^2 \\
& & M1 dep \\
& & A1 \\
& & \\
& & \\
& & Total 7 marks \\
\hline
\end{array} \]

13. (a) (i) Angles in same segment (are equal)

\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & B1 \\
& & \text{Accept “from same chord”, “on same arc”.} \\
& & \\
& & \\
& & Total 4 marks \\
\hline
\end{array} \]

(ii) \( \text{Angle at centre/middle is not 2 x angle at circumference / edge / perimeter / arc} \)
or \( \text{Angle PQT ≠ QPT or PRS ≠ RSQ (oe) or 34 ≠ 41} \)

\[ \begin{array}{|c|c|c|}
\hline
& & \\
\hline
& & B1 \\
& & \text{Accept 75 ≠ 2 x 41 or 75 ≠ 2 x 34} \\
& & \text{or using idea of isosceles triangles but must mention angles.} \\
& & \\
& & Total 4 marks \\
\hline
\end{array} \]

International GCSE Mathematics (4MA0) Paper 3H January 2012
### Question 14

<p>| | | | | | | | | | | |</p>
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<tbody>
<tr>
<td>14. (a)</td>
<td>( y = 36 - x )</td>
<td></td>
<td></td>
<td></td>
<td>M2</td>
<td>M1 for ( x + y = 36 ) oe or ( 2y = 72 - 2x )</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>((\text{Area }) = x (36 - x))</td>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td>Must see ( x ) times ((36 - x)) dep on M2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>14. (b)</td>
<td>( (dA/dx) = 36 - 2x )</td>
<td></td>
<td></td>
<td></td>
<td>B1</td>
<td>B1 for ( 36 ) B1 for (-2x)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( x = 36 - 2x = 0 )</td>
<td></td>
<td></td>
<td></td>
<td>M1</td>
<td>allow ft only on ( a + bx ) (( a,b \neq 0 ))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( x = 18 )</td>
<td></td>
<td></td>
<td></td>
<td>A1ft</td>
<td>A1ft</td>
<td></td>
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**Total 8 marks**

### Question 15

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</thead>
<tbody>
<tr>
<td>15. (a)</td>
<td>( F = \frac{k}{d^2} )</td>
<td></td>
<td></td>
<td></td>
<td>M1</td>
<td>k = letter not number.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>( 12 = k/2^2 )</td>
<td></td>
<td></td>
<td></td>
<td>M1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( k = 48 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>( F = 48/d^2 )</td>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td>Award 3 marks for ( F = \frac{k}{d^2} ) and ( k = 48 ) stated anywhere, unless contradicted by later work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. (b)</td>
<td>( (F = ) \frac{48}{5^2} )</td>
<td></td>
<td></td>
<td></td>
<td>1.92 oe</td>
<td></td>
<td>B1</td>
<td>ft ( k \neq 1 ) accept 48/25 as an answer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. (c)</td>
<td>( 3 = \frac{48}{d^2} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>k \neq 1</td>
<td>A1</td>
<td>Rearrangement to make ( d^2 ) or ( d ) the subject</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( d^2 = \frac{48}{3} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ignore ( \pm )</td>
<td></td>
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**Total 6 marks**

### Question 16

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<tbody>
<tr>
<td>16. (a)</td>
<td>( 10 \times 3 ) or ( 15 \times 2 ) or ( 12 \times 7.5/3 )</td>
<td></td>
<td></td>
<td></td>
<td>M1</td>
<td>or any correct fd in correct position and no errors, or 1 sq = 2 (runners) indicated.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>16. (b)</td>
<td>Missing blocks = 6cm, 10cm, 2cm</td>
<td></td>
<td></td>
<td></td>
<td>B2</td>
<td>3 correct blocks</td>
<td>B1</td>
<td>1 or 2 correct blocks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>16. (c)</td>
<td>( 0.6 \times 20 + 0.8 \times “30” ) or ( 3 \times “4” + 8 \times “3” ) or ( 450 \times 0.08 )</td>
<td>36</td>
<td></td>
<td></td>
<td>M1</td>
<td>(partitioning blocks) ((\text{time x fd's})) {must see clear evidence that fd values used}. 450 small squares.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td>cao</td>
<td></td>
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**Total 6 marks**

### Question 17

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<tbody>
<tr>
<td>17.</td>
<td>( x = 0.1777... ) and ( 10x = 1.777.. )</td>
<td></td>
<td></td>
<td></td>
<td>M1</td>
<td>Accept ( 10x = 1.777.. ) and ( 100x = 17.77.. )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( 9x = 1.6 )</td>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td>Must be integers in numerator and denominator but not 8 &amp; 45 (\text{N.B for } 0.1777 = 1/10 + 0.0777.. ) ((0.777 \text{ needs to be shown to be } 7/90 \text{ to gain first M1}))</td>
<td></td>
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</table>

**Total 2 marks**
| 18. | AOC = 70°
“70°/360 π x 9^2 (=49.48..)
0.5 x 9^2 x sin “70” = (38.057..)
49.48.. or 38.057...
“49.48..” – “38.057..” | B1 Could be marked on diagram.
M1ft Area of sector.
M1ft Area of triangle. Follow through angles must be the same.
A1 Either area correct to 3 sf
M1 dep on both previous M1’s
A1 (11.42253...) awrt 11.4 |
<table>
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<tbody>
<tr>
<td></td>
<td></td>
<td>11.4 6</td>
</tr>
<tr>
<td><strong>Total 6 marks</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 19. | (√3 + 3√3)/√2
4√3/√2
2√6 or (√48/√2) | M1 Must see √27 reduce to 3√3 alternative \( \frac{\sqrt{6} + \sqrt{3}}{2} \) (or better)
M1 dep on 1st M1
A1cao dep on M2 Accept √24 if M2 awarded. |
| | | 24 3 |
| **Total 3 marks** | | |
| 20. | \( \frac{4(2-x) + 3x}{x(2-x)} \) oe
8 – 4x + 3x
\( \frac{8-x}{x(2-x)} \) | M1
M1
A1 Accept \( \frac{8-x}{2x-x^2} \) Single fraction needed as final answer. |
| | | 3 |
| **Total 3 marks** | | |
21. (a) \[0.5x[(x + 5) + (x + 8)] = 42 \] (trapezium formula) or \[x(x + 5) + 0.5x(x + 3) = 42 \] (partitioning) 
\[x(2x + 13) = 84\] or \[x^2 + 5x + 1.5x = 42\]

- **M1**
  - dep on 1st M1 then needs to develop on to quadratic given.

(b) \[(2x + 21)(x - 4) = 0\] (oe)

\[x = 4\]

(P=) "4" + "9" + "12" + \(\sqrt{3^2 + 4^2}\)

- **B2** B1 for either factor correct or \((2x \pm 21)(x \pm 4)\)
  - or M1 for \(x = \frac{-13 \pm \sqrt{169 + 672}}{4}\) (condone 1 sign error)
  - then M1 for \(x = \frac{-13 \pm \sqrt{169 + 672}}{4}\)

- **A1** dep on M1 or B2

- **M1** i.e \(x + (x + 5) + (x + 8) + \sqrt{(3^2 + x^2)}\) in numeric form.

A1cao (Last two marks independent)

N.B. Working for solving quadratic could be seen in (a) if not contradicted in (b).

**Total 7 marks**