Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2004

MATHEMATICS – HIGHER LEVEL

PAPER 2 (300 marks)

MONDAY, 14 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.

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

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

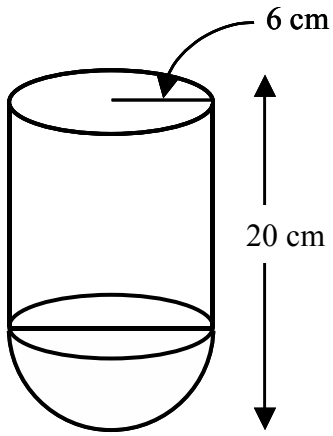
(i) ✍ Find the radius of its base.

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

Give your answer correct to three significant figures.

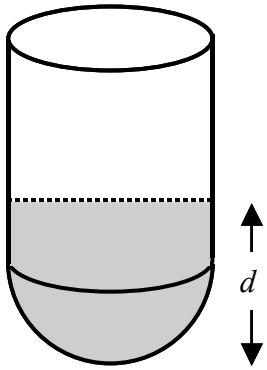
(c) **(i)** A container is in the shape of a cylinder on top of a hemisphere as shown. The cylinder has a radius of 6 cm and the container has a height of 20 cm.

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



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

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



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

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

(ii) ✍ Find $|ab|$.

(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.

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

(i) ✍ Find the slope of L.

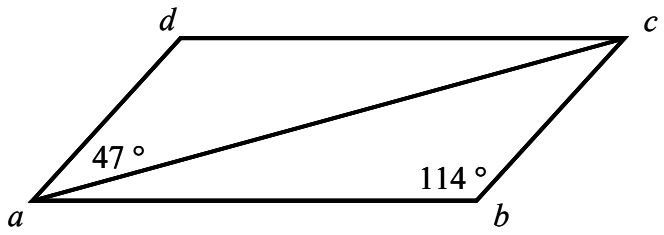
(ii) The line K contains the points a (-3, 0) and b (6, r).
K is perpendicular to L.

✍ Find the value of r.

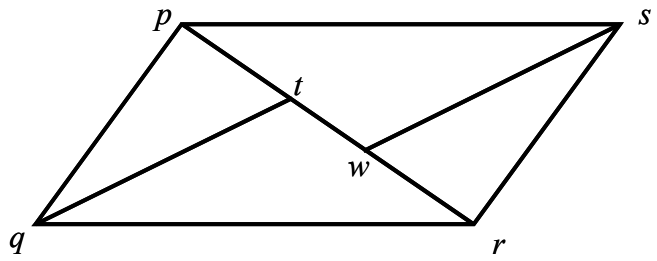
(iii) ✍ Find the co-ordinates of the image of the point b under the axial symmetry in the line L.

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

✍ Find $|\angle bac|$.



(b) 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.

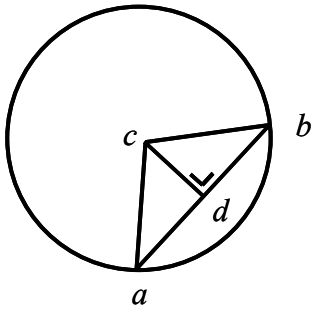
(c) ✍ Prove that if two triangles are equiangular, the lengths of corresponding sides are in proportion.

4. **(a)** 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.



(b) **(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.

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

o is the centre of the circle.

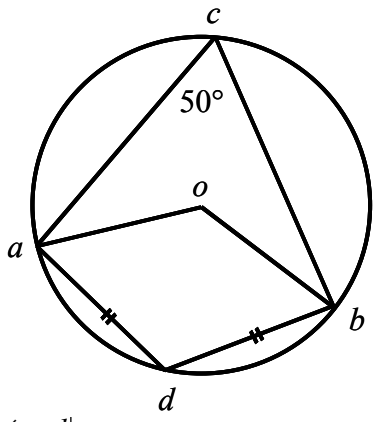
$|\angle acb| = 50°$ and $|ad| = |db|$.

Find

(i) $|\angle aob|$

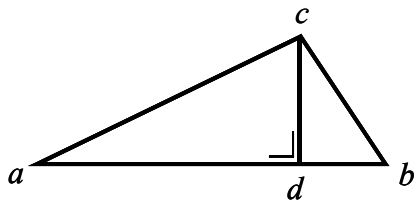
(ii) ✍ $|\angle adb|$

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



5. **(a)** ✍ If $\tan A = -1$, find the two values for the angle A, where $0° \leq A \leq 360°$.

(b) **(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.

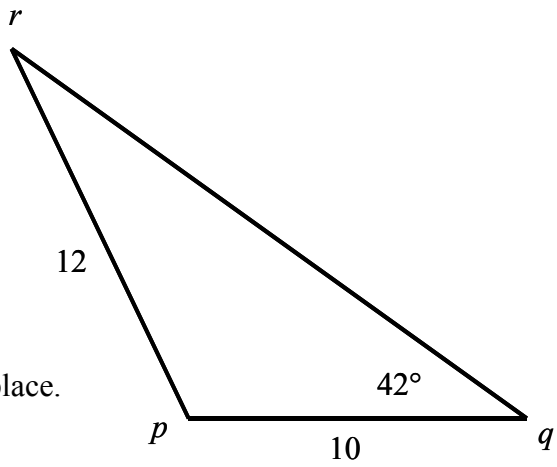
(ii) X is an acute angle such that $\sin X = \frac{1}{2}$.

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

(c) **(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.

6. **(a)** The table shows the results of a school survey into 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.

(b) 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.

(c) 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.

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