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 must be read in conjunction with the question papers and the report on the examination.

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Abbreviations

cao  correct answer only
cso  correct solution only
dep dependent
ft follow through after error
isw ignore subsequent working
oe  or equivalent
SC  Special Case
www without wrong working

1 (a)  ($) 450  B2  M1 for $650 \div (9 + 4) \times 9$
(\div 14 \text{ does not imply } 9 + 4)

1 (b)  (i)  ($) 120  B2  M1 for $0.8 \times 150$ o.e.

1 (b)  (ii)  ($) 80 \text{ ft}  B2 \text{ ft}  M1 \text{ for } (150 - \text{ their (b)(i)}) \div 0.375 \text{ o.e. only if } +\text{ve. After M0, SC1 for answer 320}

1 (c)  (i)  ($) 441  B2  M1 \text{ for } 400 \times 1.05^2 \text{ o.e. or for answer 41}

\[ \frac{1}{7} \text{ their (i) - 400} \div 400 \times 100 \text{ o.e.} \]
5.125 or 5.13 or 5.12 c.a.o. www3

If use Simple Int in (i), M0, M0 in this part
i.e. a full explicit method for \( r \)
If M0,
\[ \frac{400 \times r \times 2}{100} = \text{ their (i) - 400} \]
or their (i) \div 400 \times 100 then - 100
or \[ \frac{\text{their (i) - 400}}{400} \times 100 \text{ (s.o.i. by 10.25)} \]
If still M0, SC1 for answers 55.125 or 55.12 or 55.13 or 55.1 or 0.05125 or 0.0512 or 0.0513

2 (a) 1 B1

2 (b)  2.5 o.e. B1

2 (c)  2.96 c.a.o. B2

If B0, M1 for
\[ 15 \times 1 + 10 \times 2 + 7 \times 3 + 5 \times 4 + 6 \times 5 + 7 \times 6 \]
(allow one slip) implied by 148 seen
Ignore subsequent rounding

2 (d)  60 \times 2.95 (= 177) M1
their 177 - their 148 (or 50 \times their 2.96) M1
(Mean of new rolls =) 2.9 c.a.o. www3

Dependent on first M and only if positive or M1 for
\[ \text{their 148}(50 \times \text{their 2.96}) + x(\text{or } 10x) \]
\[ = 2.95 \]
\[ 60 \]
then M1 for
\[ x(\text{or } 10x) = 60 \times 2.95 - \text{their 148} \]
(or 50 \times their 2.96) and only if positive

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### Mark Scheme: Teachers’ version

**IGCSE – May/June 2009**

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#### Question 3

**Part (a)**

\[
\sin P = \frac{48}{0.5 \times 10 \times 14} \text{ o.e. fraction}
\]

\[P = 43.29\ldots\text{ cao}\]

- **M2** for \(0.5 \times 10 \times 14 \sin P = 48\) o.e.
- **A1**
- Allow \(0.5 \times 10 \times 14 \sin 43.3 = 48\) for **M1** but no further credit

**Part (b)**

\[10^2 + 14^2 - 2 \times 10 \times 14 \cos 43.3 = 92.2\text{ (s.o.i by 120\ldots)}
\]

- **M2**
- **M1** (dependent on **M2**) for square root of correct combination (not negative)
- i.e. \(16 \cos 43.3 (11.64\ldots)\) implies \(M2M0\)

\[(QR =) 9.6(0) (9.60 \text{ to } 9.603\ldots)\text{ c.a.o. ww2}\]

#### Question 4

**Part (a)**

\[
\frac{250}{\sin 126^\circ} \times \sin 23^\circ = \frac{250}{\sin 126^\circ} \text{ (s.o.i by 120\ldots)}
\]

\[121 (120.7 \text{ to } 121)\text{ (m) c.a.o. www3}\]

- **M2**
- **A1**

**Part (b)**

(i) 280

- **B1**

(ii) (0)69 c.a.o.

- **B2** SC1 for answer 249

#### Question 5

**Part (a)**

(i) 1.5, 3.75, –1.5

- **B1,B1,B1**

(ii) 12 points plotted ft

- **P3 ft**

- Curve through at least 10 points and correct shape over full domain

- **C1**

- Two separate branches, one on each side of \(y\)-axis, neither in contact with \(y\)-axis

- **B1** Independent

**Part (b)**

\[-1.4 \leq x \leq -1.1 \text{ and } 3.1 \leq x \leq 3.4\]

- **B1,B1**

**Part (c)**

(i) Correct ruled tangent at \(x = 2\) or \(x = -2\)

- **M1**

- Evidence of rise/run

- 0.8 to 1.2

- **M1** Long enough to be able to find gradient

- **A1**

- **B1**, \(y\)-axis stated

(ii) 0.8 to 1.2 inc. or same answer as (i) ft

- **B1 ft**

**Part (d)**

(i) Correct ruled line to cut curve for all possible intersections (at least 2)

- **B1**

- Within \(\frac{1}{2}\) square of \((-1, 1)\) and \((1, -1)\)

(ii) \(-1.3 \text{ to } -1.05, 1.05 \text{ to } 1.3\) inclusive

- **B1, B1**

**Part (e)**

\(y = kx\) with \(k \geq \frac{1}{2}\) o.e. or \(x = 0\)

- **B2**

- If **B0**, allow **SC1** for \(y = kx\) with \(k < \frac{1}{2}\) or for \(y\)-axis stated

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<tr>
<th>Question</th>
<th>Part</th>
<th>Mark Scheme</th>
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<td>6 (a) (i)</td>
<td>0.5 ([(x + 6) + (x + 2)] \times (x + 1) (= 40)) or better</td>
<td>M1A1 M1 for any algebraic use of half base × height (Brackets may be implied later) May be first line If this first line, then M0 E1 Dependent on M1A1. Fully established – no errors throughout and at least 2 steps, one with 40 or 80, after first line</td>
</tr>
<tr>
<td>6 (a) (ii)</td>
<td>–9, 4</td>
<td>B1,B1 If B0, SC1 for +9 and –4</td>
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<tr>
<td>6 (a) (iii)</td>
<td>(BC^2 = (\text{their } x + 1)^2 + (\text{their } x + 2)^2) ((BC = 7.81(0...))) c.a.o. www2 M1 Their x must be positive A1 Ignore any extra solutions</td>
<td></td>
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<tr>
<td>6 (b) (i)</td>
<td>(9 \frac{5}{12} ) or (108 + 5) or (9 \times 12 + 5) or (565) or (9 \times 60 + 25) or (60)</td>
<td>E1 Must be fractional form Condone 113/12 × 60 = 565; 9 × 60 + 25 = 565 Not for decimals</td>
</tr>
<tr>
<td>6 (b) (ii)</td>
<td>(\frac{3y + 2}{3} ) or (\frac{y + 4}{2}) or (2(3y + 2) + 3(y + 4)) or (\frac{6}{6})</td>
<td>B1</td>
</tr>
<tr>
<td>6 (b) (iii)</td>
<td>(\frac{2(9y + 16)}{12} = \frac{113}{12}) or (\frac{12}{12}) or (y = 4.5) c.a.o. www2 M1 o.e. means with common denominator or better (Trial and error scores 2 or 0.) A1</td>
<td></td>
</tr>
<tr>
<td>6 (b) (iv)</td>
<td>(Total dist =) ((3 \times \text{their } y) + 2 + (\text{their } y) + 4) o.e. (Average speed =) (\frac{\text{their } 24}{\frac{9}{5}2}) o.e. 2.55 km/h ((2.548 - 2.549)) c.a.o. www3 M1 (= 24) M1 (dependent) Must be km divided by hours o.e. for full method A1 Accept fractions in range</td>
<td></td>
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</table>
7 (a) 

\[ 250x^2 = 4840 \quad \text{o.e.} \]

\[ x^2 = 19.36 \quad \text{or} \quad (x =) \sqrt{4840 \div 250} = 4.4 \]

M1 Allow M1 for \( 250 \times 4.4^2 = 4840 \)

E1 Then E1 for \( 250 \times 19.36 = 4840 \)

(b) 42.6 (kg) cao (42.592 or 42.59)

B2 SC1 for figures 426 or 4259...

(c) 26.4 (cm) c.a.o.

B2 If B0, M1 for any of following

\( 88 \div 4.4 = 20 \) and \( 120 \div 20 = 6 \) (accept 6 bars high o.e.)

or \( 88h = 4.4^2 \times 120 \)

or \( 250 \times 88 \times h = 120 \times 4840 \)

(d) (i) \( 4840 \div 4200 \) (implied by 1.15(2))

\[ \div \frac{4}{3} \pi \quad \text{implied by 0.274 to 0.276} \]

\[ \frac{4840}{2} \quad \text{seen or implied by correct answer to more than 2 dp} \]

\[ 0.649 \div 0.651 \]

M1 M1 M1 Must be 3dp or better

(ii) 5.31 (5.306 – 5.31) (cm²)

B1

(iii) \[ \frac{4200 \times \text{their (ii)}}{2 \times 4.4^2 + 4 \times 4.4 \times 250} \times 100 \]

\[ 501.9 \div 503 \% \quad \text{c.a.o.} \quad \text{www4} \]

M3 A1 Throughout the question ratios score zero.

If using decimals, 2 s.f. correct answers to parts (c) and (d) – penalty of 1 once

Use of words e.g. 1 in 400 or 1 out of 400, Correct answers penalty of one

For method marks only accept probabilities \( p \) and \( q \) between 0 and 1

8

(a) \( p = \frac{1}{20}, \quad q = \frac{19}{20} \quad \text{o.e.} \)

B1 Could be on diagram

(b) (i) \[ \frac{1}{400} \quad \text{o.e.} \quad \text{c.a.o.} \]

B2 0.0025 allow M1 for (their \( p \))² o.e.

(ii) \[ \frac{38}{400} \quad \text{o.e.} \quad \text{c.a.o.} \]

B2 0.095 allow M1 for 2(their \( p \))(their \( q \)) o.e.

(c) \[ \frac{38}{8000} \quad \text{o.e.} \quad \text{c.a.o.} \]

B2 0.00475 allow M1 for 2(their \( p \))² (their \( q \)) o.e.

including their (ii) \times their \( p \)

(d) their (b)(i) + their (c) \[ \frac{58}{8000} \quad \text{o.e.} \quad \text{c.a.o.} \]

M1 A1 0.00725

(e) their (d) \times 1000 = 7.25 o.e. ft

B1 ft Accept 7 or 8 or an equivalent integer ft

[15]

[10]
### 9 (a) (i) 174 to 174.25 (cm) c.a.o. B1
(ii) 167 (cm) c.a.o. B1
(iii) 12 (cm) c.a.o. B1
(iv) 37 c.a.o. B2

If B0, B1 for 63 seen in working space

(b) (i) 10, 25, 155, 165, 175, 185

(Their 10 × 155 + their 25 × 165 + 47 × 175 + 18 × 185)

\[ \div 100 \]

172 or 172.3 (cm) c.a.o. www 4 A1

### 10 (a) (i) \(-2\), B1
(ii) 26, B1
(iii) \(\frac{1}{3}\) o.e. B1

(b) 
\[ y + 1 \]
\[ \frac{1}{2} \]
\[ (\text{or} x) \]

\[ f^{-1}(x) = \frac{x + 1}{2} \]

o.e. www2 M1, M1, M1, A1

If switch x and y first then M1 for \(x = 2y - 1\) or

If use a diagram/chart then M1 for any evidence of +1 then result ÷ 2

(c) 
\[ z = x^2 + 1 \]

\[ z - 1 = x^2 \]

\[ (x) = \sqrt{z - 1} \] www2 M1, M1

Correct rearrangement at any stage for \(x\) or \(x^2\).

Correct sq root at any stage Ignore +, – or ± in front of \(\sqrt{\)}

(d) 
\[ (2x - 1)^2 + 1 \]

\[ = 4x^2 - 4x + 2 \]

or \(2(2x^2 - 2x + 1)\) www 2 M1, A1

Final answer but condone one minor factorising slip if first answer seen

(e) 
\[ 9 \]

B1

(f) 
\[ 2(2x - 1) + x^2 + 1 = 0 \]

or better 
\[ (x^2 + 4x - 1 = 0) \]

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

www 2 M1, M1

\[ x = -4.24, 0.24 \] c.a.o. www 4 A1, A1

(fall answers)

(g) (i) Straight line with positive gradient and negative y-intercept L1

U-shape Parabola C1

vertex on positive y-axis V1

Dependent [18]
11 (a) 15, 21, 28, 36  
11 (b) (i) $10 + 15 = 25$, $15 + 21 = 36$ etc  
(ii) Square  
(iii) $\frac{4 \times 5}{2} = 10$ o.e.  
11 (c) (i) 2  
(ii) $16290$ c.a.o.  
(d) (i) $\frac{(n+1)(n+2)}{2}$ or $\frac{n^2 + 3n + 2}{2}$ seen  
$\frac{n(n+1)}{2} + \frac{(n+1)(n+2)}{2}$ or $\frac{n^2 + n}{2} + \frac{n^2 + 3n + 2}{2}$  
$\frac{(n+1)(n+n+2)}{2}$  
$\frac{(n+1)(2n+2)}{2}$  
$\frac{2(n+1)(n+1)}{2} = (n+1)^2$  
(ii) 1711 and 1770 final answers c.a.o.  

Graph for Question 5