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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates’ scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the Report on the Examination.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
Nonsense in one part may be used to earn M marks in any other part of the question. Throughout accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer in degrees and minutes.

(a) \( \angle ABO = 90^\circ \) with reason.

(b)(i) \( \sin \angle OAB = 6/13 = 0.4615 \ldots \) or \( \angle OAB = 27.48^\circ \), or seen

\[ \text{(leads to } \angle OAB = 27.5^\circ \text{)} \]

\( \text{AG} \)

(ii) \( \frac{15}{\tan 27.5} \)

28.8 to 28.9 (cm)

(iii) \( 2(\text{their AC})\sin 27.5 \) or \( 2 \times 15 \cos 27.3 \)

\[ \text{or } \text{EPC} = 2(90 - 27.5) = 125 \]

\[ \frac{1}{\text{and } \sqrt{15^2 + 15^2 - 2 \times 15 \times 15 \cos (\text{their } 125)}} \]

26.55 to 26.65 (cm)

2 (a) \( t = 2 \frac{1}{2}, 2.33 \text{ or better} \)

After B0, allow B1 for \( t = 7/3 \) or 2.3 or 3 or for 3t = 7 seen

(b) \( x = -2.5 \) or -2 1/2 and \( y = 17 \)

After B0, allow B1 for one value found with no errors

or allow M1 for correct method to eliminate one variable

(reaching such as \( 4y = k, \text{ky} = 68, 8x = k \) or \( kx = -20 \))

(c) \( (y + 2)(y - 2) \) so 1

\( (3y + 2)(y + 2) \) so 1

\( 2y + 2 \) obtained with no errors seen

\( y = 2 \)

(d) Collect terms e.g. \( 2x + y^2 = 2f - 3h \)

Factorise e.g. \( x(2 + y) = 2f - 3h \)

\( 2f - 3h \)

\( 2 + g \)
3. (a) (i) \( \angle DCA = 90° \) (angle in semicircle)  
(ii) \( \angle DAC = 34° \ or \ 124° \ -- \ their \ (i) \ \sqrt \) (angle sum of triangle)  
(iii) \( \angle CBA = 124° \) (opposite angles of cyclic quad)  
(iv) \( \angle AEB = \angle ADB = 28° \) (angles in same segment) \( \text{B1} \)

Lack of reason loses B1 on first occasion only

(b) \( \angle EBD = 28° \) (alternate angles) Reason needed \( \text{B1} \)

Deduces \( \angle BDX \ or \ \angle BDA = EBD \)  
And hence triangle \( \text{BDX is isosceles} \) \( \text{indep} \ \text{B1} \ \text{2} \)

(c) \( \angle ABE = 62° \) \( \text{B1} \ \text{1} \)

(d) Convincingly shows \( X \) is the centre of the circle  
\( \text{e.g.} \) Deduces \( \text{triangle ABX is isosceles, so AX = BX = DX} \) \( \text{B1} \ \text{1} \ \text{8} \)

4. (a) Correct, labelled, diagram representing 4, 7, 6, 5, 2, 0, 1  
After B0, allow B1 for diagram without labels  
or labelled diagram with at least 4 values correct \( \text{B2} \ \text{2} \)

(b) (i) \( \text{Median} = \sqrt{2} \) \( \text{B1} \)
(ii) \( \text{Mode} = \sqrt{1} \) \( \text{B1} \)
(iii) \( \text{Mean} = 1.92 \ or \ 48/25 \ or \text{B1} \ \text{3} \)

(c) \( k , 0.2 \ or \ 20% \sqrt{5k} \) \( \text{B1} \ \text{1} \)

(d) \( k , 0.04 \ or \ 4\% \sqrt{25k} \) \( \text{B2} \ \text{2} \)

\( \text{After B0, allow B1 for} k , 0.02 \ or \ 2\% \ or \ 24, 0.0384 \ or \ 3.84\% \)
\( 50k \ \text{625} \)

(e) Use \( 2 \times 6 \) cars or total number of cars (48) \( \text{M1} \)
\( k , 0.25 \ or \ 25\% \sqrt{4k} \) \( \text{A1} \ \text{2} \ \text{i)
5. (a) (i) Lists 5 different ways
   e.g. on 4017: (1, 1, 1, 1), (2, 1, 1), (1, 2, 1), (1, 1, 2), (2, 2)
   or on 4024: (10, 10, 10, 10), (20, 10, 10), (10, 20, 10), (10, 10, 20), (20, 20)
   (ii) Lists 8 different ways
   or justifies it is 5 ways with 10 cents first + 3 ways with 20 cents first
   (b) (i) a = 13
   b = 21 or 8 + their (i)
   (ii) z = x + y ≥ 0

6. (a) \( \frac{24}{x} \)
   (b) \( \frac{24}{x+0.5} \)
   (c) \( \frac{24}{x} - \frac{24}{x+0.5} = \pm 2 \int \frac{x}{x+0.5} \) oe, but must contain x in 2 terms

Correct method to remove fractions,
   e.g. \( 24(x+0.5) - 24x = \pm 2x(x+0.5) \int \) oe
   (but must have contained x in 2 different denominators)

Obtain \( 2x^2 + 8 - 12 = 0 \) AG

(d) **Formula** For numerical \( p = \sqrt{q} \), (not ± p) seen or used.

   \( \tau \),

   Allow B1 for \( p = -1 \) and \( \tau = 4 \)

   and B1 for \( q = 97 \) or \( \sqrt{q} = 9.84... \) soi

   Complete square: Allow B1 for \( (x + \sqrt{q})^2 \) or \( (x + \frac{1}{4}) \) oe soi

   and B1 for 97/16 or square roots such as 2.46... or 9.84...

   \( \frac{4}{4} \)

Final answers: Allow B1 for each of 2.212 and -2.712 new
   or allow B1 for both 2.21 and -2.71 seen
   or allow B1 for both 2.2122... and -2.7122... seen

(c) Time \( \frac{24}{10 \text{ minutes } 50} \) to 52 seconds
7 (a) (i) $\frac{1}{2} \times 0.6^2 \approx 0.5655$ seen

1.520 to 1.530 (m²)

(ii) $2 \times 2.2(2.5 + 2.6) (= 26.84)$

Their 26.84 - their (i) - 1.9 × 0.9 (≈ 23.604...)

Leading to 23.6 (m²) AG

(b) (i) Increased area = 23.6 \times 1.12 \text{ oe } (≈ 26.43... \text{ or } 26.44)

Number of tiles = \frac{26.4}{0.25} \text{ independant}

= 422 to 424

(ii) Number of boxes = \frac{423}{20} \text{ (leading to 22.)}

Cost = $330 \text{ cao}

(iii) Division by 120

\[ \frac{20}{120} \times 15 \text{ or } \frac{100}{120} \times 15 \text{ soi} \]

$2.5$
Nonsense in one part may be used to earn M marks in any other part of the question. Throughout accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer is given in degrees and minutes.

(a) (i) \(292^\circ\)

(ii) \(72^\circ + 60^\circ = 2 \times 72 \times 60 \cos 75 \text{ or soi}

Correct formula simplification and a square root taken, seen or implied by subsequent values dep

\(80.85 \text{ to } 80.95 \text{ (m)}

After A0, allow A1 for 6547 or 11020 or 104.9 seen, (dep on first M1)

(iii) \(\sin B = \frac{\sin 75}{60} \text{ or soi}

\sin ABC = \frac{60 \sin 75}{\text{their (ii)}}\)

45.70 to 45.80°

(iv) 157.70 to 158 or \((\text{their (i)} - \text{their (iii)} - 180)\)

(b) (Height of kite =) 72 tan 24 \(=32.05\)

\(\tan \alpha = \frac{\text{their height}}{60}\)

28.05 to 28.15°

Some possible answers
<table>
<thead>
<tr>
<th>Question</th>
<th>Marks</th>
<th>Syllabus</th>
<th>Paper</th>
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</thead>
<tbody>
<tr>
<td>9 (a) ( \sqrt{12^2 + 13^2} ) oc seen [leading to 13 AG]</td>
<td>B1 1</td>
<td>4024</td>
<td>2</td>
</tr>
<tr>
<td>(b) ( \pi \times 5 \times 13 ) soi ( -65\pi = 204.2 )</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 2 \pi \times 5^2 ) soi ( -50\pi = 157.1 )</td>
<td>indep M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Their ( 65\pi + \pi \times 50 + k \pi \times 5^2 ) where ( k ) = integer (provided all terms are areas)</td>
<td>indep M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 361.0 ) to ( 362.0 ) (cm²)</td>
<td>A1 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) ( \frac{1}{2} \pi \times 5^2 \times 12 ) soi ( -100\pi = 314.2 )</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{250 \pi \times 5}{\pi} ) soi ( = 250 \pi \times 5 = 261.8 )</td>
<td>indep M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 575.5 ) to ( 576.5 ) (cm²)</td>
<td>A1 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Figs. ( \pi \times 13 \times 2 ) ( = 4.14 ) ( = \text{fig} { 9 \times 2 } = \text{fig} 14.14 )</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct conversion, (using 1 000 000)</td>
<td>indep M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig their 14.14 their 576</td>
<td>indep M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 24500 ) to ( 24600 )</td>
<td>A1 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(a) (i) $EF = x - 2$
(ii) $BC = \frac{100}{x}$
(iii) $FG = \left[\frac{100}{x}\right] - 5$ or their (ii) - 5

All three correct
After B0, allow B1 for any two correct answers

(b) $y = \left(x - 2\right)\left(\frac{100}{x} - 5\right)$ convincingly leading to $y = \frac{110 - 5x - 200}{x}$

(c) $40(0.0)$

(d) All 7 points plotted (P1 for at least 5 of these)

Smooth curve, not grossly thick, through all plotted points, of which at least 5 are correct

(e) Drawing tangents at $x = 8$ and estimating change in $y$, ignoring sign change in $x$

- 1.60 to 2.00

[Ignore support from Calculus]

(f) (i) 4.65 to 4.80
(ii) 8.45 to 8.55

After R0, allow R1 for either value
Accept such as \( b = -a \) for \( b = a \) throughout.

Only expressions linear in \( a \) and/or \( b \) can score.

(a) (i) \( \text{DO} = a \) \( \sim \) \( \sim \) \( \sim \)

(ii) \( \text{AB} = b - a \) \( \sim \) \( \sim \)

(iii) \( \text{DB} = a + b \) \( \sim \) \( \sim \)

(b) Triangle OAB is equilateral, so length \( OA = OB = AB \)

(c) (i) \( \text{(AX)} = \frac{1}{3} b \) \( \sim \) \( \sim \)

(b) \( \text{(YX)} = \frac{3}{2} b \) \( \sim \) \( \sim \)

(iii) Points lie on a straight line \( \sim \)

(d) \( \text{(XZ)} = 3a \) \( \sim \)

(e) \( YZ = 3b - 3a \) \( \sim \) or \( ZY = 3a - 3b \) \( \sim \)

Deduces \( |XZ| = |YX| = |YZ| \),

So sides are equal and hence triangle equilateral

Alternative: States \( XZ \parallel \text{OA} \) and \( YX \parallel \text{OB} \) so \( 60^\circ \)

And length \( XZ = \text{length YX} \) so equilateral

(f) \( \frac{1}{9} \) \( \rightarrow \) \( \rightarrow \) \( \rightarrow \) \( \rightarrow \)

After 0/2, allow B1 for 1 to 9, 1:9, \( \left( \frac{1}{3} \right)^2 \) or \( \left( \frac{a}{3a} \right)^2 \) seen