



Coimisiún na Scrúduithe Stáit State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2007

MATHEMATICS – HIGHER LEVEL

PAPER 2 (300 marks)

MONDAY, 11 JUNE – MORNING, 9:30 to 12:00

Attempt **ALL** questions.

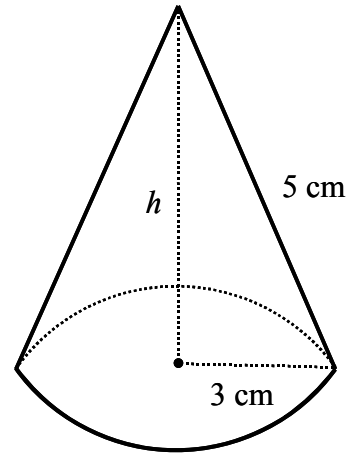
Each question carries 50 marks.

Graph paper may be obtained from the superintendent.

The symbol  indicates that supporting work must be shown to obtain full marks.

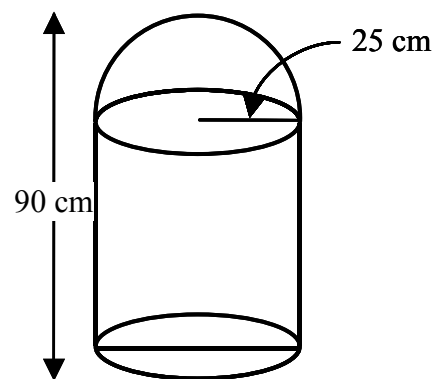
1. (a) A cone has a base radius of 3 cm and a slant height of 5 cm.

- (i) ✎ Find h , the perpendicular height of the cone.
- (ii) ✎ Find the volume of the cone in terms of π .

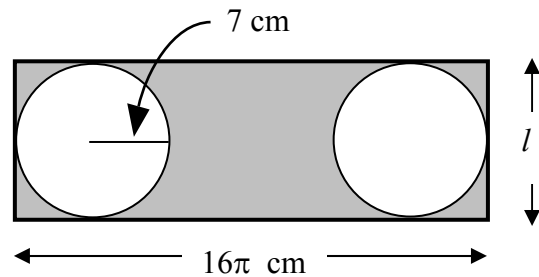


- (b) A hot water container is in the shape of a hemisphere on top of a cylinder as shown. The hemisphere has a radius of 25 cm and the container has a height of 90 cm.

- ✎ Find the internal volume of the container in litres, giving your answer correct to the nearest litre.




- (c) A rectangular piece of metal has a width of 16π cm. Two circular pieces, each of radius 7 cm, are cut from the rectangular piece, as shown.




- (i) Find the length, l , of the rectangular piece of metal.
- (ii) ✎ Calculate the area of the metal not used (i.e. the shaded section), giving your answer in terms of π .
- (iii) ✎ Express the area of the metal not used as a percentage of the total area.


2. (a) $p(2, 4)$ and $q(-1, 1)$ are two points.

q is the midpoint of $[pr]$.

 Find the co-ordinates of r .


(b) $(0, 6)$ and $(4, -2)$ are two points on the line M .


(i)  Find the slope of M .


(ii)  Find the equation of the line N through $(4, -2)$, which is perpendicular to M .

Give your answer in the form $ax + by + c = 0$, where a, b and $c \in \mathbf{Z}$.

(c) L is the line $x - 2y + 2 = 0$ and K is the line $x + 2y - 6 = 0$.

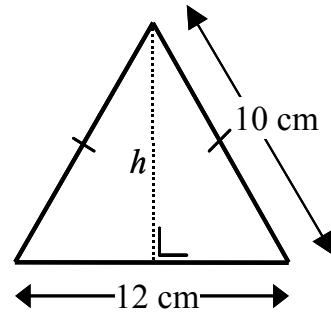
(i)  Find the coordinates of u , the point of intersection of L and K .

(ii)  L cuts the y -axis at the point v . Find the coordinates of v .

(iii)  Show that $w(0, 3)$ is on the line K .

(iv)  Show that $|uw| = |uv|$.

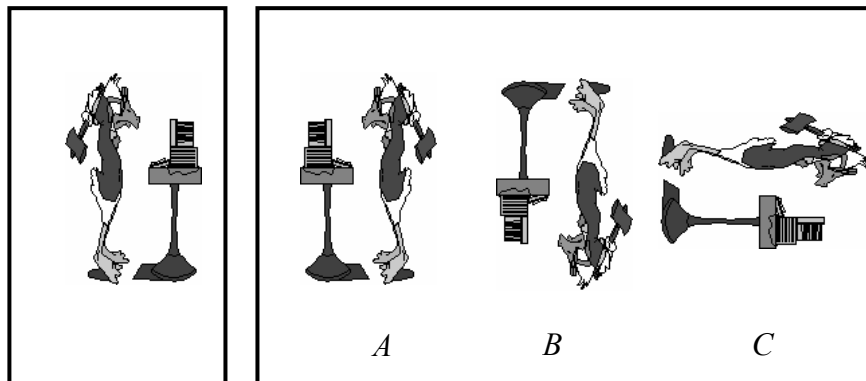
3. (a) The isosceles triangle shown in the diagram, has a base of length 12 cm and the other two sides are each 10 cm in length.



- ✍ Find h , the perpendicular height of the triangle.

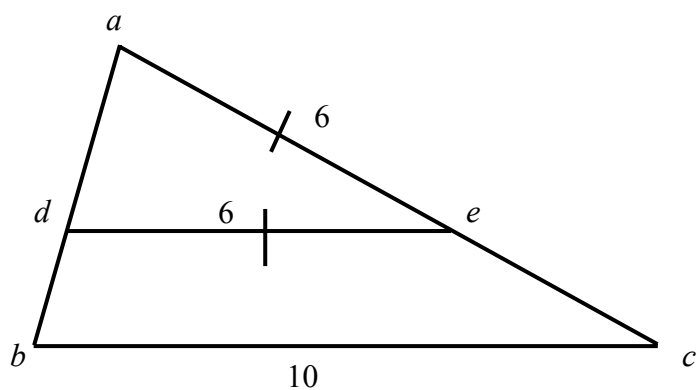
- (b) (i) ✍ Prove that if two sides of a triangle are equal in measure, then the angles opposite these sides are equal in measure.

- (ii) Each of the three figures labelled A , B and C shown below in the box on the right is the image of the figure shown in the box on the left under a transformation. For each of A , B and C , state what the transformation is (translation, central symmetry, axial symmetry or rotation) and in the case of a rotation, state the angle.



- (c) In the triangle abc , $bc \parallel de$, $|ae| = |de| = 6$ and $|bd| = \frac{1}{2} |ce|$.
 $|bc| = 10$.

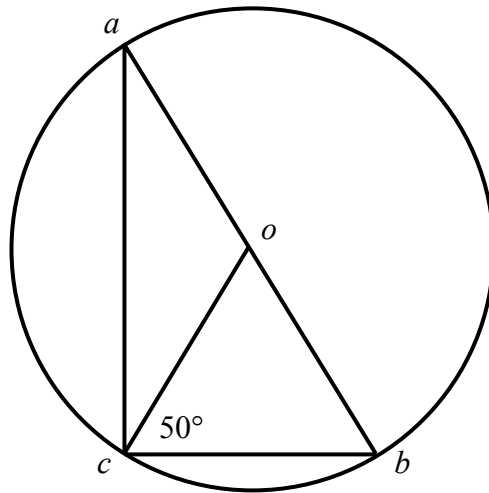
- (i) ✍ Find $|ce|$.
(ii) ✍ Find $|ad|$.
(iii) ✍ Find $|ab|$.



4. (a) $[ab]$ is the diameter of a circle of centre o .

$$|\angle ocb| = 50^\circ.$$

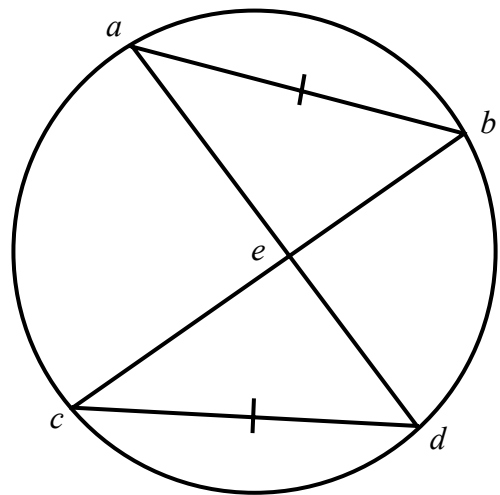
- (i) ✎ Find $|\angle boc|$.
- (ii) ✎ Find $|\angle bac|$.



- (b) ✎ Prove that the measure of the angle at the centre of the circle is twice the measure of the angle at the circumference, standing on the same arc.

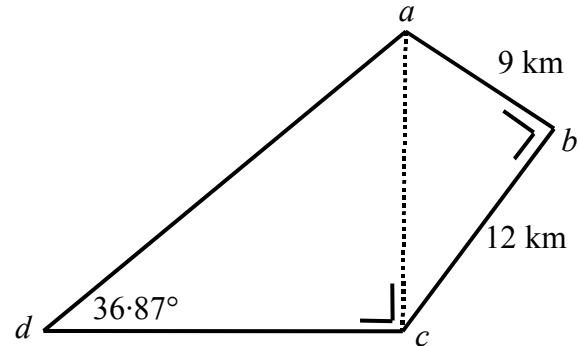
- (c) $[ab]$ and $[cd]$ are chords of the circle as shown and $|ab| = |cd|$.
The chords $[ad]$ and $[bc]$ intersect at the point e .

- (i) State why $|\angle bad| = |\angle bcd|$.
- (ii) ✎ Prove that the triangles bae and dce are congruent.
- (iii) ✎ Prove $|ad| = |bc|$.

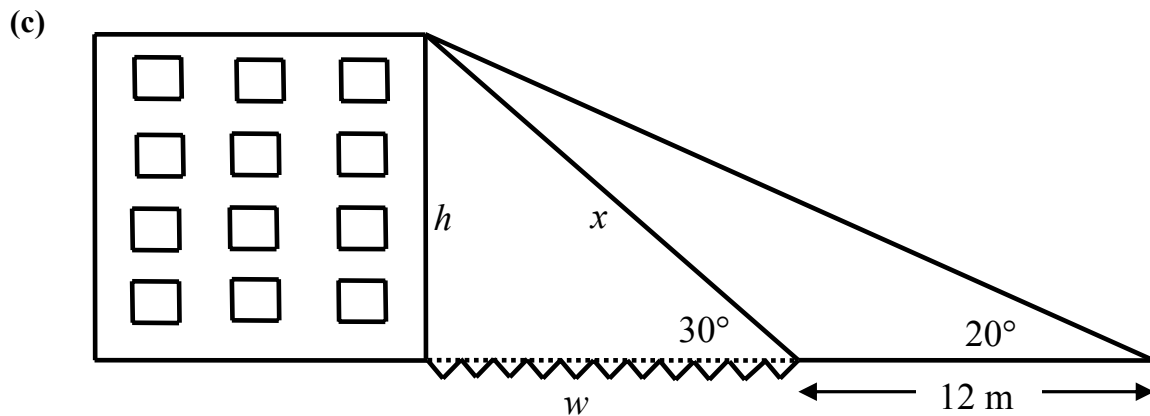


5. (a) ✎ If $\sin A = -\frac{1}{2}$, find the two values for the angle A , where $0^\circ \leq A \leq 360^\circ$.

- (b) In the diagram opposite, $abcd$ represents the course in a triathlon. Competitors must swim the 9 km from a to b , then run the 12 km from b to c and cycle from c to d and back to a . $|\angle adc| = 36.87^\circ$.



- (i) ✎ Find the distance from a to c .
- (ii) ✎ Find the distance from c to d , correct to the nearest km.
- (iii) ✎ Find the total length of the course.



The diagram shows an office block built on a river bank. From a point on the opposite river bank the angle of elevation of the top of the office block is 30° . From a point 12 m further back the angle of elevation is 20° .

- (i) ✎ Find x , correct to 2 decimal places.
- (ii) ✎ Find h , the height of the office block, correct to 2 decimal places.
- (iii) ✎ Find w , the width of the river, correct to 2 decimal places.



6. (a) In 4 games, a soccer player scored 1, x , 4 and 3 goals respectively.

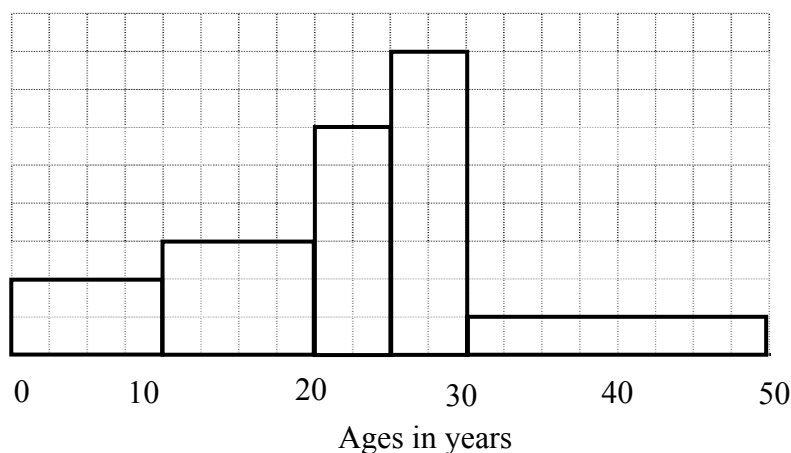
The mean number of goals scored by the player per game was 2.

 Find the number of goals scored in the second game i.e. the value of x .

- (b) Over a period of one month, the owner of a factory recorded the number of days that each of his 50 employees was absent from work. The following table shows the results.

No. days absent	0	1	2	3	4	5
No. of employees	7	9	11	12	7	4

- (i)  Find the mean number of days the employees were absent.
- (ii)  Find the percentage of employees who were absent for more than the mean number of days.
- (iii) Write down the mode.
- (c) The distribution of the ages of people living in an apartment block is shown in the histogram below.




- (i) Given that there are 10 people in the 0 – 10 age group, copy and complete the frequency table below.

Ages in years	0 – 10	10 – 20	20 – 25	25 – 30	30 – 50
No. of people	10				

[Note: 10 – 20 means 10 years or more but less than 20 years old, etc.]

- (ii) Copy and complete the cumulative frequency table below.

Ages in years	< 10	< 20	< 25	< 30	< 50
No. of people					

- (iii)  Construct an ogive and use it to estimate the median age.

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