An Roinn Oideachais agus Eolaíochta

Junior Certificate Examination 2002

MARKING SCHEME

MATHEMATICS

ORDINARY LEVEL

PAPER 2

GENERAL GUIDELINES FOR EXAMINERS

1. Penalties of three types are applied to candidates' work as follows:
   - Blunders - mathematical errors/omissions (-3)
   - Slips - numerical errors (-1)
   - Misreadings (provided task is not oversimplified) (-1).

   Frequently occurring errors to which these penalties must be applied are listed in the scheme. They are labelled as B1, B2, B3,....., S1, S2, S3,...., M1, M2, ...etc.

2. The lists of blunders, slips and misreadings are not intended to be exhaustive.

3. When awarding attempt marks, e.g. Att(3), it is essential to note that
   - any correct relevant step in a part of a question merits *at least* the attempt mark for that part
   - when deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
   - a mark between zero and the attempt mark is never awarded.

4. Worthless work is awarded zero marks. Some examples of such work are listed in the scheme and they are labelled as W1, W2,....etc.

5. The *same* error in the *same* section of a question is penalised *once* only.

6. Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks only.

7. The phrase "and stops" means that no more work is shown by the candidate.

QUESTION 1

Each Part **10 marks** **Att 3**

Part (i) **10 marks** **Att 3**

(i) Two angles of a triangle measure 74° 50′ and 79° 40′.
What is the measure of the third angle?

Part (i) **10 marks** **Att 3**

$74° 50' + 79° 40' = 154° 30'$
Third angle = $180° - 154° 30' = 25° 30'$.

* Accept correct answer and no work.
* Ignore degrees and minutes notation.

Blunders (-3)
B1 Error in handling minutes → degrees e.g. $180° - 154° 30' = 25° 70'$ [i.e. $1° = 100'$] (penalise once only).
Note:. $26° 10'$ is a common incorrect answer which merits 7 marks.
B2 Sum of angles in a triangle not 180° and finishes.
B3 Subtracts one of the angles correctly from 180° and stops.
B4 Adds two angles correctly to get $154° 30'$ and stops (no subtraction from 180°).
B5 Ignores minutes (i.e. $180° - 153° = 27°$).
B6×2 Subtracts 74° or 79° from 180° and stops.
B7×2 Adds minutes only, converts to minutes and degrees and stops (i.e. $50' + 40' = 1° 30'$).

Slips (-1)
S1 Numerical errors to a maximum of –3 (but note blunders above).

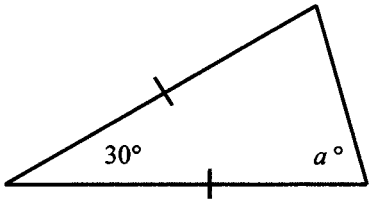
Misreadings (-1)
M1 Misreads $74° 50'$ as $47° 50'$ or similar.

Attempts (3 marks)
A1 Any mention of 180°.
A2 Adds degrees only (153°) – must be correct.
A3 Adds minutes only ($90'$) – must be correct. (Note B7×2 above.)
A4 Any attempt at adding the given angles.
A5 Subtracts the two angles (i.e. $79° 40' - 74° 50' = 4° 50'$, but must handle minutes correctly to gain the attempt).

Worthless (0)
W1 Incorrect answer with no work (but note blunders above).

Part (ii) **10 marks** **Att 3**

(ii) Calculate the value of a in the diagram.



Part (ii) **10 marks** **Att 3**

(ii) Third angle = a

$2a = 180° - 30° = 150°$

$a = \frac{150}{2} = 75°$

* Accept correct answer and no work.

Blunders (-3)

B1 Third angle = 30° to give $a = 120°$.

B2 Sum of angles in a triangle not 180° and continues.

B3 Serious numerical error (e.g. $180-\frac{30}{2} = 165°$).

B4 Does not use base angles equal or does not divide by 2 ($180° - 30° = 150°$).

B5 Assigns a value to the third angle and finishes (e.g. takes third angle = 90° to give a = 60°).

B6×2 180° - 30° and stops (i.e. 180° - 30° not evaluated).

B7×2 $a = 30°$ and stops.

B8×2 Third angle = a and stops (note: this may be done on a diagram).

Slips (-1)

S1 Numerical errors to a maximum of –3.

Attempts (3 marks)

A1 Angle sum of triangle = 180° and stops.

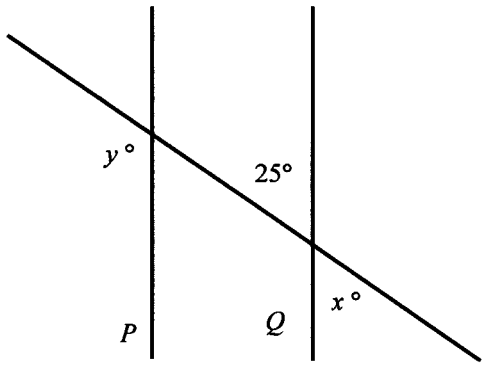
A2 States " Base angles of an isosceles triangle are equal" and stops.

Worthless (0)

W1 Incorrect answer and no work (but note blunders above).

Part (iii) **10 marks** **Att 3**

(iii)
P and *Q* are parallel lines.
Calculate the value of *x* and the value of *y*.

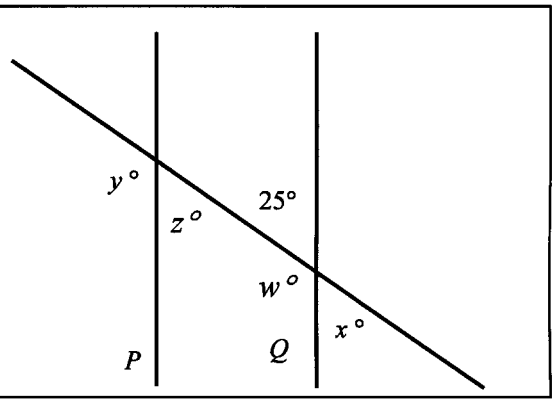


Part (iii) **10 marks** **Att 3**

Show angle *z* or *w* on diagram
x = 25° .....vertically opposite angles
z = 25°.....alternate angles
y = 180° - 25° = 155°.....straight line

or

x = 25° .....vertically opposite angles
w = 180° - 25° = 155°.....straight line
y = 155°.....corresponding angles



* Accept correct answers and no work.
* Accept correct answers marked on a diagram.
* Accept any other correct method.
* Ignore degree notation.
* Need not indicate which angle is 25° and which is 155° for full marks.

Blunders (-3)
B1 Only one answer worked out correctly.
B2 Straight line angle not 180° (e.g. *y* = 90° - 25° = 65° or *y* = 360° - 25° = 335°).
B3 Leaves as 180° - 25°.
B4 Transposition error.
B5×2 $x + y = 180°$ and stops.

Slips (-1)
S1 Each numerical error to a maximum of –3.
S2 *x* = 155° and *y* = 25°.

Misreadings (-1)
M1 Misreads 25° as 52°.

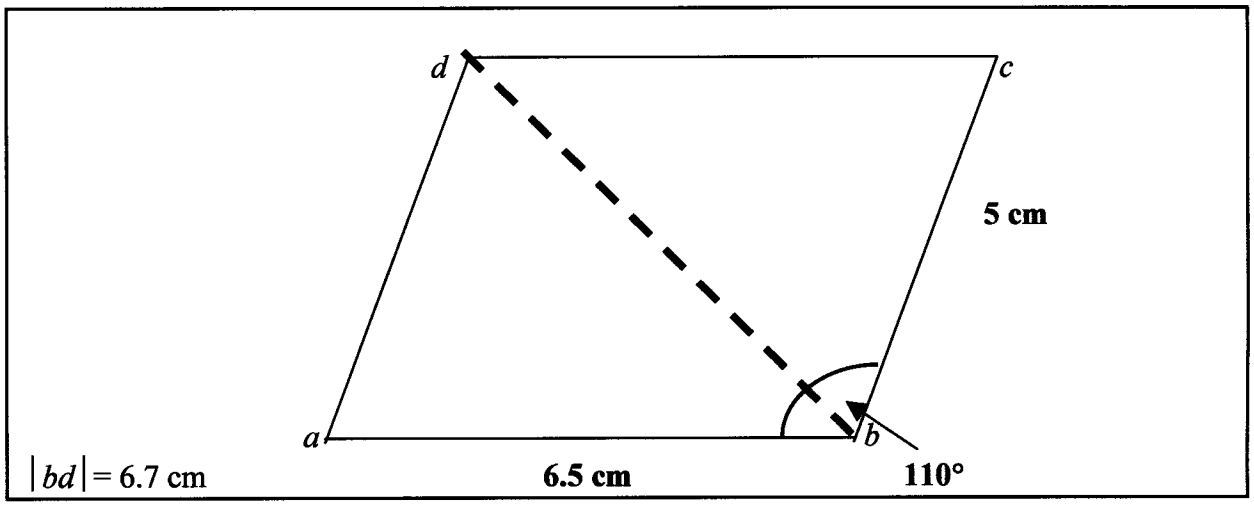
Attempts (3 marks)
A1 Straight line angle = 180° and stops.
A2 Any indication of alternate, corresponding or vertically opposite angles.

Worthless (0)
W1 Diagram reproduced with no modifications.
W2 Incorrect answers with no work shown (but note blunders above).
W3 Measures the angles with a protractor.

Part (iv) **10 marks** **Att 3**

(iv) Construct the parallelogram *abcd* in which
$|ab| = 6.5$ cm, $|bc| = 5$ cm and $|\angle abc| = 110°$.
Measure the length of $[bd]$, giving your answer in centimetres.

Part (iv) **10 Marks** **Att 3**



* Tolerance of ± 2 mm on sides.
* Tolerance of ± 2° on angle.
* Accept candidate's diagram for measuring $|bd|$.
* Ignore order of lettering.
* Examiners must measure candidates' work.

Blunders (-3)
B1 Does not measure $|bd|$ or measures $|bd|$ incorrectly.
B2 Incorrect length to a maximum of 2 blunders - must measure $|bd|$ correctly.
B3 Incorrect angle.
B4 Point *d* or *c* not constructed (i.e. constructs triangle *abc* and measures $|ac|$ correctly [note: also incurs M1 below] **or** constructs triangle *abd* and measures $|bd|$ correctly).

Misreadings (-1)
M1 Measures the other diagonal (i.e. $|ac|$).

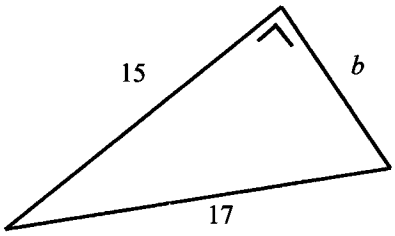
Attempts (3 marks)
A1 Pilot diagram drawn.
A2 One side drawn correctly and stops.
A3 Angle drawn correctly and stops.

Worthless (0)
W1 Incorrect $|bd|$ with no construction.

Part (v) **10 marks** **Att 3**

(v)

In a right-angled triangle, the hypotenuse has length 17. One of the other sides has length 15. Find b, the length of the third side.



Part (v) **10 marks** **Att 3**

(v)

$$b^2 + 15^2 = 17^2$$
$$b^2 + 225 = 289$$
$$b^2 = 289 - 225 = 64$$
$$b = 8$$

* Accept correct answer and no work.

* Accept correct trigonometric solution.

Blunders (-3)

B1 Incorrect use of Pythagoras' Theorem (e.g. $b^2 = 15^2 + 17^2 = 514 \Rightarrow b = \sqrt{514} = 22.67$).

B2 Incorrect transposition (i.e. $b^2 = 289 + 225$ and finishes).

B3 Gets $b^2 = 64$ and stops.

B4 Calculates $b = \sqrt{64}$ and stops.

B5 $15^2 = 30$ or similar and finishes, but penalise once only.

B6 Incorrect use of square root or squares tables (e.g. gets $\sqrt{6.4} = 2.530$ **or** $15^2 = 2250$ **or** $\sqrt{64} = 32$) - penalise once only.

B7×2 $15^2 = 225$ and $17^2 = 289$ and stops.

Slips (-1)

S1 Each numerical error to a maximum of –3.

Attempts (3 marks)

A1 $b = 17 - 15 = 2$

A2 Some correct statement of Pythagoras' Theorem. (Note: accept Pythagorean triple 3,4,5 etc. here)

A3 $\text{Sin} = \frac{15}{17}$ or $\cos = \frac{15}{17}$ and stops.

A4 Any correct trigonometric ratio written down.

A5 $15^2 = 225$ or $17^2 = 289$ and stops.

A6 Attempt at a scaled diagram.

Worthless (0)

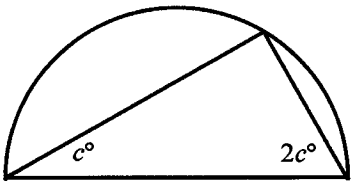
W1 $15 + 17 = 32$.

W2 Incorrect answer and no work. (but note blunders above)

W3 Writes 15,16,17 and no further work.

Part (vi) **10 marks** **Att 3**

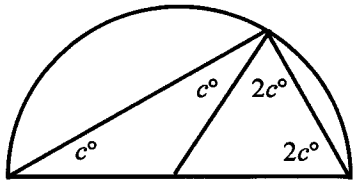
(vi) The diagram shows a triangle in a semi-circle.
Calculate the value of c.



Part (vi) **10 marks** **Att 3**

(vi) $90° + c + 2c = 180°$
$c + 2c = 90°$
$3c = 90°$
$c = 30°$

or



$c + c + 2c + 2c = 180°$
$6c = 180°$
$c = 30°$

* Accept correct answer and no work.
* Accept correct indication on a diagram.

Blunders (-3)

B1 Angle sum of triangle not 180°.
B2 Leaves as $3c = 90°$ (i.e. no division by 3).
B3 Incorrect transposition and finishes (i.e. $c + 2c = 270° \Rightarrow c = 90°$ or $c + 2c = 180° \Rightarrow c = 60°$).
B4 Angle in semi-circle not 90° (e.g. may write $c + 2c + 2c = 180° \Rightarrow c = 36°$ or $2c + c + c = 180° \Rightarrow c = 45°$).
B5 $c + 2c = 2c^2$ and finishes by giving $c = 6.708$. (Note: if left at $c = \sqrt{45}$ or incorrect use of square root tables incurs another blunder.)
B6 $2c = 90°$ and finishes to give $c = 45°$. (Incorrect angle in a semi-circle).
B7 Transposition error e.g. $3c = 90° \Rightarrow c = 90 - 3 = 87°$ **or** $3c = 270° \Rightarrow c = 90°$.
B8 $90° + 3c = 93c = 180° \Rightarrow c = 1.94°$.
B9×2 Third angle = 90° or states "angle in semi-circle is a right angle" and stops (note: may be indicated on a diagram).
B10×2 States $c + 2c = 90°$ and stops.
B11×2 $c = 90°$and stops.

Slips (-1)

S1 Numerical errors to a maximum of –3.

Attempts (3 marks)

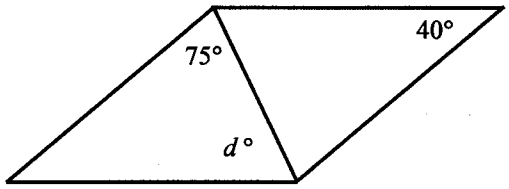
A1 Any mention of 180°.
A2 Joins apex of triangle to centre and stops.
A3 States " Angle at centre = 2× angle at circle standing on same arc" and stops.

Worthless (0)

W1 Diagram reproduced without modification.
W2 Incorrect answer and no work (but note blunders above).

Part (vii) **10 marks** **Att 3**

(vii) The diagram shows a parallelogram.
Calculate the value of d.



Part (vii) **10 marks** **Att 3**

Opposite angle = 40°	or	Alternate angle = 75°
75° + 40° + d = 180° … angle sum of triangle		75° + 40° + d = 180°…
supplementary		
115° + d = 180°		115° + d = 180
d = 180° – 115° = 65°		d = 180° – 115° = 65°

* Accept correct answer and no work.
* Accept correct indication on a diagram.
* Accept any other correct method.

Blunders (-3)
B1 Angle sum of triangle not 180°.
B2 Incorrect transposition.
B3 Leaves as d = 180° – 115° (i.e. no subtraction).
B4 Opposite angles in a parallelogram not equal and finishes e.g. 75° + 75° + d = 180° ⇒ d = 30° **or** 75° + d + d = 180° ⇒ d = 52½° (i.e. assumes lower triangle is isosceles).
B5 Assumes upper triangle is isosceles to give angle adjacent to 75° is 70° ⇒ d = 70 .
B6×2 Calculates 75° + 40° = 115° and stops.

Slips (-1)
S1 Numerical errors to a maximum of –3.

Misreadings (-1)
M1 Misreads 75° as 57° or similar.

Attempts (3 marks)
A1 Angle sum of triangle = 180° and stops.
A2 Some correct statement re alternate angles or angles in a parallelogram.
A3 Opposite angle = 40° or Alternate angle = 75° and stops.

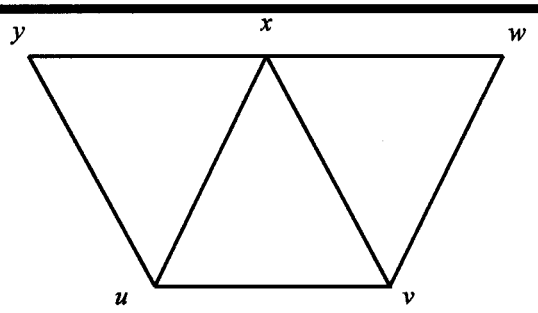
Worthless (0)
W1 Incorrect answer and no work, but note blunders above.

Part (viii) **10 marks** **Att 3**

(viii)

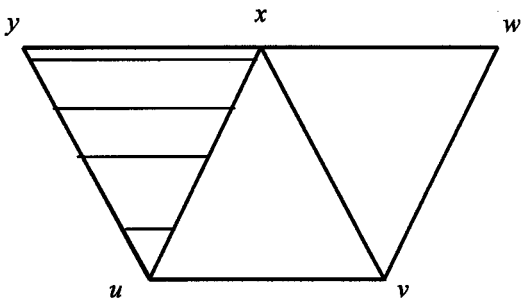
uvxy and *uvwx* are parallelograms.
Copy the diagram and shade in the Image of the triangle *wxv*

under the translation $\overrightarrow{xy}$.



Part (viii) **10 marks** **Att 3**

(viii)



or

Triangle *wxv* → Triangle *xyu*

* Accept *w*→ *x* *x*→ *y* *v*→ *u* in any order.

Blunders (-3)

B1 Correct image of triangle *wxv* under some other translation (may be on an extended diagram).

B2 Correct image of triangle *wxv* under some central or axial symmetry e.g. triangle *xuv* is a common incorrect answer which gains 7 marks.

B3 Each point not translated or translated incorrectly e.g. triangle *wxv* is a common incorrect answer which gains 4 marks.

B4 Correct image of some other triangle under the translation $\overrightarrow{xy}$.

Attempts (3 marks)

A1 Shows some knowledge of translation and stops.

A2 A translation not related to the diagram or question.

A3 Correct central symmetry or axial symmetry on some other triangle.

A4 States image is a triangle.

Worthless (0)

W1 Diagram reproduced without modification.

Part (ix) **10 marks** **Att 3**

(ix) The equation of a line is $3x + 4y = 12$.
Find the slope of the line.
(The equation of a line with slope m is $y = mx + c$.)

Part (ix) **10 marks** **Att 3**

(ix) $4y = -3x + 12$

$y = -\frac{3}{4}x + 3$

Slope $= -\frac{3}{4}$

or one point $(x_1, y_1) = (4,0)$

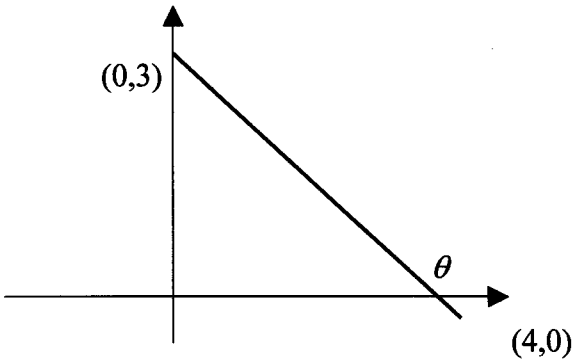
second point $(x_2, y_2) = (0,3)$

slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-0}{0-4} = -\frac{3}{4}$

$m = \frac{\text{Vertical}}{\text{Horizontal}} = -\frac{3}{4}$

or $\text{Tan}\,\theta = \frac{\text{opposite}}{\text{adjacent}} = -\frac{3}{4}$

or



or

$ax + by = c$

$m = -\frac{a}{b} = -\frac{3}{4}$

* Accept correct answer and no work.

* Accept $y = -\frac{3}{4}x + 3$ or $y = -\frac{3}{4}x + c$ and $y = mx + c$ written.

* Note: $m = -\frac{3}{4} \Rightarrow$ 10 marks

$m = \frac{3}{4}$ or $-\frac{4}{3}$ or $-3 \Rightarrow$ 7 marks

$m = \frac{4}{3}$ or $3 \Rightarrow$ 4 marks

Blunders (-3)

Method 1

B1 Incorrect transposition and continues (i.e. $4y = 3x + 12$).

B2 States $4y = -3x + 12$ and writes $m = -3$ i.e. no division by 4. (Note $m = 3$ is B1 and B2.)

B3 States $y = -\frac{3}{4}x + 3$ and stops.

B4 States $3x = -4y + 12 \Rightarrow m = -\frac{4}{3}$

Method 2

B5 Incorrect formula (i.e. uses $\frac{y_2 - y_1}{x_1 - x_2}$ *or* $\frac{x_2 - x_1}{y_2 - y_1}$ to give $\frac{3}{4}$ *or* $-\frac{4}{3}$).

B6 Incorrect sign in formula (i.e. $\frac{y_2 + y_1}{x_2 + x_1} = \frac{3+0}{0+4} = \frac{3}{4}$).

B7×2 Uses $\frac{x_1 - y_1}{x_2 - y_2}$ and continues (apply B7×2 if points other than (4,0) and (0,3) are used).

B8 Answer left as $\frac{3-0}{0-4}$ or similar.

B9 Each incorrect substitution if not already penalised to a maximum of 2 blunders (e.g. uses (0,0) as one of the points).

Method 3

B10 Tan $\theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{\text{vertical}}{\text{horizontal}} = \frac{3}{4}$ (i.e. minus sign omitted).

B11 Tan $\theta = \frac{\text{adjacent}}{\text{opposite}} = \frac{\text{horizontal}}{\text{vertical}} = -\frac{4}{3}$.

B12×2 Calculates vertical = 3 and horizontal = 4, but does not state $m = -\frac{3}{4}$. (Note: may be calculated on diagram by inserting right-angled triangle)

Method 4

B13 Writes $m = \frac{a}{b} = \frac{3}{4}$.

B14 Writes $m = -\frac{b}{a} = -\frac{4}{3}$.

B15×2 Writes $m = \frac{b}{a} = \frac{4}{3}$.

Attempts (3 marks)

A1 Finds one or two points on the line.

A2 Tan $\theta = \frac{\text{opposite}}{\text{adjacent}}$ or $\frac{\text{vertical}}{\text{horizontal}}$ and stops or makes one substitution.

A3 Attempt at isolating y or $4y$.

Worthless (0)

W1 Uses wrong formula. (e.g. midpoint or distance formula)

W2 Incorrect answer and no work.

W3 Writes $y = mx + c$ and stops.

Part (x)	**10 marks**	**Att 3**
(x) $A = 30°$. Use the book of Tables to find $\sin 2A$.		

Part (x)	**10 marks**	**Att 3**

(x) $A = 30°$ $2A = 60°$ $\sin 2A = \sin 60° = 0.8660$ or $\frac{\sqrt{3}}{2}$.	**or** $A = 30°$ $2A = 60°$ $\text{Sin}60° = 2\sin 30°\cos 30°$ $\sin 2A = 2\left(\frac{1}{2}\right)\left(\frac{\sqrt{3}}{2}\right) = \frac{\sqrt{3}}{2} \text{ or } 0.8660$

* Accept correct answer and no work.
* Note: Refer to tables - candidates' incorrect answers may have worth.

Blunders (-3)
B1 No decimal point or misplaced decimal point (e.g. 8660 or 8.660 or similar).
B2 Finds $\text{Sin}A = 0.5000$ (i.e. has omitted the 2).
B3 Calculates $2\sin A = 2(.5) = 1$ (i.e. 2 in wrong place).
B4 Looks up incorrect table (e.g. $\cos 60° = 0.5000$).
B5 Looks up $\sin 230° = -0.7660$ or $\sin 2°30' = 0.0436$ or $\sin 2° = 0.0349$ or $\sin 32° = 0.5299$ or $\sin 30°2' = 0.5005$ or $\sin 60' = \sin 1° = 0.0175$.
B6×2 Looks up $\sin 30' = 0.0087$.
B7 Writes $\sin 2A = 2\left(\frac{1}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$ and stops i.e. not evaluated.
B8×2 Writes $\text{Sin}60° = 2\sin 30°\cos 30°$ and stops.

Slips (-1)
S1 Reads from incorrect row or column related to the question.
S2 Each numerical error to a maximum of –3.

Misreadings (-1)
M1 Reads 30° as 3° and continues correctly (i.e. $\sin 6° = 0.1045$).

Attempts (3 marks)
A1 Any correct trigonometric ratio written down (but not SOHCAHTOA or similar).
A2 Writes $2A = 2(30°)$ or writes 60° and stops.

Worthless (0)
W1 Incorrect answer and no work (but note blunders and slips above).
W2 Writes $\sin 2A = 2\sin A\cos A$ and stops.

QUESTION 2

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 (10,10) marks**	**Att (3,3)**
Part (c)	**20 (5, 5, 5, 5) marks**	**Att (2,2,2,2)**

Part (a)	**10 marks**	**Att 3**
(a)	Write 42 as a percentage of 70.	

Part (a)	**10 marks**	**Att 3**
(a)	$\frac{42}{70}\times 100 = 60\%$	

* Accept correct answer and no work.

Blunders (-3)

B1 Decimal error (e.g. 6% or similar).

B2 Calculates $\frac{42}{70} = 0.6$ and stops i.e. no multiplication by 100).

B3 Calculates $42\times\frac{70}{100} = 29.4\%$ (i.e. gets 70% of 42 - common incorrect answer).

B4 Writes $\frac{42}{70}\times 100$ and stops (i.e. not evaluated).

B5 Calculates $\frac{70}{42}\times 100 = 166.66\%$ (accept rounding to nearest whole number i.e. 167).

B6 Calculates $\frac{28}{70}\times 100 = 40\%$ (i.e. does not subtract 40% from 100%).

B7×2 Writes $\frac{28}{70}\times 100$ and stops (i.e. B4 and B6).

B8×2 Writes $\frac{42}{70}$ or $\frac{6}{10}$ or $\frac{3}{5}$ or similar and stops (i.e. expressed as a fraction, not a percentage).

Slips (-1)

S1 Each numerical error to a maximum of –3.

Misreadings (-1)

M1 Misreads 42 as 40 or similar.

Attempts (3 marks)

A1 Writes $\frac{42}{100}$ or $\frac{70}{100}$ or 0.42 or 0.7 and stops.

A2 Writes 42 = 100% or similar and stops.

A3 Writes $\frac{28}{70}$ and stops.

Worthless (0)

W1 42 ± 70, whether calculated or not.

W2 Incorrect answer and no work (but note blunders above).

Part (b) **20 (10,10) marks** **Att (3,3)**

(b) Using 1 euro = 0.92 dollars,

(i) convert 250 euro into dollars

(ii) convert 138 dollars into euro.

Part (b)(i) **10 marks** **Att 3**

(b)(i)	€250 = 250 × 0.92 = $230	**or**	250 × 0.08 = 20 250 – 20 = $230

* Euro or dollar symbol not required.
* Accept correct answer and no work.

Blunders (-3)

B1 Misplaced decimal point (e.g. $23).

B2 States €25 = $23 or similar.

B3 Writes 250 ×0.92 and stops (i.e. multiplication not carried out).

B4 Calculates $\frac{250}{0.92} = \$271.74$ (i.e. divides rather than multiplies).

B5×2 States €100 = $92 or €10 = $9.20 and stops.

B6 Calculates 250 × 0.08 = $20 (i.e. no subtraction from 250).

B7 Calculates $250 - \frac{250}{0.08} = -\$2875$ (do not penalise absence of minus sign).

B8 Calculates 250 + 20 = $270 (i.e. adds rather than subtracts).

Slips (-1)

S1 Each numerical error to a maximum of –3.

Misreadings (-1)

M1 Misreads 0.92 as 0.90 or similar.

M2 Uses a conversion rate of 0.79 or 1.27.

Attempts (3 marks)

A1 Writes $\frac{250}{.08}$ and stops.

A2 0.92×2; 0.92×3 etc., but note B2 and B5×2 above (i.e. trial and error).

Worthless (0)

W1 250 ± 0.92 (whether calculated or not).

W2 Incorrect answer and no work (but note blunders above).

Part(b)(ii) **10 marks** **Att 3**

$$\$138 = \frac{138}{0.92} = €\,150$$

* Note: If candidate divided in part **(i)**, then do not penalise if candidate multiplies in part **(ii)**.
* € or $ symbol not required.
* Accept correct answer and no work.

Blunders (-3)

B1 Misplaced decimal point (e.g. €15).

B2 Multiplies 138 × 0.92 or gives 138 - 138 × 0.08 (and an answer of €126.96) but note first asterisk above.

B3 Does not carry out the division (i.e. leaves as $€\frac{138}{0.92}$).

B4×2 States €50 = $46 or €5 = $4.60 or €100 = $92 and stops.

B5×2 Calculates 138 × 0.08 = 11.04 but adds to 138, instead of subtracting (gives an answer of €149.04).

Slips (-1)

S1 Numerical errors to a maximum of –3.

Misreadings (-1)

M1 Misreads 0.92 as 0.90 or similar.

M2 Uses a conversion rate of 0.79 or 1.27.

Attempts (3 marks)

A1 0.92 × 2; 0.92 × 3 etc but note B4 × 2 above (i.e. trial and error).

A2 138 × 0.08 and stops.

Worthless (0)

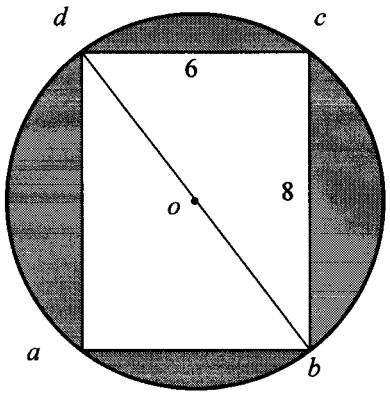
W1 138 ± 0.92 (whether calculated or not).

Part (c) **20 (5, 5, 5, 5) marks** **Att (2, 2, 2, 2)**

2(c)

abcd is a rectangle, $|bc| = 8$, $|cd| = 6$
and *o* is the centre of the circle.

(i) Write down the area of the rectangle.
(ii) Calculate $|bd|$.
(iii) Find the area of the circle. Take $\pi = 3.14$.
(iv) Find the area of the shaded region.



Part(c)(i) **5 marks** **Att 2**

Area of rectangle = 6 × 8 = 48

* Accept correct answer and no work.
* Note: one blunder results in attempt mark of 2.

Attempts (2 marks)
A1 Writes 6 × 8 and stops.
A2 Finds perimeter correctly (i.e. 28).
A3 Calculates area of triangle = ½(6 × 8) = 24.
A4 Calculates area of square = $6^2 = 36$ or $8^2 = 64$ (or even $6^2 = 12$ or $8^2 = 16$).
A5 States " area of rectangle = length × breadth" and stops.

Slips (-1)
S1 Numerical errors to a maximum of –3.

Worthless (0)
W1 Incorrect answer and no work (but note attempts above).

Part(c)(ii) **5 marks** **Att 2**

$|bd|^2 = 6^2 + 8^2$
$|bd|^2 = 36 + 64 = 100$
$|bd| = \sqrt{100} = 10$

* Accept correct trigonometric method.
* Accept recognition of Pythagorean triple 6,8,10.
* Accept correct answer and no work.
* Note one blunder results in attempt mark of 2.

Attempts (2 *marks*)

A1 $6^2 = 12$ or $8^2 = 16$, but penalise only once here.
A2 $|bd|^2 = 8^2 - 6^2$ (gives an answer of 5.292).
A3 Does not square 6 or 8 (i.e. $|bd|^2 = 6 + 8$, giving an answer of 3.742).
A4 $|bd|^2 = 100$ or even $|bd| = 100$ or $|bd| = \sqrt{100}$ and stops (i.e. no square root or square root not worked out).
A5 Incorrect use of squares or square root tables, but penalise once only.
A6 Recognises Pythagorean triple 3,4,5 but does not double.
A7 Any correct statement of Pythagoras' theorem.
A8 $|bd| = 6 + 8 = 14$.
A9 Any correct relevant squaring.
A10 Tan $b = \frac{6}{8}$ or tan $d = \frac{8}{6}$ and stops.
A11 Any correct trigonometric ratio written down.
A12 Attempt at a scaled diagram.

Slips (-1)

S1 Numerical errors to a maximum of –3.

Worthless (0)

W1 Incorrect answer and no work (but note attempts above).
W2 Measures $|bd|$ from the diagram (4.9).
W3 Diagram reproduced without modification.

Part(c)(iii) **5 marks** **Att 2**

Area of circle = $\pi r^2 = 3.14 \times 5^2 = 3.14 \times 25 = 78.5$

* Accept candidates' r from calculating $|bd|$ in part **(ii).**
* Note: one blunder results in attempt mark of 2.
* Accept $\pi = \frac{22}{7}$ and continues correctly (answer = 78.57).

Attempts (2 marks)

A1 Uses $r = 10$ and continues correctly (answer = 314).
A2 $5^2 = 10$ and continues correctly.
A3 3.14×5^2 or 3.14×25 or 25π and stops.
A4 Uses area = $2\pi r$ and continues correctly.
A5 Substitutes value for π or r into πr^2 or $2\pi r$ and stops.
A6 States $r = 5$ and stops.

Slips (-1)

S1 Numerical errors to a maximum of –3.

Worthless (0)

W1 Area = πr^2 or $2\pi r$ and no substitution.
W2 Any volume formula with or without substitution.

Part(c)(iv) **5 marks** **Att 2**

Shaded area = 78.5 – 48 = 30.5

* Accept correct answer and no work.
* Accept candidates' value for area of rectangle and/or area of circle from parts **(i)** and **(iii).**
* Note: one blunder results in attempt mark of 2.

Attempts (2 marks)

A1 78.5 – 48 and stops (i.e. does not carry out subtraction).
A2 78.5 + 48 = 126.5 (i.e. adds instead of subtracts).
A3 Divides area of rectangle or circle by 4 or 2.
A4 States "Area of shaded part = area of circle – area of rectangle" and stops.

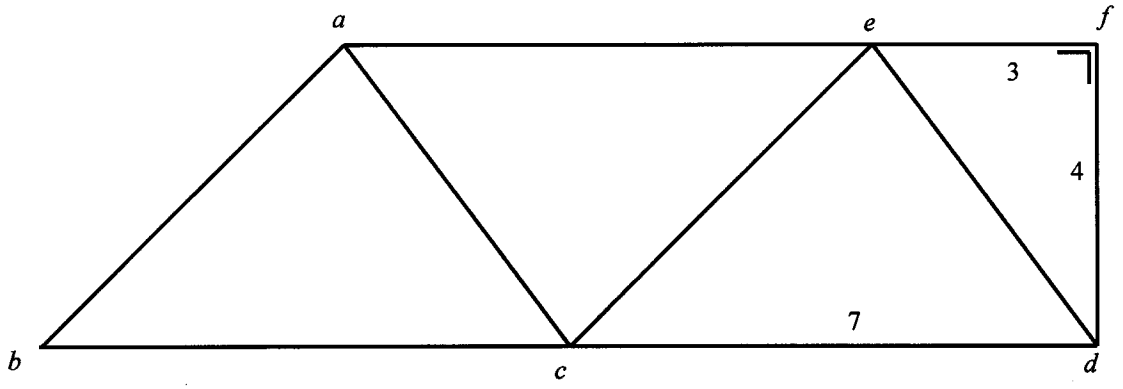
Slips (-1)
S1 Numerical errors to a maximum of –3.

Worthless (0)
W1 Diagram reproduced and no further work.
W2 Incorrect answer and no work (but note A2 above).

QUESTION 3

Each of the five parts **10 Marks** **Att 3**

abce and *acde* are parallelograms, and $|\angle dfe| = 90°$.
$|cd| = 7$, $|df| = 4$ and $|ef| = 3$.



Part (i) **10 marks** **Att 3**

(i) Name two angles equal in measure to $\angle bac$.

Part (i) **10 marks** **Att 3**

$|\angle bac| = |\angle ace|$ and $|\angle ced|$

* Accept correct angles clearly indicated on diagram.

Blunders (-3)

B1 Names only one angle equal in measure to $\angle bac$.

B2×2 Names any two angles which are equal in measure to one another, but not equal in measure to $\angle bac$.

Attempts (3 marks)

A1 Any mention of alternate angles, corresponding angles, or opposite angles in a parallelogram.

Worthless (0)

W1 Angles named using one point only, where there is ambiguity (e.g. $\angle c$).

Part (ii) **10 marks** **Att 3**

(ii)

Write down the image of [*ed*] under the translation $\overrightarrow{cb}$.

Part (ii) **10 marks** **Att 3**

[*ed*] → [*ac*]

* Accept $e \rightarrow a$ $d \rightarrow c$ in any order.
* Accept correct indication on diagram.
* Line segment [ ] notation not required.
* Accept any order of letters.
* Accept [$e'd'$] plotted near [*ac*] on diagram.

Blunders (-3)

B1 Image of one point only found correctly (i.e. $e \rightarrow a$ or $d \rightarrow c$).

B2 Correct image of [*ed*] under some other translation (may be on an extended diagram).

B3 Correct image of [*ed*] under some central symmetry or axial symmetry.

B4 Correct image of some other line segment under translation $\overrightarrow{cb}$.

Attempts (3 marks)

A1 Shows some knowledge of translation and stops.

A2 A translation not related to the diagram or question.

A3 Correct central symmetry or axial symmetry on some other line segment, but note blunders above.

A4 States image is a line segment.

Worthless (0)

W1 Diagram reproduced without modification.

Part (iii)	**10 marks**	**Att 3**
(iii) Calculate the length of $[ac]$.		

Part (iii)	**10 marks**	**Att 3**
$\|ed\|^2 = 3^2 + 4^2$ $\|ed\|^2 = 9 + 16 = 25$ $\|ed\| = 5$ $\|ac\| = \|ed\| = 5$		

* Accept correct answer and no work.
* Accept recognition of Pythagorean triple 3,4,5.
* Accept correct trigonometric method.

Blunders (-3)

B1 $3^2 = 6$ or $4^2 = 8$, but penalise only once here.
B2 $|ed|^2 = 4^2 - 3^2$ and continues correctly (gives an answer of 2.646).
B3 Does not square 3 or 4, but penalise once only (i.e. $|ed|^2 = 3 + 4$ and continues correctly, giving an answer of 2.646).
B4 $|ed|^2 = 25$ or $|ed| = \sqrt{25}$ (or even $|ed| = 25$) and stops (i.e. no square root or square root not worked).
B5 Incorrect use of squares or square root tables, but penalise once only.

Slips (-1)
S1 Numerical errors to a maximum of –3.

Attempts (3 marks)
A1 Any correct statement of Pythagoras' theorem.
A2 $|ed| = 3 + 4 = 7$.
A3 Any correct relevant squaring.
A4 Tan $= \frac{4}{3}$ or Tan $= \frac{3}{4}$ and stops.
A5 Any correct trigonometric ratio written down.
A6 Attempt at a scaled diagram.

Worthless (0)
W1 Incorrect answer and no work (but note blunders above).

Part (iv)	10 marks	Att 3
(iv)	Explain why [*bc*] and [*cd*] are equal in length.	

Part (iv)	10 marks	Att 3
$\|bc\| = \|ae\| = \|cd\|$		

* Accept clear indication that line segments are equal on a diagram and [*ae*] must be incuded.
* Accept $(b,c) \uparrow (a,e) \uparrow (c,d)$.
* Accept [*cd*] is the image of [*bc*] under *ae*.

Blunders (-3)

B1 Writes $|bc| = |ae|$ or $|ae| = |cd|$ and stops.

B2 States " Opposites sides in a parallelogram are equal in length", but does not name line segments equal in length.

B3 States: triangles *abc* and *ecd* are congruent, but does not give a correct reason or gives no reason for congruency. (Note: need not name the triangles.)

B4 Writes SAS or ASA and stops.

B5 States [*cd*] is the image of [*bc*] under an unspecified translation and stops.

B6×2 States [*cd*] is the image of [*bc*] or $|bc| = |cd| = 7$ or c is the midpoint of [*bd*] and stops.

Attempts (3 marks)

A1 States "They are congruent" and stops.

A2 States "SSS or RHS" and stops.

A3 Mentions a parallelogram and stops.

Worthless (0)

W1 Diagram reproduced without modification.

W2 More than the required 3 sides marked using the same symbol.

W3 States " [*bc*] and [*cd*] are the same" and no further work.

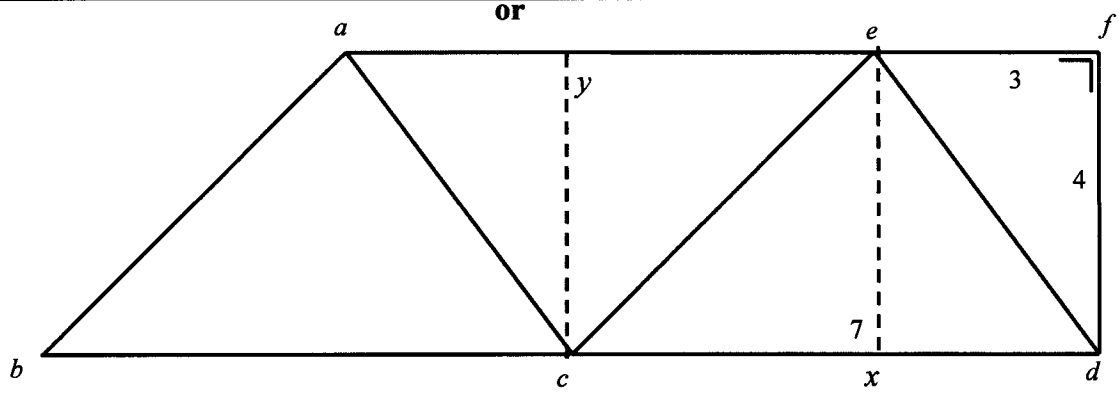
Part (v) **10 marks** **Att 3**

(v) Calculate the area of the figure *ecdf*.

Part (v) **10 marks** **Att 3**

Area triangle *efd* = ½.3.4 = 6
Area triangle *edc* = ½.7.4 = 14
Area of *ecdf* = 6 + 14 = 20

or



Area of *xdfe* = 3×4 = 12
Area of *cxe* = ½.4.4 = 8
Area of *ecdf* = 12 + 8 = 20

or

Area of *cdfy* = 7×4 = 28
Area of *cye* = ½.4.4 = 8
Area of *ecdf* = 28 - 8 = 20

* Accept correct answer and no work.
* Accept any other correct method.

Blunders (-3)
B1 ½ omitted in area of triangle, but penalise once only.
B2 Failure to add 6 and 14 or similar.
B3 Finds area of rectangle *cdfy* , but subtracts wrong triangle area (i.e. 28 – 6 = 22).
B4 Subtracts area of *cxe* from area of *xdfe* (i.e. 12 – 8 = 4).
B5 Adds area of *cye* to area of *cdf.* (i.e. 28 + 8 = 36).
B6×2 Finds area of one triangle and stops.
B7×2 Finds area of rectangle *xdfe* or *cdfy* and stops.

Slips (-1)
S1 Numerical errors to a maximum of –3.

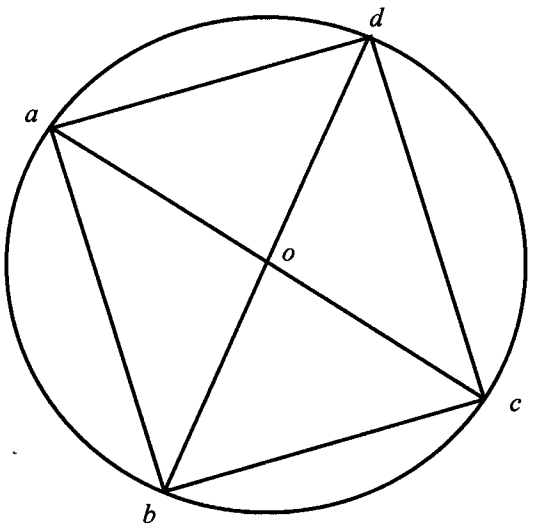
Attempts (3 marks)
A1 States area of triangle = ½ x base × height (but not ½*ah*).
A2 States area of rectangle = length × breadth.

Worthless (0)
W1 Incorrect answer and no work. (but note blunders above)
W2 3×5×7×4 = 420 or 3 + 5 + 7 + 4 = 19.

QUESTION 4

Each of five parts	10 marks	Att 3

4 $[ac]$ and $[bd]$ are diameters of a circle.
The centre of the circle is o.



Part (i)	10 marks	Att 3

(i) Write down the measure of $\angle abc$.

Part (i)	10 marks	Att 3

$|\angle abc| = 90°$

* Accept right angle indicated/marked on diagram
* Accept correct answer and no work (reason not required).

Blunders (-3)

B1 States angle standing on a diameter at circumference and stops (i.e. no conclusion).
B2 States $|\angle abc| = ½|\angle aoc| = ½(180°)$ and stops.
B3×2 States $|\angle abc| = ½|\angle aoc|$ and stops.

Attempts (3 marks)

A1 States " Angle at centre = twice angle at circle standing on same arc" and stops.
A2 States " Straight line angle = 180°" and stops.
A3 States " Opposite angles in a cyclic quadrilateral sum to 180° " and stops.
A4 States " Opposite angles in a rectangle are equal" and stops.

Worthless (0)
W1 Incorrect answer and no work.
W2 Diagram reproduced without modification.

Part (ii)	**10 marks**	**Att 3**
4(ii)	Name one isosceles triangle, giving a reason for your answer.	

Part (ii)	**10 marks**	**Att 3**
	Triangle *oab* or *obc* or *ocd* or *oda.* Reason: Each has two sides equal in length (radii of the circle).	

* Accept isosceles triangle clearly indicated on diagram, provided reason is given for full marks.

Blunders (-3)

B1 Names correct isosceles triangle but does not give reason.

B2×2 States a correct reason but does not name an isosceles triangle or names a triangle which is not isosceles.

B3 Names incorrect sides as equal.

B4 Gives reason as " All sides equal ".

Attempts (3 marks)

A1 Writes *aoc* or *b.* (because there are two radii involved).

Worthless (0)

W1 Non isosceles triangle named.

Part (iii)	**10 marks**	**Att 3**
(iii)	Name two triangles that are congruent.	

Part (iii)	**10 marks**	**Att 3**
Δaob and Δdoc	or Δaod and Δboc	or any two large triangles.

* Accept correct pair of congruent triangles clearly indicated on diagram.

Blunders (-3)

B1 Names a pair of small triangles which have two of the three criteria for congruency (e.g. Δaob and Δdoa).

B2×2 Names more than two triangles, two of which are congruent but fails to say which two (e.g. Δaob; Δdoc; Δdoa).

Note: 2 correct small triangles or 2 correct large triangles $\Rightarrow$ 10 marks.
2 incorrect small triangles $\Rightarrow$ 7 marks.
1 small triangle and 1 large triangle $\Rightarrow$ 0 marks.

Attempts (3 marks)

A1 States any reason for congruency and stops (SSS, SAS, ASA,RHS).

A2 States " Congruent triangles are equal in all respects." or like statement and stops (similar is not acceptable).

Worthless (0)

W1 Names only one triangle and stops.

Part (iv) **10 marks** **Att 3**

(iv) The area of the triangle *abc* is 30. The length of [*bc*] is 5.
Calculate the length of [*ab*].

Part (iv) **10 marks** **Att 3**

$$\tfrac{1}{2}|ab|.5 = 30 \quad \text{or} \quad \tfrac{1}{2}|ab|.5.\sin 90° = 30$$
$$\Rightarrow 2.5|ab| = 30$$
$$\Rightarrow |ab| = \frac{30}{2.5}$$
$$\Rightarrow |ab| = 12$$

* Accept correct answer and no work.
* Accept candidate's answer to part **(i)** if ½*ab*sin*C* is used.

Blunders (-3)

B1 ½ omitted in area of triangle.
B2 Incorrect transposition and continues correctly (e.g. $|ab| = 30\times2.5 = 75$).
B3 Each incorrect substitution or missing substitution for ½,5 or 30. (But note: W1 and W3 below)
B4 Leaves as $\frac{30}{2.5}$. (i.e. $\frac{30}{2.5}$ not calculated)
B5×2 ½ $|ab|.5 = 30$ or $2.5|ab| = 30$ and stops.
B6 Sin 90° ≠ 1, if ½ absinC is used.

Slips (-1)
S1 Numerical errors to a maximum of –3.

Attempts (3 marks)
A1 States " Area of triangle = ½ x base x perpendicular height" and stops (but not ½*ah*).
A2 Identifies perpendicular height as 5 and stops.
A3 States: Area of triangle *abc* = ½ × area of rectangle *abcd* and stops.

Worthless (0)
W1 Incorrect answer and no work (but note blunders above).
W2 $|ab|$ measured using a ruler (i.e. 5.2).
W3 $|ab| = 30$ and stops.

Part (v) **10 marks** **Att 3**

(v) Calculate the radius of the circle.

Part(v) **10 marks** **Att 3**

$|ac|^2 = 5^2 + 12^2$

$|ac|^2 = 25 + 144$

$|ac|^2 = 169$

$|ac| = \sqrt{169}$

$|ac| = 13$

Radius = $\frac{1}{2}(13) = 6.5$

* Accept candidate's answer for $|ab|$ in part **(iv).**

* Accept correct answer and no work.

* Accept recognition of Pythagorean triple 5,12,13 for $|ac|$.

* Accept correct trigonometric method.

Blunders (-3)

B1 Calculates $|ac|$ and stops (i.e. finds the diameter).

B2 $5^2 = 10$ or $12^2 = 24$, but penalise only once here.

B3 $|ac|^2 = 12^2 - 5^2$ and continues correctly (gives an answer of 10.91 for $|ac|$).

B4 Does not square 5 or 12, but penalise once only (i.e. $|ac|^2 = 5 + 12$ and continues correctly, giving an answer of 4.123 for $|ac|$).

B5 $|ac|^2 = 169$ or $|ac| = \sqrt{169}$ (or even $|ac| = 169$) and continues correctly, i.e. no square root or square root not worked (may also incur B1 if radius not worked)

B6 Incorrect use of squares or square root tables, but penalise once only.

B7 Incorrect transposition (e.g. radius = 13 × 2 =26)

Slips (-1)

S1 Numerical errors to a maximum of –3.

Attempts (3 marks)

A1 Any correct statement of Pythagoras' theorem.

A2 $|ac| = 5 + 12 = 17$.

A3 Any correct relevant squaring.

A4 Tan $= \frac{12}{5}$ or Tan $= \frac{5}{12}$ and stops.

A5 Any correct trigonometric ratio written down.

A6 Attempt at a scaled diagram.

A7 States: radius = ½ × diameter and stops.

Worthless (0)

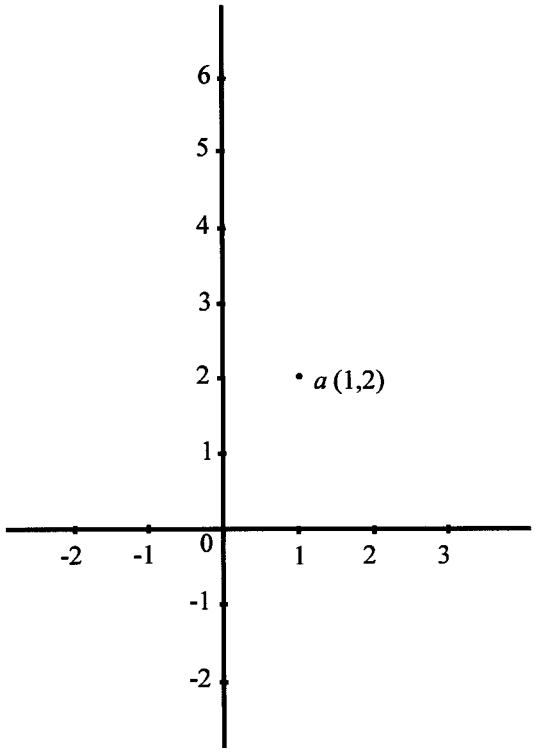
W1 Radius measured with a ruler (3.4).

W2 Incorrect answer and no work (but note blunders above).

QUESTION 5

	50 (10, 10, 10, 5, 5, 10) marks	Att (3,3,3,2,2,3)
Part (i)	**10 marks**	**Att 3**
Part (ii)	**10 marks**	**Att 3**
Part (iii)	**10 marks**	**Att 3**
Part (iv)	**5 marks**	**Att 2**
Part (v)	**5 marks**	**Att 2**
Part (vi)	**10 marks**	**Att 3**

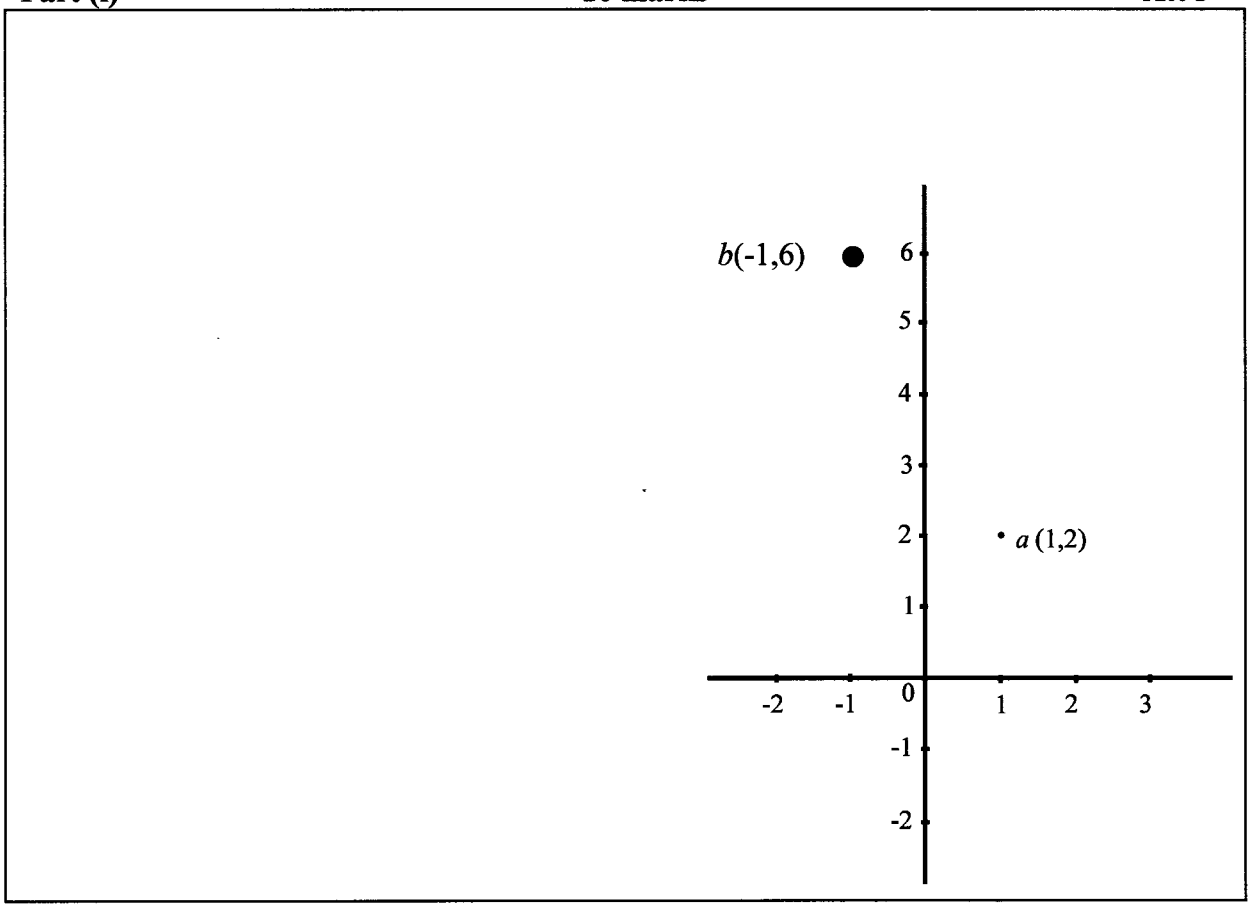
The point $a(1,2)$ is shown on the diagram.



Part (i) **10 Marks** **Att 3**

5(i) Copy the diagram and plot the point $b(-1,6)$.

Part (i) **10 marks** **Att 3**



Blunders (-3)

B1 Incorrect scales on axes. Penalise once only.
B2 Plots (-1,y) or (x,6) (but note M1).
B3 Draws a line joining (-1,0) to (0,6).
B4 Draws $x = -1$ or $y = 6$ (if both drawn no penalty, provided intersection is on the graph).
B5 Plots (6,-1).

Misreadings (-1)

M1 Plots (1,6) or (1,-6) or (-1,-6) but note B5

Attempts (3 marks)

A1 Plots an arbitrary point.
A2 Draws the axes only.

Part (ii)	**10 marks**	**Att 3**
(ii) Find the slope of *ab*.		

Part (ii)	**10 marks**	**Att 3**

$$\text{Slope of } ab = \frac{6-2}{-1-1} = \frac{4}{-2} = [-2]$$

or

$$\text{Slope of } ab = \frac{2-6}{1--1} = \frac{-4}{2} = [-2]$$

* Accept $\frac{4}{-2}$ or $\frac{-4}{2}$ without further simplification, but if evaluated incorrectly then penalise in part **(iii)** (e.g. $\frac{4}{-2} = 2$).

* Accept correct trigonometric method (i.e. Tan $\theta = \frac{4}{-2} = -2$).

Blunders (-3)

B1 Answer left as $\frac{6-2}{-1-1}$ or similar.

B2 Serious numerical error (e.g. $\frac{6}{-1} \pm \frac{2}{1}$).

B3 Incorrect sign in slope formula (e.g. $\frac{y_2 + y_1}{x_2 + x_1}$).

B4 Uses $\frac{x_2 - x_1}{y_2 - y_1}$ or $\frac{y_2 - y_1}{x_1 - x_2}$ and continues.

B5×2 Uses $\frac{x_1 - y_1}{x_2 - y_2}$ and continues.

B6 Each incorrect substitution if not already penalised to a maximum of 2 blunders (e.g. gets slope of *oa* or *ob*).

B7 Tan $\theta = \frac{\text{adjacent}}{\text{opposite}}$ or $m = \frac{\text{horizontal}}{\text{vertical}}$ and continues.

B8×2 Calculates *vertical* = 4 and *horizontal* = -2, but does not state $m = \frac{4}{-2}$. (Note: may be calculated on diagram by inserting right-angled triangle.)

Slips (-1)

S1 Numerical errors to a maximum of –3.

Attempts (3 marks)

A1 Tan $\theta = \frac{\text{opposite}}{\text{adjacent}}$ or $m = \frac{\text{vertical}}{\text{horizontal}}$ and stops or makes one substitution.

Worthless (0)

W1 Uses wrong formula (e.g. midpoint or distance formula).

Part (iii) **10 marks** **Att 3**

(iii)	Find the equation of the line *ab*.

Part (iii) **10 marks** **Att 3**

Equation of *ab* $\Rightarrow \quad y-2 = -2(x-1) \quad \Rightarrow \quad 2x + y - 4 = 0$

* Accept candidate's slope from part **(ii)**.
* Accept y - 2 = -2(x – 1) or y – 6 = -2(x + 1) for full marks.
* Accept substitution of m = -2 and c = 4 into $y = mx + c$ to give $y = -2x + 4$.

Blunders (-3)
B1 Incorrect sign in formula, but penalise once only.
B2 Sign error in slope (e.g. from part **(ii)** may have written $m = \frac{4}{-2} = 2$).
B3 $y = -2x + c$ and stops (i.e. c not worked).
B4 Each incorrect substitution, if not already penalised, to a maximum of 2 blunders (e.g. 6 - 2 = -2(-1 – 1) is two blunders).
B5 Uses $x - x_1 = m(y - y_1)$ and continues.
B6×2 Uses $y - x_1 = m(x - y_1)$ and continues.
B7 Omits brackets. (e.g. $y - 2 = -2x - 1$ or similar)
B8 $y = mx + 4$ and stops.

Slips (-1)
S1 Numerical errors to a maximum of –3.
S2 Equation of *oa* or *ob* if origin is used as (x_1, y_1) , but correct if a or b used as (x_1, y_1) since incorrect slope has already been penalised in part **(ii)**.

Attempts (3 marks)

A1 States m = -2 (or candidate's value) and stops.

Worthless (0)
W1 Writes down a given formula for the equation of a line.
W2 $y = mx + c$ and incorrect m and c.

Part (iv) **5 marks** **Att 2**

(iv) The line ab intersects the x-axis at the point p.
Calculate the co-ordinates of the point p.

Part (iv) **5 marks** **Att 2**

Cuts x axis at $2x + 0 - 4 = 0$ $\Rightarrow$ $p(2, 0)$

* Note one blunder results in attempt mark of 2.
* Accept candidate's equation from part **(iii).**

Attempts (2 marks)
A1 $x = 2$ and stops.
A2 Graphical solution but must state (2,0).
Note: Verification of graphical solution by substituting into the equation gets full marks.
A3 States $x = 0$ or $y = 0$ and stops.
A4 Transposition error (e.g. $2x = -4$).
A5 Uses incorrect equation from part **(iii),** if not already penalised.

Slips (-1)
S1 Intersects the y axis at (0,4) if calculated, but attempt only if graphical.
S2 Numerical errors to a maximum of –3.

Worthless (0)
W1 Indicating point on graph without naming it.
W2 Incorrect graphical, but note A3, as one ordinate may be correctly stated.

Part (v) **5 marks** **Att 2**

(v) Find the co-ordinates of the point q, the midpoint of $[ab]$.

Part (v) **5 marks** **Att 2**

Mid point $[ab]$ $= \left(\frac{1-1}{2}, \frac{2+6}{2}\right) = \left(\frac{0}{2}, \frac{8}{2}\right) \Rightarrow q(0, 4)$

* Accept correct answer and no work.
* Note: no penalty on brackets e.g. 0,4 is acceptable.
* Accept translation method.
* Note: one blunder results in attempt mark of 2.

Attempts (2 marks)

A1 Incorrect sign in mid-point formula (penalise once only).
A2 Formula correctly filled but not completed i.e. $\left(\frac{1-1}{2}, \frac{2+6}{2}\right)$.
A3 Incorrect multiplication of signs i.e.1 + (-1) = 1+1.
A4 Omits divisor 2.
A5 Reversal of coordinates i.e. (4,0).
A6 One ordinate only worked out.
A7 Uses one of the points given and some other arbitrary point e.g. (1,2) and (0,0).
A8 $x \rightarrow x - 2$; and/or $y \rightarrow y + 4$ or similar.
A9 Correct graphical merits attempt only (i.e. between the two given points, but not named).
A10 One correct substitution and no further work.

Slips (-1)

S1 Numerical errors to a maximum of –3.
S2 Takes (-1,6) as midpoint and finds extremity (e.g. (1,2) → (-1,6) → (-3,10) **or** takes (1,2) as midpoint and finds extremity i.e. (-1,6) → (1,2) → (3,-2).
S3 Leaves as $\left(\frac{0}{2}, \frac{8}{2}\right)$.

Worthless (0)

W1 Uses incorrect formula e.g. slope formula.
W2 Incorrect midpoint marked on graph.

Part (vi) **10 marks** **Att 3**

(vi) Find $|pq|$, correct to one decimal place.

Part (vi) **10 marks** **Att 3**

$|pq| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(2-0)^2 + (0-4)^2} = \sqrt{(2)^2 + (-4)^2}$

$= \sqrt{20} = 4.472 = 4.5$

* Accept correct use of Pythagoras.
* Accept candidate's points p and q.
* Accept finding $|ab|$ correctly for full marks. (Note: $|pq| = |ab|$.)

Blunders (-3)

B1 Incorrect sign in distance formula, but penalise once only.
B2 Omits square root sign or leaves as $\sqrt{20}$. (Note: also incurs S2.)
B3 Incorrect use of square root tables.
B3 Omits squares, but penalise once only. (Note: may also incur B2 and S2.)
B4 Each incorrect substitution to a maximum of 2 blunders.
B5 $(-2)^2 = -4$ or $(-4)^2 = -16$, but penalise once only.
B6 Unfinished work e.g. leaves as $\sqrt{(2)^2 + (-4)^2}$. (Note: also incurs S2.)

Slips (-1)
S1 Numerical errors to a maximum of –3.
S2 Does not round correct to one decimal place.

Attempts (3 marks)
A1 Any one number filled correctly into formula.
A2 Leaves as $\sqrt{(2-0)^2 + (0-4)^2}$.

Worthless (0)
W1 Using incorrect formula (e.g. slope formula).
W2 Writes down distance formula and stops.
W3 Identifies (x_1, y_1) and (x_2, y_2) and no further work

QUESTION 6

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 7**
Part (c)	**20 (10,10) marks**	**Att (3,3)**

Part (a) **10 marks** **Att 3**

(a) Use the book of Tables to find:

(i) Sin 54°6′

(ii) Sin 54°10′.

Part (a) **10marks** **Att 3**

Sin 54°6′ = 0.8100

Sin 54°10′ = 0.8107

* Note: Each blunder is penalised only once in this section.

Blunders (*-3*)

B1 Only one value looked up correctly.

B2 No decimal point or misplaced decimal point, but penalise only once in this section.

B3 Gets $\sin^{-1}0.546 = 33°6'$.

B4 Correct Cos or Tan of 54°6′ (0.5864 or 1.3814).

B5 Ignores minutes (Sin 54° = 0.8090).

B6 Gets $\text{Sin}^{-1}0.5410 = 32°45'$.

B7 Correct Cos or Tan of 54°10′ (0.5855 or 1.3848).

B8 Error in use of mean difference column - this includes looking up Sin 10°54′ in part **(ii)**.

Slips (-1)

S1 Reads from incorrect row or column related to the question.

Misreadings (-1)

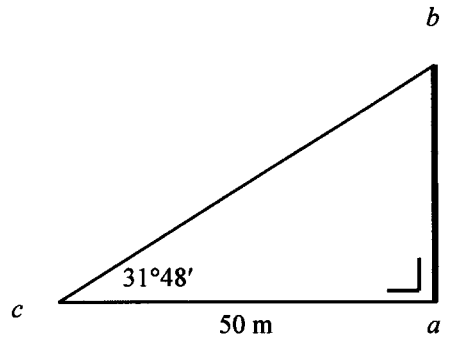
M1 Looks up Sin 6°54′ (but note B8).

Attempts (3 marks)

A1 Any correct trigonometric ratio written down (but not SOHCAHTOA or similar).

Part (b) **20 marks** **Att 7**

6(b)
A mast [*ab*] is held upright by a cable [*bc*], as shown.
Find $|ab|$, the height of the mast.



Part (b) **20 marks** **Att 7**

$$\frac{ab}{50} = \tan 31°48' = 0.6200$$
$$\Rightarrow |ab| = 31$$

Blunders (-3)
B1 No decimal point or misplaced decimal point.
B2 Incorrect trigonometric ratio and continues.
B3 Writes Tan 31° 48' $= \frac{50}{|ab|}$ and finishes correctly ($|ab| = 80.65$).
B4×2 Leaves as Tan31° 48' × 50.
B5×2 $\frac{|ab|}{50} = 0.6200$ and stops.
B6 Picks an arbitrary angle and proceeds correctly.
B7 Incorrect use of the mean difference column, if it occurs.

Slips (-1)
S1 Numerical errors to a maximum of –3.
S2 Reads from incorrect row or column related to the question.

Misreadings (-1)
M1 Finds $|cb|$ correctly ($|cb| = 58.83$).

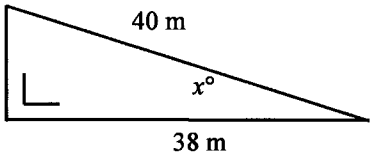
Attempts (7 marks)
A1 Any correct trigonometric ratio written down.
A2 $|ab| =$ Tan 31° 48' and stops.
A3 Writes $|\angle abc| = 58°\ 12'$ and stops.
A4 Looks up Sin, Cos or Tan of 31° 48' or 58° 12' correctly and stops.
A5 Any mention of 180°.

Worthless (0)
W1 50 ' combined with' 31° 48'.

Part (c) **10 marks** **Att 3**

(i) Write $\frac{38}{40}$ as a decimal.

(ii) Hence find the value of x in the diagram.



Part (c)(i) **10 marks** **Att 3**

$$\frac{38}{40} = 0.95$$

* Accept correct answer and no work.

Blunders (-3)

B1 No decimal point or misplaced decimal point.

B2 Gets $\frac{40}{38} = 1.05$ (accept correct to 2 decimal places).

B3 $\frac{38}{40} = 0.9$ and stops.

Slips (-1)

S1 Numerical errors to a maximum of –3.

Attempts (3 marks)

A1 Makes some attempt at dividing 38 by 40.

Worthless (0)

W1 Writes .3840.

W2 Incorrect answer and no work (but note blunders above).

Part (c)(ii) **10 marks** **Att 3**

$$\text{Cos } x = \frac{38}{40} = 0.95$$

$$\Rightarrow \quad x = 18°12'$$

* Accept correct answer and no work.
* Accept candidate's value for $\frac{38}{40}$ from part **(i).**
* Accept other correct methods (e.g. use of Pythagoras, then Sin or Tan).

Blunders (-3)

B1 Incorrect trigonometric ratios, but note W3 below.

B2 Finds the angle at the top correctly and stops (71°48′ - does not subtract from 90°).

B3 Writes $\text{Cos } x = \frac{38}{40} = 0.95$ and stops.

B4×2 $\cos x = \frac{38}{40}$ and stops.

B5 Error in handling minutes → degrees, if top angle found first.

Slips (-1)

S1 Reads from incorrect row or column related to the question.

Attempts (3 marks)

A1 Any correct trigonometric ratio written down. (but not SOHCAHTOA or similar)

A2 States theorem of Pythagoras or uses it to find length of third side (12.49).

Worthless (0)

W1 Diagram reproduced without modification.

W2 Angle measured with a protractor (18°).

W3 Value of Sin or Cos > 1.