QUESTION 1

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 (10,10)marks**	**Att 6**
Part (c)	**20 (10,10) marks**	**Att 6**

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

The perimeter of a rectangle is 200 cm. If the length : breadth = 3 : 2, find the area of the rectangle.

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

$P = 2(3x + 2x) = 200$	step 1	or $P = 10x = 200 \Rightarrow x = 20$	step 1
$\Rightarrow 5x = 100 \Rightarrow x = 20$	step 2	$\Rightarrow L = 3x = 60 : B = 2x = 40$	Step 2
$A = 6x^2 = 6(400) = 2{,}400\ \text{cm}^2$	step 3	$\Rightarrow A = L \times B = 60 \times 40 = 2{,}400$	step 3

B1 Each step incorrect or omitted
S1 Arithmetic slips
A1 Area formula e.g. 2 x 3 = 6
A2 Diagram with 2 and/or 3 shown
W1 Rectangle with no figures

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

A solid cone has a vertical height 6 cm. The slant height is 7·5 cm.

(i) Find the radius of its base.

(ii) Find the total surface area in cm^2.

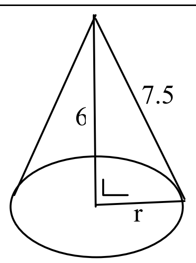
Give your answer correct to three significant figures.

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

$r^2 + 6^2 = 7 \cdot 5^2$ step1

$\Rightarrow \quad r^2 = 7 \cdot 5^2 - 6^2 = 56.25 - 36$ step 2

$\Rightarrow \quad r = 4 \cdot 5 \ (\text{or } \sqrt{20 \cdot 25})$ step3



B1 Each step incorrect or omitted
B2 Incorrect substitution into correct formula
S1 Numerical slips
A1 Some effort at Pythagoras
A2 Correct formula but no substitution
A3 Right-angled triangle with correct figures

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

T.S.A. $= \pi$ rl $+ \pi$ r^2 step 1
$= \pi \times 4.5 \times 7.5 + \pi \times 4.5^2 = 33.75\pi + 20.25\pi$ step2
$= 54\pi = 169.56$ (169.668, 169.646, 169.714)
$= 170$ step3

*** Accept candidate's answer from (b)(i)**

B1 Each step incorrect or omitted
B2 Leaves answer in terms of pye
B3 Each part calculated but not added
B4 Uses one formula of step1 and completes correctly

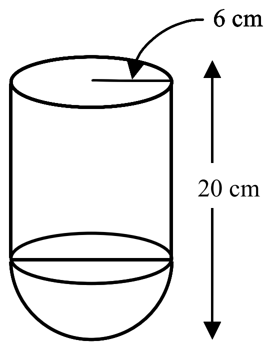
S1 Numerical slips
S2 Failure to round off or does it wrongly

A1 One or other of the formulae with some substitution and stops
A2 Indication of addition of some relevant formulae (must have π) and stops
A3 Substitutes into some relevant formula (π in it) & stops: If continues correctly merits 4m
W1 π rl and/or π r^2 and stops (i.e. no addition shown)

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

(i) A container is in the shape of a cylinder on top of a hemisphere as shown. The cylinder has a radius of 6 cm and the container has a height of 20 cm.

✍ Calculate the volume of the container in terms of π.



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

$$V = \pi r^2 h + \frac{2}{3}\pi r^3 \quad \text{step1 (Accept } \frac{2}{8}\pi r^3 \text{ or } \frac{1}{4}\pi r^3 \text{)}$$

$$= \pi 6^2 \times 14 + \frac{2}{3}\pi 6^3 \quad \text{step 2} \qquad 504\pi + 144\pi = 648\pi \quad \text{step 3}$$

B1 Each step incorrect or omitted
B2 Incorrect height e.g. 20 or 17
B3 Incorrect relevant formula e.g. $\frac{4}{3}\pi r^3$

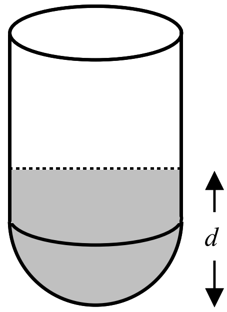
S1 Numerical slips
S2 Answer not in terms of π (2034.72)
A1 Either formula with some substitution
A2 Height = 14 or 17 & stops
A3 $\frac{2}{3}\pi r^3$ and stops

A4 One formula correctly calculated merits the attempt mark at most

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

(ii) One third of the volume of the container is filled with water.

✍ Calculate, d, the depth of the water in the container.



1 $\text{Vol. of water} = \frac{1}{3}(648\pi) = 216\pi$ step 1:

$\Rightarrow$ Vol of water in cyl $= 216\pi - 144\pi$(hemisphere) $\Rightarrow 72\pi = \pi r^2 h$ step 2

$\Rightarrow 36h = 72 \Rightarrow h = 2 \qquad \Rightarrow d = 2 + 6 = 8$ step 3

2 $\frac{2}{3}(648\pi) = 432\pi$ step 1 $\qquad \Rightarrow \pi r^2 h = 432\pi$ step2

$\Rightarrow 36h = 432 \quad \Rightarrow h = 12 \qquad \Rightarrow d = 20 - 12 = 8$ step 3

- **Accept candidate's work from (c)(i)**

B1 Each step incorrect or omitted

B2 Blunders as in (c)(i)

B3 $\pi r^2 h = 216\pi$ (method 2) and continues ($h = 6, d = 14$)

B4 Answer 2 or 12 i.e. no addition or subtraction

S1 Numerical slips

A1 Attempts as in (c) (i)

A2 Indicates division by 3 e.g. $\frac{20}{3}$

Note Accept $r = 3$ in this part if $h = 17$ in (c)(i)

QUESTION 2

Part (a)	**15 (5,10) marks**	**Att 5**
Part (b)	**15 (10,5) marks**	**Att 5**
Part (c)	**20 (5,5,5,5) marks**	**Att 8**

Part (a)	**10 (5,5) marks**	**Att 2,2**

a (3, -2) and *b* (-1, 1) are two points.

(i) ✍ Find the co-ordinates of the midpoint of [*ab*].

(ii) ✍ Find $|ab|$.

(a) (i)	**5 marks**	**Att 2**

$$\frac{3-1}{2},\frac{-2+1}{2} = (1,-\frac{1}{2})$$

B1 Incorrect mid-point formula & continues B2 Mixes x^s & y^s in both
B3 Error in signs
A1 Writes mid-point formula and/or substitutes & stops
A2 Some attempt at addition or subtraction & stops
A3 Any revelant graphical attempt (once only)

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

$$|ab| = \sqrt{(3+1)^2+(-2-1)^2} = \sqrt{16+9} = 5$$

B1 Incorrect distance formula & continues B2 Error in signs
A1 Writes distance formula & stops
A2 Some attempt at addition or subtraction & stops

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

(b) The line $3x - 2y + 9 = 0$ cuts the *x*-axis at *p* and the *y*-axis at *q*.

(i) ✍ Find the co-ordinates of *p* and the co-ordinates of *q*.

(ii) ✍ Find the co-ordinates of the image of *p* under the central symmetry in *q*.

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

$y = 0 \Rightarrow 3x - 0 + 9 = 0$ $x = -3$ p (-3.0)

$x = 0 \Rightarrow 0 - 2y + 9 = 0$ $y = 4\frac{1}{2}$ $q\,(0,4\frac{1}{2})$

B1 Error in transposition

B2 (-3,4·5) or variations

B3 (0,-3) and (4·5, 0)

B4 One point correct only

S1 One point correct, the other the wrong way round

A1 States y = 0 for p and/or x = 0 for q and stops

A2 Attempts to get point(s) on the line

W1 Draws any line and stops

(b) (ii) **5 marks** **Att 2**

$p(-3,0) \rightarrow q(0,4\frac{1}{2})$ x up 3, y up $4\frac{1}{2}$ $\Rightarrow p^1 = (0+3, 4\frac{1}{2}+4\frac{1}{2})$ step1 $= (3,9)$ step2	$\frac{-3+x}{2}, \frac{0+y}{2}$ $\frac{-3+x}{2} = 0$ $\frac{0+y}{2} = 4\frac{1}{2}$ step 1 $\Rightarrow x = 3$ $y = 9$ step 2

Or (-3,0) $\rightarrow$ $(0,4\frac{1}{2})$ $\rightarrow$ (3,9) for full marks

B1 Each step incorrect or omitted

B2 Incorrect sign in change of x and/or y and continues

B3 Incorrect direction of translation (gets image of q in p)

B4 Change in x applied to y and vice versa

S1 Incorrect numerical change each time (must be in the correct direction)

A1 Determines one change & stops

A2 Correct graphical solution

A3 Invents p and q and carries out symmetry correctly

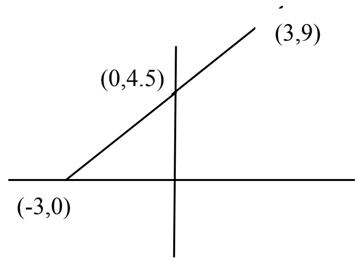
A4 Gives explanation of central symmetry and stops e.g. finds symmetry in the origin of any point

A5 Gets the mid-point of [pq] & stops

A6 Mid-point formula & stops

Note: This diagram merits 2 marks

However if arrows are shown it merits 5 marks



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

L is the line $3x - y - 11 = 0$.

(i) ✍ Find the slope of L.

(ii) The line K contains the points a (-3, 0) and b (6, r).
K is perpendicular to L.

✍ Find the value of r.

(iii) ✍ Find the coordinates of the image of the point b under the axial symmetry in the line L.

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

$3x - y - 11 = 0$	$m = -\frac{a}{b}$	(3,-2), (4,1) or other points
$-y = -3x + 11$	$= \dfrac{-3}{-1}$	$\dfrac{1+2}{4-3}$
$m = 3$	$= 3$	$m = 3$

B1 Error in manipulation

B2 Error in formula

B3 Selects a point that is not on the line & continues

A1 Correct formula and stops.

A2 Finds correct point(s) on the line and stops.

A3 Says x = 0 at the Y-axis and/or y = 0 at the X-axis and stops.

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

$$m = \frac{r - 0}{6 - (-3)} = -\frac{1}{3} \quad \Rightarrow \frac{r}{9} = -\frac{1}{3} \quad \Rightarrow r = -3$$ or

$$K : (-3,0), m = -\frac{1}{3} \Rightarrow y - 0 = -\frac{1}{3}(x+3) \Rightarrow x + 3y + 3 = 0 : b \in K \Rightarrow 6 + 3r + 3 = 0 \Rightarrow r = -3$$ or

$$K:\ x + 3y + k = 0,\ (-3,0) \in K \Rightarrow -3 + 3(0) + k = 0; \Rightarrow k = 3 \text{ giving } K : x + 3y + 3 = 0 \text{ \& continues}$$

*** Allow candidate's work from (c)(i)**

B1 Incorrect slope of K

B2 Incorrect formula

B3 Switches x and y in substitution

B4 Substitutes correctly for x and y but no slope

S1 Incorrect sign after substituting and continues

A1 States $m_1 m_2 = -1$ and stops

A2 Gets $m = -\frac{1}{3}$ and stops

A3 Correct line formula and stops

A4 Correct graphical solution

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

$L \cap K: 3x - y - 11 = 0 \;\; X\; 3 \Rightarrow 9x - 3y = 33$
$x + 3y + 3 = 0 \quad \Rightarrow x + 3y = -3 \;\Rightarrow 10x = 30 \Rightarrow x = 3$ and $y = -2 \Rightarrow (3,-2)$

***Accept candidate's work from (c) (ii)**

B1 Error in manipulation of equations

B2 Incorrect or no substitution for second value

A1 Any correct step and stops
A2 Correct graphical solution
A3 Attempts to get a point on L or K

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

$(6,-3) \;\rightarrow\; (3,-2)$ x down 3 and y up 1 $\Rightarrow (3,-2) \rightarrow (0,-1) = S_L b$

B1 Incorrect direction of translation

B2 Incorrect sign in change of x and/or y and continues

S1 Numerical slips

A1 States correct translation & stops

A2 Correct graphical solution

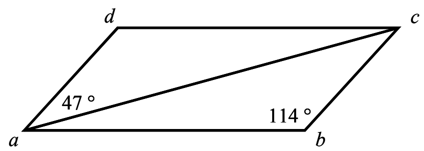
A3 Invents point of intersection and carries out symmetry correctly

QUESTION 3

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 6**
Part (c)	**20 marks**	**Att 6**

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

In the parallelogram *abcd*,
$|\angle abc| = 114°$
and $|\angle dac| = 47°$.



✍ Find $|\angle bac|$.

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

$|\angle \text{acb}| = 47°(\text{alt})$ step 1

$\Rightarrow |\angle \text{bac}| = 180° - (114° + 47°)$ step 2 $\Rightarrow |\angle \text{bac}| = 180° - 161° = 19°$ step 3

or 114 x 2 =228; 360 – 228 = 132 Step 1: $132 \div 2 = 66$ step 2 66 - 47 = 19 step 3

B1 Each step incorrect or omitted

B2 Treats triangles as isosceles

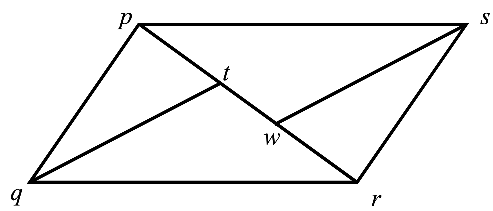
B3 Uses 360° for 180°

S1 Numerical slips
A1 Indicates angles in triangle total 180° or angles in parallelogram total 360° & stops
A2 Mentions alternate angles & stops
A3 States some parallelogram property & stops e.g. opposite angles are equal

W1 Treats [ac] as bisector of $\angle$bad getting $\angle$bac = 47°
W2 treats $\angle$bad = 90° getting $\angle$bac = 43°

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

In the parallelogram *pqrs*, the points *t* and *w* are on the diagonal [*pr*] such that $|\angle pqt| = |\angle wsr|$.



(i) ✍ Prove that $|pt| = |wr|$.

(ii) ✍ Hence, or otherwise, show that the triangles *psw* and *qtr* are congruent.

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

Compare Δpqt and Δwsr
$\lvert\angle pqt\rvert = \lvert\angle wsr\rvert$ (given) and $\lvert\angle qpt\rvert = \lvert\angle wrs\rvert$ (alt) step 1
$\lvert pq\rvert = \lvert sr\rvert$ step 2
$\Delta pqt \equiv \Delta wsr$ (orASA) $\Rightarrow \lvert pt\rvert = \lvert wr\rvert$ step 3

B1 Each step incorrect or omitted

B2 Each incomplete step

A1 Diagram with the given pair of equal angles indicated & stops

A2 Identifies the two congruent triangles & stops

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

SSS	**SAS**
step 1 $\lvert pw\rvert = \lvert rt\rvert$ as $\lvert pw\rvert = \lvert pt\rvert + \lvert tw\rvert$ and $\lvert rt\rvert = \lvert rw\rvert + \lvert tw\rvert$ step 2 $\lvert ps\rvert = \lvert qr\rvert$ (opp. sides) $\lvert sw\rvert = \lvert qt\rvert$ (from (b)(i)) step 3 $\Rightarrow \Delta psw \equiv \Delta qrt$ (SSS)	step 1 $\lvert\angle spw\rvert = \lvert\angle trq\rvert$ (alt) $\lvert ps\rvert = \lvert qr\rvert$ step 2 $\lvert pw\rvert = \lvert rt\rvert$ step 1 opposite step 3 $\Delta psw = \Delta qrt$ (SAS) **Can also be proved by ASA**

B1 Each step incorrect or omitted

B2 Each step incomplete

A1 Identifies both triangles e.g. draws them separately

A2 Diagram with pair of equal angles indicated

Part (c) **20 marks** **Att 6**

> ✍ Prove that if two triangles are equiangular, the lengths of corresponding sides are in proportion.

(c) **20 marks** **Att 6**

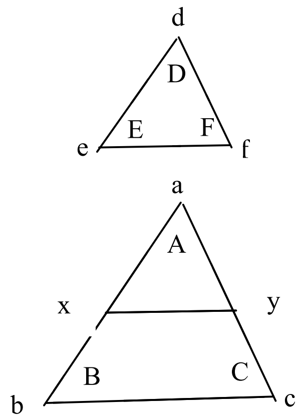
Given : Δabc and Δdef with

$$|\angle A| = |\angle D| : |\angle B| = |\angle E| : |\angle C| = |\angle F|$$

R.T.P. $\dfrac{|ab|}{|de|} = \dfrac{|bc|}{|ef|} = \dfrac{|ac|}{|df|}$ step 1

Const. Mark x on [ab] such that $|ax| = |de|$

Mark y on [ac] such that $|ay| = |df|$ step 2



Proof : Δaxy and Δdef are congruent

$|\angle axy| = |\angle E|$ step 3

$\Rightarrow |\angle axy| = |\angle abc| \Rightarrow xy \,//\, bc$ step 4

$\Rightarrow \dfrac{|ab|}{|ax|} = \dfrac{|ac|}{|ay|}$ step 5

$\Rightarrow \dfrac{|ab|}{|de|} = \dfrac{|ac|}{|df|} \Rightarrow \dfrac{|ab|}{|de|} = \dfrac{|bc|}{|ef|} = \dfrac{|ac|}{|df|}$ step 6

B1 Each step incorrect or omitted

A1 Draws two separate triangles and indicates equal angles

A2 Indicates the second diagram of the proof & stops

A3 Any knowledge of the theorem shown

QUESTION 4

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 6**
Part (c)	**20 marks**	**Att 7**

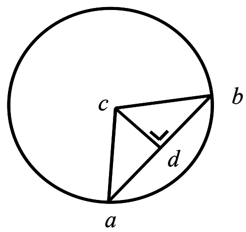
Part (a) **10 marks** **Att 3**

A circle, centre c, has a chord $[ab]$ of length 8.

d is a point on $[ab]$ and cd is perpendicular to ab.

$|cd| = 3$.

Find the length of a diameter of the circle.



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

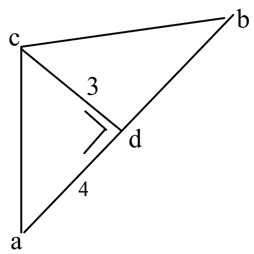
$|ca|^2 = 3^2 + 4^2 = 25$ step 1 $|ad| = 4$

$\Rightarrow |ca| = 5(\sqrt{25}) = r$ step 2 $|ca|$ or $r = 5$

$\Rightarrow$ diameter $= 10\ (2\sqrt{25}\ )$ step 3 diameter $= 10$

Note : Award full marks for

Diagram with 3,4,5 shown $\Rightarrow$ diameter $= 10$



B1 Each step incorrect or omitted

B2 Misuse of Pythagoras or uses 8 for 4

S1 Numerical slips

A1 States or implies Pythagoras & stops

A2 States theorem about line through the centre bisecting the chord

A3 Indicates $|ac| = |bc|$ & stops

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

(i) Prove that a diagonal bisects the area of a parallelogram.

(ii) Show how to construct the circumcircle of a triangle.

All construction lines must be clearly shown.

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

Given; Parm abcd with diagonal ac

To prove : area Δabc = area Δadc step 1

Proof : $|ac| = |ac|$

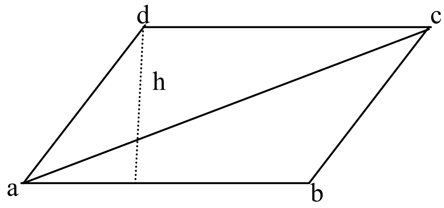
$|ab| = |dc|$

$|ad| = |bc|$ step 2

$\Rightarrow \Delta abc \equiv \Delta adc \Rightarrow$ area Δabc = area Δadc step 3

Note

Candidate may use half the base by the perpendicu lar height



- **Accept step 2 clearly indicated on diagram**
- **Memorised proof with no diagram: award full marks if all steps are given**

B1 Each step incorrect or omitted

B2 Proves theorem “opposite sides and angles in a parallelogram are equal”

A1 Parallelogram with a diagonal drawn & stops

W1 Any theorem other than in B2

W2 A parallelogram with nothing else

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

Construction: Draw a triangle abc. With compass and suitable radius length bisect any two sides of the triangle. Let the bisectors meet at the point k. k is the circumcentre of the triangle. With k as centre draw a circle passing through the points a,b and c. This circle is the circumcircle of the triangle abc.

One side bisected step 1: Second side bisected step 2: Circle drawn step 3

- **Allow a tolerance of 2mm for the vertices**
- **Arcs must be shown or other construction method**

B1 Each vertex not on circle (i.e. outsde tolerance)

A1 Circumcircle and triangle drawn with no construction lines shown

A2 Bisects one angle of the triangle & stops

MR Incircle drawn with construction lines clearly shown

W1 Triangle with incircle drawn but no construction shown

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

a, d, b, c are points on a circle, as shown.

o is the centre of the circle.

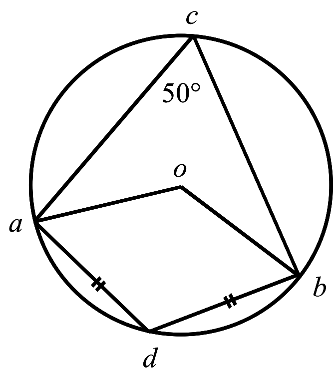
$|\angle acb| = 50°$ and $|ad| = |db|$.

Find

(i) $|\angle aob|$

(ii) ✍ $|\angle adb|$

(iii) ✍ By joining a to b, or otherwise, find $|\angle oad|$.



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

$|\angle aob| = 100°$ or $260°$

*** Accept correct answer given on a diagram or answer given as 2(50)**

B1 25° or 335°

A1 $|\angle aob| = 2|\angle acb|$ & stops

A2 c joined to o in diagram

W1 Diagram reproduced without modification

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

$|\angle adb| = 180° - 50° = 130°$ OR

Reflex angle $|\angle aob| = 360° - 100° = 260° \Rightarrow |\angle adb| = \frac{1}{2}(260°) = 130°$

*** Work with candidate's answer in (c)(i)**

B1 50° or 90° or 80° with work shown

S1 Numerical slips

A1 $|\angle acb| + |\angle adb| = 180°$ or similar & stops

W1 Any other angle other than at B1

W2 Diagram without modification

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

In isosceles Δaob $\lvert\angle \text{aob}\rvert = 100° \Rightarrow \lvert\angle \text{oab}\rvert = \frac{1}{2}(80°) = 40°$ step 1
In isosceles Δadb $\lvert\angle \text{adb}\rvert = 130° \Rightarrow \lvert\angle \text{dab}\rvert = \frac{1}{2}(50°) = 25°$ step 2 : $40° + 25° = 65°$ step 3
Or
$100° + 130° = 230°$ step 1 : $360° - 230° = 130°$ step 2 : $\frac{130°}{2} = 65°$ step 3

B1 Each step incorrect or omitted

B2 Sum of angles in triangle $\neq 180°$

A1 $\lvert \text{ao}\rvert = \lvert \text{bo}\rvert$ & stops

A2 Two angles in an isosceles triangle are equal

A3 Angles in a triangle total 180°

QUESTION 5

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 7**
Part (c)	**20 marks**	**Att 6**

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

If $\tan A = -1$, find the two values for the angle A, where $0° \leq A \leq 360°$.

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

Angle of reference is $45°$: step 1

$\Rightarrow \text{A} = 180° - 45°$ or $360° - 45°$ step 2 $\Rightarrow$ $\text{A} = 135°$ and $315°$ step 3

B1 Incorrect ACTS
B2 Incorrect use of 180° or 360°
B3 Uses 90° and/or 270°

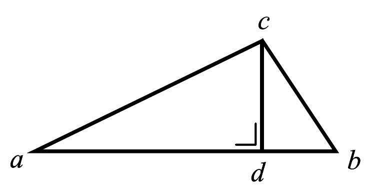
S1 Numerical slips

S2 Correct angle outside range

A1 Uses calculator to get –45° & stops
A2 Axes drawn with at least one angle or ACTS indicated
A3 $-0 \cdot 0174$ (i.e. $\text{Tan}(-1)$)
A4 Incorrect mode on calculator
A5 $\text{TanA} = \dfrac{\text{O}}{\text{A}}$

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

(i) *abc* is a triangle where $|bc| = 6$.
d is a point on [*ab*] and
cd is perpendicular to *ab*,
where $|cd| = 4$ and $|ad| = 9$.



Find $|\angle cbd|$, correct to the nearest degree,

and find $|\angle cad|$, correct to the nearest degree.

(ii) X is an acute angle such that $\sin X = \dfrac{1}{2}$.

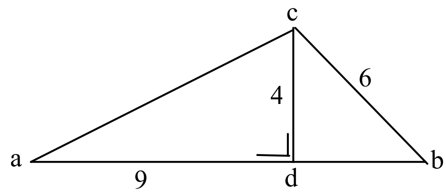
Find the value of $\cos X$ in surd form.

(b) (i) **10 (5,5)marks** **Att 2,2**

$\text{Sin } \angle cbd = \frac{4}{6}$ step 1 $|\angle cbd| = 41 \cdot 8° = 42°$ step2

$\text{Tan } \angle cad = \frac{4}{9}$ step 1 $\Rightarrow |\angle cad| = 23 \cdot 9° = 24°$ step2

Other ratios may be used



To be applied to parts (b) and (c)

B1 Each step incorrect or omitted
B2 Incorrect ratio (Sin, Cos or Tan)
B3 Incorrect ratio in Sine Rule
B4 Error in cross-multiplication
B5 Error in transposition
B6 Takes 1° = 100’
B7 Decimal error
B8 Failure to calculate
B9 Reads wrong page of the tables or calculator in the wrong mode
B10 Early rounding off which affects the accuracy of the answer

Mr 1 Fails to distinguish between degrees and minutes and decimal degrees

S1 Numerical slips
S2 Fails to round off or rounds off incorrectly each time
S3 Slip reading tables e.g. wrong column

A1 Partly filled in Sine Rule and stops
A2 Writes down Sin, Cos or Tan ratio & stops
A3 Finds $|ac|$ or $|db|$ and stops in (b) (i)
A4 Triangle cdb and/or acd drawn with sides identified – attempt 2 for each

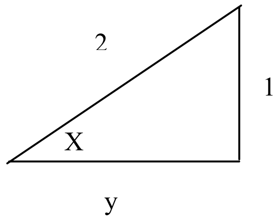
(b) (ii) **10 marks** **Att 3**

X is acute and $\sin X = \frac{1}{2} \Rightarrow |\angle X| = 30° : \Rightarrow \cos X = \frac{\sqrt{3}}{2}$ or

Diagram or $\sin X = \frac{1}{2} = \frac{o}{h}$ step 1

$|y|^2 = 2^2 - 1^2 = 3 \Rightarrow |y| = \sqrt{3}$ step 2

$\Rightarrow \cos \angle X = \frac{\sqrt{3}}{2}$ step 3



B11 Each step incorrect or missing
B12 Error in Theorem of Pythagoras
B13 Answer not in surd form

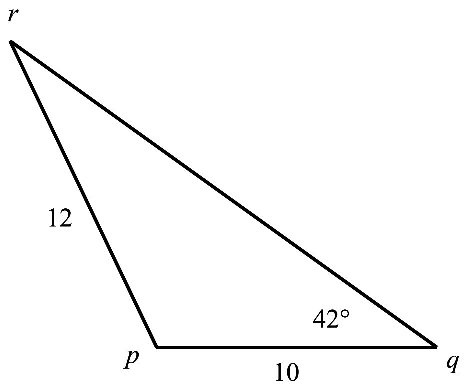
A5 Correct formula for Theorem of Pythagoras & stops
A6 Diagram with 1 and 2 but no X & stops

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

(i) In the triangle pqr,
$|pq| = 10$, $|pr| = 12$ and
$|\angle pqr| = 42°$.

✍ Find $|\angle prq|$,

giving your answer correct to one decimal place.



(ii) ✍ Calculate the area of the triangle pqr, giving your answer correct to one decimal place.

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

$$\frac{\text{Sin}\angle \text{prq}}{10} = \frac{\text{Sin}\angle 42°}{12} \quad \text{step1} \quad \Rightarrow \quad \text{Sin}\angle\text{prq} = \frac{10.\text{Sin}\angle 42°}{12} = \cdot 5576 \quad \text{Step 2}$$

$$\Rightarrow |\angle\text{prq}| = 33 \cdot 89 = 33 \cdot 9 \quad \text{step 3}$$

B1 Each step incorrect or missing

W1 Treats triangle pqr as a right-angled triangle

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

$$|\angle\text{rpq}| = 180° - (42° + 33 \cdot 9°) \quad = 104 \cdot 1° \quad \text{step 1}$$

$$\text{Area } \Delta \text{ pqr} = \frac{1}{2}.10.12.\,\text{Sin}104 \cdot 1° \quad \text{step 2} \qquad = 58 \cdot 19 = 58 \cdot 2 \quad \text{step 3}$$

***Note: Candidate may get $|\text{rq}|$ by the sine Rule and get the area using a different angle (17.39)**

B14 Uses only one side $\frac{1}{2}|\text{rp}|\text{Sin}104 \cdot 1°$

B15 Incorrect formula e.g. Cos for Sin or omits the half

B16 Halves the $104 \cdot 1°$ in the $\text{Sin}\angle 104 \cdot 1°$ and continues

Note: $\frac{1}{2}.10.12.\text{Sin}42°$ is double blunder for 4m and further slip –1 if no round off, giving 3m

And the same for $\frac{1}{2}10.12..\text{Sin } 33 \cdot 9°$

A7 Gets $|\text{rq}| = 17 \cdot 39$ and stops

A8 Some substitution in the area formula $\frac{1}{2}\text{absinC}$

QUESTION 6

Part (a)	**10 (5,5)marks**	**Att 4**
Part (b)	**20 marks**	**Att 8**
Part (c)	**20 marks**	**Att 8**

Part (a) **10 (5,5)marks** **Att 2,2**

The table shows the results of a school survey into students' favourite types of music.

Music Type	Pop	Rock	Classical	Other
Number of students	45	25	5	15

✍ Draw a pie-chart to illustrate the above information, showing clearly how you calculate the size of each angle.

Calculation 5 marks Att 2	**Part A**	**Pie-chart 5 marks att 2**

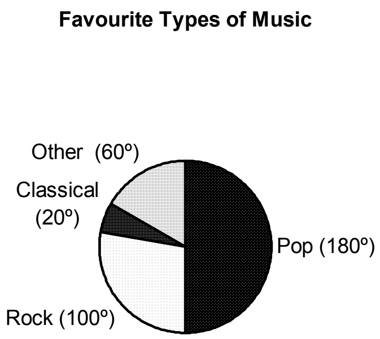
Total $= 90 \Rightarrow \dfrac{1}{90}(360°) = 4°$

Pop $= 45 \text{ x } 4° = 180°$

Rock $= 25 \text{ x } 4° = 100°$

Classical $= 5 \text{ x } 4° = 20°$

other $= 15 \text{ x } 4° = 60°$



B1 360° not used in calculation
B2 Inverted (incorrect) fraction
B3 Inaccurate drawing allowing for tolerance of 5°

S1 Numerical slips (if not B2)
S2 Each missing or incorrect angle to a max of 3
S3 Each missing or incorrect sector to a max of 3

A1 Gets 90 & stops
A2 Indication of 360°
A3 Any circle
A4 Some other diagram e.g. Bar-chart (once only)

Part (b) **20 (5.5,5,5) marks** **Att 2,2,2,2**

The cumulative frequency table shows the amount of time spent studying in a certain week by 100 Leaving Certificate students.

Time in hours	≤ 2	≤ 4	≤ 6	≤ 8	≤ 10
Number of students	10	28	60	85	100

(i) On graph paper construct the ogive.

Use your graph to estimate:

(ii) the median

(iii) the inter-quartile range

(iv) the number of students who spent 9 hours or more studying.

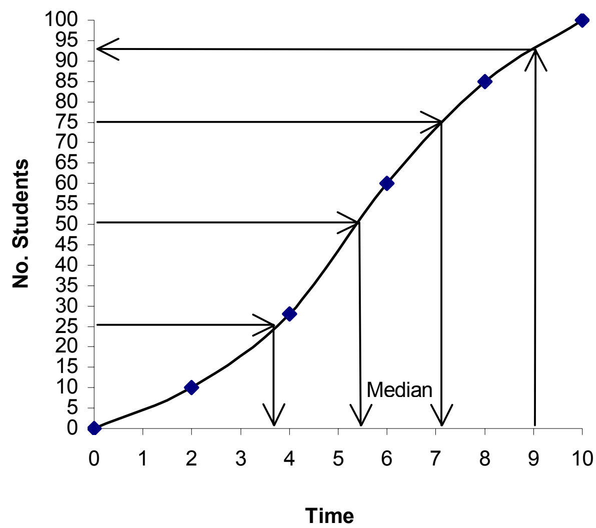
(b) **20(5,5,5,5) marks** **Att ,2,2,22**

(i) Ogive

(ii) Median at 5·4

(iii) 3^{rd} Q at 7;
1^{st} Q at 3·6
IQR = 3·4 hrs.

(iv) $\geq$ 9 hours 7



- **No penalty for not joining (0,0) to (2,10)**

Ogive

B1 Incorrect scales once only B2 Draws a cumulative Histogram
B3 Plots points but does not join them or joins by line segments
B4 Draws a cumulative cumulative graph

S1 Each incorrect plot or point omitted

A1 Draws axes & stops

Median

Accept correct answer without horizontal or vertical lines
Accept median with candidate's ogive within tolerance $\pm 0{\cdot}2$ for his correct answer

B1 Mean for median (21·82)
B2 Draws horizontal from wrong point e.g. 5
B3 Draws horizontal line only (no penalty if the correct answer is given)
B4 Draws perpendicular from Time 5 hours to get the median = 41

S1 Lines drawn correctly and median not given or outside tolerance for the graph

A1 Indicates use of mid-value (50 or 5)
A2 Some knowledge of median e.g. $\frac{100}{5}$

Inter-quartile range

Accept the answer consistent with the candidate's graph with tolerance $\pm 0 \cdot 2$

B1 Uses wrong axes $x = 2{\cdot}5,\ 7{\cdot}5$
B2 No subtraction
B3 Correct lines drawn on the graph but no values given

S1 $3{\cdot}6 - 7 = -3{\cdot}4$
S2 Work correct but outside tolerance

A1 Finds 25 or 75 & stops

Number of students with 9 hours or more study

Accept **answer** consistent with the candidate's graph with a tolerance ± 2

B1 Line drawn from wrong starting point of correct axes
B2 No subtraction
B3 Uses 9 on the vertical axis
B4 Draws a vertical line from 9 & stops

S1 Work correct but outside tolerance
S2 100 + 93 or 93 – 100

W1 Line drawn from incorrect starting point on correct axis & stops

Note
Diagram as shown in the solution merits 5,4,2,2 = 13 marks

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

Third year students were asked how much pocket money they spent in a certain week.

The results are shown in the frequency distribution table below.

Amount of pocket money in €	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Number of students	4	22	14	x	6

[Note: 5 – 10 means €5 or more but less than €10, etc.]

Taking mid-interval values it was found that the mean amount of pocket money spent in that week was €11·10.

✍ Find the value of x.

(c) Step 1 **5 marks** **Att 2**

2·5 7·5 12·5 17·5 22·5

B1 Mid-interval values not used e.g. 0,5,10,15,20 or 5,10,15,20,25

S1 Each arithmetic slip to max of 3

S2 Each incorrect mid-interval value to max of 3

(c) Step 2 **5 marks** **Att 2**

$$\frac{(2\cdot5\times4)+(7\cdot5\times22)+(12\cdot5\times14)+(17\cdot5\times x)+(22\cdot5\times6)}{46+x}=11\cdot10$$

or $$\frac{485+17\cdot5\,x}{46+x}=11\cdot1$$

- **Accept either of Left Hand sides for 5m**

B1 Adds instead of multiplying in numerator

B2 Multiplies instead of adding in denominator

B3 Uses 5 or 5x in denominator

B4 Uses 46x in denominator

(c) Step 3 **5 marks** **Att 2**

$$485 + 17{\cdot}5\,x = 11.1(46 + x)$$

Or

$$485 + 17.5\,x = 510.6 + 11.1\,x$$

W1 $10{\cdot}54 + 17{\cdot}5\,x = 11{\cdot}1$

W2 No cross multiplication

(c) Step 4 **5 Marks** **Att 2**

$$17\cdot5\,x - 11\cdot1x = 510\cdot6 - 485$$

$$\Rightarrow 6\cdot4x = 25\cdot6$$

$$\Rightarrow x = \frac{25\cdot6}{6\cdot4} = 4$$

B1 Each error in cross-multiplication or transposition

B2 Decimal blunder (aplied to lines 1 & 2 of the proof)

S1 $x = \dfrac{25\cdot6}{6\cdot4}$ accept for 4m & if continues to get 4 award 5m.