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### International GCSE Maths June 2011 – Paper 4H Mark scheme

Apart from questions 5b, 8, 15d, 20b, 21b, 23, 24b (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply correct working.

<table>
<thead>
<tr>
<th>Question</th>
<th>Working</th>
<th>Answer</th>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$\frac{15}{100} \times 640 = 96$ 640 – “96”</td>
<td>544</td>
<td>M1</td>
<td>M1 dep or M2 for 640 x 0.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M1 dep</td>
<td>or M2 for 640 x 0.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 3 marks</td>
</tr>
<tr>
<td>2.</td>
<td>(a) 120 – 90 (=30)</td>
<td>30/120 oe</td>
<td>2</td>
<td>M1 or 1 – 90/120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) “30/120” X 200 oe</td>
<td>50</td>
<td>M1 ft</td>
<td>or 200 – “90/120” x 200 (i.e. 200 – “heads”/120 x 200)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M1 ft</td>
<td>or 200 – “90/120” x 200 (i.e. 200 – “heads”/120 x 200)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1 ft</td>
<td>ft if final ans &lt; 200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 4 marks</td>
</tr>
<tr>
<td>3.</td>
<td>$15 \div 6$ (≈2.5) or $6 \div 15$ (≈0.4)</td>
<td>apples = 575 &amp; raspberries = 500</td>
<td>M1</td>
<td>i.e “correct” calculation for apples OR raspberries</td>
</tr>
<tr>
<td></td>
<td>or $230 \div 6$ (≈38.33) or $200 \div 6$ (≈33.33)</td>
<td></td>
<td>M1 dep</td>
<td>(i.e “correct” calculation for apples OR raspberries)</td>
</tr>
<tr>
<td></td>
<td>or $6 \div 230$ (≈0.026) or $6 \div 200$ (≈0.03)</td>
<td></td>
<td>M1</td>
<td>(i.e “correct” calculation for apples OR raspberries)</td>
</tr>
<tr>
<td></td>
<td>$230 \times “15/6”$ or $200 \times “15/6”$ oe</td>
<td></td>
<td>A1 cao</td>
<td>both correct</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SC M1M1A0 if answers wrong way round with/without working</td>
<td></td>
</tr>
</tbody>
</table>
4. \[72 \div 1\frac{1}{3} \text{ oe} \]

\[54 \text{ oe} \]

B1M1 accept \(72 \div 1.33\) (2dp or better) or 0.9 x 60 (B1 M0 for \(72 \div 1.2(0)=60\) or \(72 \div 80 \approx 0.9\) or \(72 \div 1.3 = 55.4\) or better)) or \(72000 \div 1.33\) (or better)

A1 cao

Total 3 marks

5. (a) (i) \(a^6\)

\[\text{B1 not a4 accept upper case A} \]

(a) (ii) \(30ab\)

\[\text{B1 accept ab30, 30ba, a30b, b30a (no x signs allowed)} \]

\[\text{accept upper case A and/or B} \]

(a) (iii) \(q^6\)

\[\text{B1 accept upper case Q} \]

(b) \(5 - 12 = 2\) y oe

\[-3.5 \text{ oe} \]

M1 or \(5 - 12 \div 2\) or \(12 - 5 \div -2\)

A1 ans dependent on M1 (above numerical methods acceptable)

(c) \(6^2 - 2 \times 6\) oe

\[24 \text{ oe} \]

M1 accept 36 - 12

A1

Total 7 marks

6. (a) \(\frac{1}{2} (6+8) \times 5\) or \(\frac{1}{2} \times 2 \times 5 + 6 \times 5\)

\[35 \text{ oe} \]

B1M1 could be seen on diagram

\(\theta = \tan^{-1}(\frac{6}{8-6}) = 68.2\) or better

M1 (dep) \(\theta = \tan^{-1}(\frac{5}{8-6}) = 68.2\) or better

M1 (dep) \(\theta = \tan^{-1}(\frac{6}{8-6}) = 68.2\)

A1 5.38516..... awrt 5.39

Total 6 marks

7. \(6 \times 5 \approx 30\) or \(3 + 2 + 7 + 6 + 2 = 20\)

or \((3+2+7+6+2 + "x")/6=5 + "x")/6=5\)

"30" - "20"

\[10 \text{ oe} \]

M1

M1 dep

A1

Total 3 marks

International GCSE Mathematics (4MA0) Paper 4H Summer 2011
### Question 8
Intersecting arcs from P and Q
Perpendicular bisector joining both arcs
| 2 | B1 | arcs must intersect above and below line PQ |
| 2 | B1 dep |
| **Total 2 marks** |

### Question 9
1. (i) 136.5 1 B1
2. (ii) 137.5 or 137.49 recurring or 137.499.. 1 B1 dot above 9 for recurring or 137.499.... (i.e. .499 or better)
| **Total 2 marks** |

### Question 10
3 or more correct factors of which 2 are from 2,3,3,7
E.g. 2 x 3 x 7 or 2, 3, 7 must multiply to 126
could be implied from a factor tree or division ladder
| 2 | M1 | could be implied from a factor tree or division ladder |
| 3 | A1 | any order, do not accept inclusion of 1’s must be a product on answer line (dots or crosses) |
| **Total 3 marks** |

### Question 11
Use of sin 42 or cos (90 – 42)
9.3 x sin 42 or 9.3 cos (90 – 42)
| 6.22 | M1 | 9.3² – (9.3 cos 42)² (=38.72..) |
| 2 | M1 | √("38.72..") (M1 dep) |
| 6.22awrt 6.22 | A1 | 6.22(2914...) |
| **Total 3 marks** |

### Question 12
1. (i) 2x ≥ 6 – 13 oe
x ≥ –3.5 oe 2
| M1 | Condone 2x > 6 – 13 oe |
| A1 | mark response on answer line (do not isw) |
| correct answer with no working = M1A1 |
2. (ii) –3, –2, –1 2 B2 any order B1 for –3, –2, –1, 0
| **Total 4 marks** |

### Question 13
(a) Earth 1 B1 or 1.28 x 10⁷
(b) 6790000 1 B1
(c) 1.21 x 10⁷ – 4.88 x 10⁶ oe
| 7.22 x 10⁶ | M1 | or sight of digits 722 |
| A1 | **Total 4 marks** |
### Question 14

<table>
<thead>
<tr>
<th>14.</th>
<th>( 7 \times 3^2 )</th>
<th>( 63 )</th>
<th>( 2 )</th>
<th>( M1 ) for ( 3^2 ) or ( 9 ) or ( \frac{1}{9} ) or ( \left( \frac{1}{3} \right)^2 )</th>
<th>( A1 )</th>
</tr>
</thead>
</table>

**Total 2 marks**

### Question 15

<table>
<thead>
<tr>
<th>(a)</th>
<th>Correct cancelling 8 &amp; 4 or brackets</th>
<th>( 2(x - 3) ) oe</th>
<th>( 2 )</th>
<th>( M1 )</th>
<th>( A1 )</th>
</tr>
</thead>
</table>

| (b) | \((a + 12)(a - 12)\) oe | \( (a + 12)(a - 12) \) | \( 2 \) | \( B2 \) | \( B1 \) for \((a±12)(a±12)\) |

| (c) | \( p + 5r \) \( (=Vq) \) | \((p+5r)^2 \) oe | \( 2 \) | \( M1 \) | \( A1 \) do not isw (e.g. proceed onto \( p^2 + 25r^2 \)) |

| (d) | \( 4 = 5(y - 4) \) oe | \( 4 = 5(y - 4) \) oe | \( 4.8 \) oe | \( 3 \) | \( M1 \) or \((y-4)/4 = 1/5\) |

**Total 9 marks**

### Question 16

| (i) | \( 120, 100 \) | \( 120, 100 \) | \( 2 \) | \( M1 \) | \( A1 \) |

| (ii) | Blocks at 5, 1, 2 squares | Blocks at 5, 1, 2 squares | \( 2 \) | \( B1B1 \) for all 3 correct blocks, \( B1B0 \) for 1 or 2 correct blocks. |

**Total 4 marks**

### Question 17

| (a) | \( \frac{7}{8} \) for not late \( \frac{8}{8} \) Correct binary structure ALL labels and values correct | \( \frac{15}{64} \) | \( 3 \) | \( B1 \) on lower first branch \( B1 \) 4 branches needed on RHS | \( A1 \) |

| (b) | \((1/8) \times \( (7/8) \) or \((7/8) \times \( 1/8) \) or \((1/8) \times \( 1/8) \) | \( 1/8 \times \( (7/8) \) + \((7/8) \times \( 1/8) \) +\( (1/8) \times \( 1/8) \) | \( 15 \) \( 64 \) | \( 3 \) | \( M1 \) ft \( \) Any 1 “correct” product \( M1 \) ft \( 3 \) “correct” products with intention to add. Only ft probabilities < 1 or \( M2 \) for \( 1 - \left( \frac{7}{8} \right)^2 \) \( A1 \) cao (0.234375) |

**Total 6 marks**
### 18.

\[
x = 0.396396...
\]

\[
1000x = 396.396...
\]

\[
999x = 396
\]

\[
\frac{44}{111}
\]

2

A1 must reach \(\frac{396}{999}\) or equivalent fraction (but not \(\frac{44}{111}\))

**Total 2 marks**

### 19.

\[
\frac{AB}{\sin 28} = \frac{10.2}{\sin 134}
\]

\[
(AB =) \sin 28 \times \frac{10.2}{\sin 134}
\]

6.66

3

M1

M1 isolate AB correctly (14.17 or 14.18 or 14.2 for \(\frac{10.2}{\sin 134}\))

A1 (6.65695....) awrt 6.66

**Total 3 marks**

### 20.

(a) \( (x=0)\)

1

B1 Accept \((x)\neq 0\)

(b)

\[
\left(\frac{2}{a} + 1\right) / \frac{2}{a} = 3
\]

\[
\frac{2}{a} + 1 = \frac{6}{a} \text{ or } 1 + \frac{a}{2} = 3 \text{ oe}
\]

4

M1 (Any letter in place of \(a\) acceptable) Solve \(g(x)=3\) \((x=0.5)\)

M1 Solve \(f(a)=0.5\)

A1 dep on M2

(c)

\[
y = \frac{x+1}{x}
\]

\[
x(y-1) = 1
\]

\[
x = \frac{1}{y-1}
\]

\[
\frac{1}{x-1}
\]

3

A1 reverse labels \(x\) and \(y\)

**Total 7 marks**
### Question 21

**Part (a)**

\[
\frac{(600+5x)-50x}{50} \times 100 = x \text{ oe}
\]

\[
100(600 +5x - 50x) = 50x^2 \text{ oe}
\]

\[
2(600-45x) = x^2 \text{ oe (but not ans)}
\]

50x \times \left[ 1 + \frac{x}{100} \right] = 600 + 5x \text{ oe}

5000x + 50x^2 = 60000 + 500x

x^2 = 1200 - 90x

\[
M1 \quad \frac{\text{actual profit}}{\text{original}} \times 100 = x
\]

\[
\frac{(600+5x)}{50} -1 \times 100 = x \text{ oe}
\]

\[
M1 \quad \text{dep (removing denominator)}
\]

\[
(600 +5x - 50x) \times 100 = 50x^2
\]

\[
1200 - 90x = x^2
\]

\[
M1 \quad \text{dep on M2}
\]

\[
(600 +5x - 50x) \times 100 = 50x^2
\]

\[
1200 - 90x = x^2
\]

**Part (b)**

\[
-90 \pm \frac{\sqrt{90^2 - 4 \times 1 \times (-1200)}}{2}
\]

\[
\begin{align*}
x &= \frac{-90 \pm \sqrt{8100 + 4800}}{2} \\
x &= \frac{-90 \pm \sqrt{12900}}{2}
\end{align*}
\]

\[
x = \frac{-90 \pm 113.9}{2}
\]

\[
x = 11.789 \ldots
\]

\[
M1 \quad \text{condone 1 sign error (working can be seen in part a)}
\]

\[
\text{sign error} = +90 \text{ instead of } -90 \text{ or } +1200 \text{ instead of } -1200
\]

\[
M1
\]

\[
A1 \quad \text{awrt 11.8 (ignore negative root)}
\]

**Total 6 marks**

### Question 22

**Part (a)**

\[
\text{(AC}^2 =) \quad 5^2 + 7^2 \quad (=74)
\]

\[
\text{(AG}^2 =) \quad “74” + 3^2 \quad (=83)
\]

\[
\text{(AG =) } \sqrt{”83”}
\]

\[
M1 \quad \text{or AC} = 8.6 \ldots \quad \text{or (BG}^2 =) \quad 3^2 + 7^2 \quad (=58) \quad \text{or (AF}^2 =) \quad 3^2 + 5^2 \quad (=83)
\]

\[
\text{(AG}^2 =) \quad “58” + 5^2 \quad (=83)
\]

\[
M1 \quad \text{ft (dep on M1)} \quad \text{M1M1 for } \sqrt{(5^2 + 7^2 + 3^2)}
\]

\[
A1 \quad \text{awrt 9.11}
\]

**Part (b)**

\[
\sin \theta = \frac{3}{\sqrt{”83”}}
\]

\[
19.2 \quad 2
\]

\[
M1 \quad \text{or } \cos \theta = \sqrt{”74”}/\sqrt{”83”} \quad \text{or } \tan \theta = \frac{3}{\sqrt{”74”}}
\]

\[
\text{or } \cos \theta = \frac{”74” + ”83”}{9 \times \sqrt{”74”} \times \sqrt{”83”}}
\]

\[
A1 \quad \text{awrt 19.2 or 160.8}
\]

**Total 5 marks**
### Question 23

**Expression:**
\[\sqrt{8 \times 6} + \sqrt{18 \times 6} + (2\sqrt{2} \times \sqrt{6}) + (3\sqrt{2} \times \sqrt{6})\]

**Simplified Expression:**
\[\sqrt{2} \times \sqrt{12} + \sqrt{6} \times \sqrt{6} + \sqrt{2} \times \sqrt{6} + \sqrt{2} \times \sqrt{6}\]

**Simplified:**
\[\sqrt{50} + \sqrt{2} \times \sqrt{6} + \sqrt{2} \times \sqrt{6} + \sqrt{2} \times \sqrt{6}\]

**Mark Scheme:**
- M1: or \(\sqrt{(16 \times 3)} + \sqrt{(36 \times 3)} = 10\sqrt{3}\)
- A1: dep on at least 1 M1 sight of decimals used in working loses M marks at that stage and A mark
- or \(\sqrt{(4 \times 12)} + \sqrt{(9 \times 12)} = 5\sqrt{12}\)

**Total 3 marks**

### Question 24

**Part (a) (i)**
- **Expression:** \(b \times b \times b = a \times b \times b \times b\)
- **Mark:** 4b

**Part (a) (ii)**
- **Expression:** \(a + b\)
- **Mark:** 1 B1

**Part (a) (iii)**
- **Expression:** \(3b - a\)
- **Mark:** 1 B1

**Part (b)**
- **Expression:**
  - \(TS = \frac{1}{5}(a + b) + 3b - a\)
  - \(QT = -a + 4/5(a + b)\)
- **Mark:** 4b

**Part (b)**
- **Expression:**
  - \(TS = -4/5a + 16/5b\)
  - \(QT = -1/5a + 4/5b\)
  - \(TS = 4/5(-a + 4b)\) and \(QT = 1/5(-a + 4b)\)
- **Mark:** k=4

**Mark Scheme:**
- M1 for any correct route from T to S or from Q to T using capitals or lower case.
- M1 for both correct simplified routes from T to S and Q to T (must be lower case vectors here)
- A1 dep on B1 in aii) and aiii) and at least M1

**Total 6 marks**

**Total for Paper: 100 Marks**
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