



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

JUNIOR CERTIFICATE EXAMINATION, 2008

MATHEMATICS – HIGHER LEVEL

PAPER 2 (300 marks)

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

Attempt **ALL** questions.

Each question carries 50 marks.

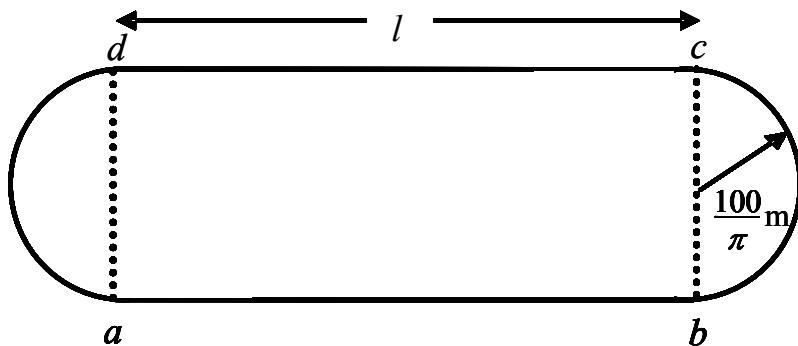
Graph paper may be obtained from the superintendent.

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

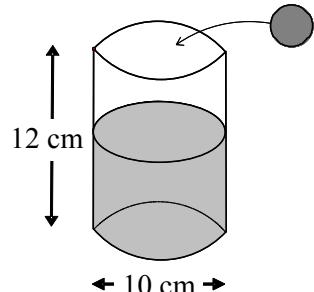
1. (a) The height and the diameter of a solid cylinder are both 8 cm in length.

 Find the curved surface area of the cylinder correct to the nearest whole number.

- (b) The diagram shows the perimeter of a running track, consisting of two straight sections of length l , and two semi-circular sections, at each end, of radius $\frac{100}{\pi}$ m, as shown.



- (i)  Given that the perimeter of the track measures 400 m, find l .
- (ii) A 1500 m race starts at the point a and goes in the direction $abcd$.
-  At what point does the race finish?
- (iii) An athlete completes this distance in 3 mins 26 sec.
-  Find his average speed in m/s, correct to one decimal place.
- (c) A spherical golf ball has a diameter of 4 cm.
- (i)  Find the volume of the golf ball in terms of π .
- A cylindrical hole on a golf course is 10 cm in diameter and 12 cm deep. The hole is half full of water.
- (ii)  Calculate the volume of water in the hole, in terms of π .
- The golf ball is dropped into the hole.
- (iii)  Find the rise in the level of the water, correct to two decimal places.



- 2.** (a) $a (3, 6)$ and $b (-1, 3)$ are two points.

(i) Find $|ab|$.

- (b) The line $L: 3x - 5y + 15 = 0$ and the line $M: 3x + 4y - 12 = 0$ cut the x -axis at the points c and d respectively.

(i) Find the coordinates of c and d .

(ii) Find e , the point of intersection of L and M .

(iii) Show the lines L and M on a coordinate diagram on graph paper.

(iv) Find the area of Δcde .

- (c) p is the point $(2, -3)$ and q is the point $(-2, 1)$.

(i) Find r , the midpoint of $[pq]$.

K is the line through r , perpendicular to $[pq]$.

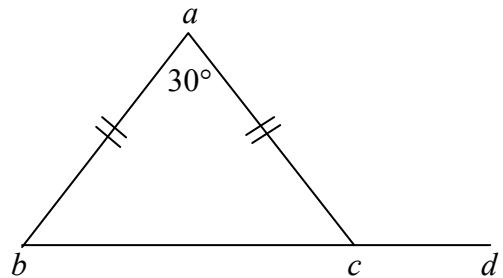
(ii) Find the equation of K .

(iii) Show that $s (3, 2)$ is on the line K .

(iv) Prove that the triangle Δpqs is isosceles.

- 3.** (a) abc is an isosceles triangle, with $|ab| = |ac|$ and $|\angle bac| = 30^\circ$.

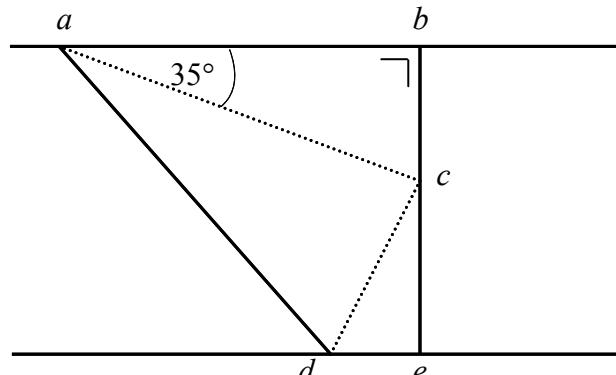
Find $|\angle acd|$.



- (b) (i) Construct a triangle of sides 11 cm, 8 cm and 6 cm.

(ii) Prove that the measures of the three angles of a triangle sum to 180° .

- (c) ab is parallel to de ,
 ac bisects $\angle bad$,
 dc bisects $\angle ade$,
 be is perpendicular to ab and
 $|\angle bac| = 35^\circ$.



(i) Find $|\angle ade|$.

(ii) Find $|\angle acd|$.

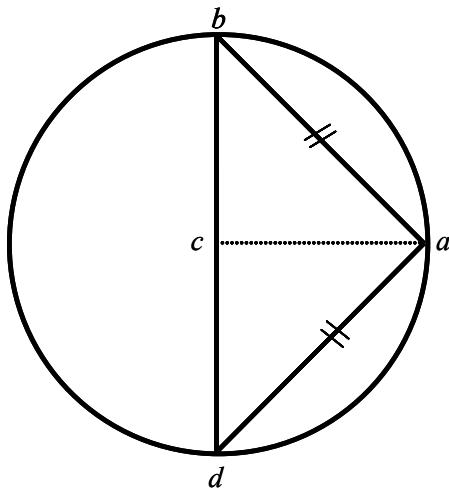
(iii) Prove that the triangles adc , abc and cde are equiangular.

(iv) Given that $|ab| = 5$ and $|bc| = 3.5$, write $|de| : |ec|$ in the form $m : n$, where $m, n \in \mathbb{N}$.

4. (a) [bd] is the diameter of the circle, c is the centre of the circle and $|ba| = |ad|$.

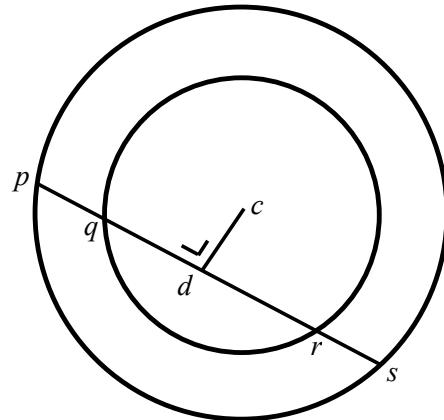
Find (i) $|\angle adb|$,

(ii) $|\angle dac|$.



- (b) (i) Prove that a line through the centre of a circle perpendicular to a chord bisects the chord.

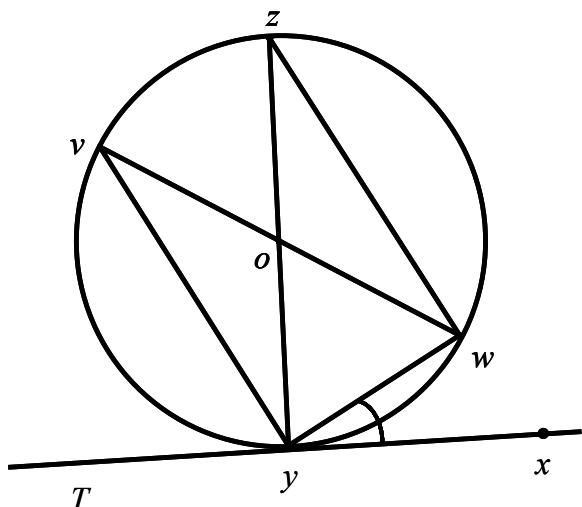
- (ii) c is the centre of both circles.
 $[ps]$ is a chord of the larger circle.
 $[ps]$ intersects the smaller circle at q and r.
 cd is perpendicular to ps .
 Prove $|pq| = |rs|$.



- (c) T is a tangent to the circle and o is the centre of the circle.

$$|\angle xyw| = 40^\circ.$$

- (i) Find $|\angle wvy|$.
(ii) Using congruent triangles or otherwise, prove $|zw| = |vy|$.



5. (a) Given that $\tan A = 4$, write $\cos A$ in the form $\frac{1}{\sqrt{x}}$, $x \in \mathbb{N}$.

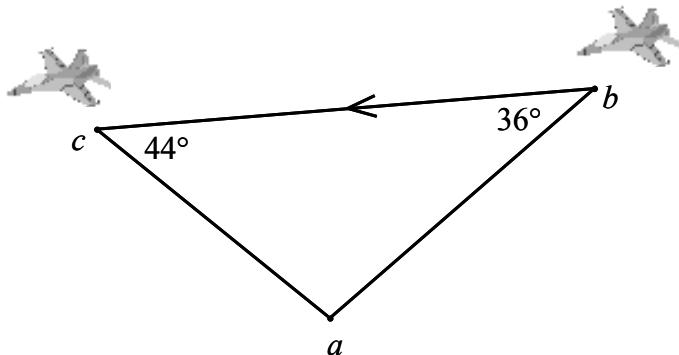
- (b) b and c are two airports as shown.

When airport b is viewed from a ,

$$|\angle abc| = 36^\circ.$$

When airport c is viewed from a ,

$$|\angle acb| = 44^\circ.$$



It takes a plane 25 minutes travelling at a speed of

384 km/h to go from airport b to airport c .

Find (i) the distance between both airports, i.e. $|bc|$,

(ii) the distance airport c is from point a , i.e. $|ac|$,
correct to the nearest km.

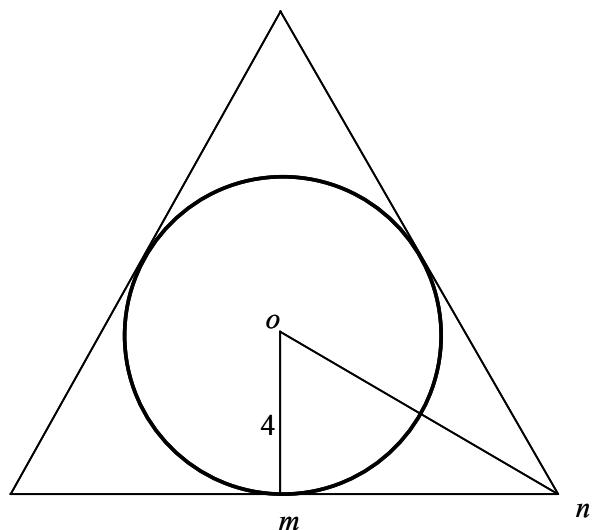
- (c) The diagram shows an equilateral triangle and the incircle of the triangle with centre o .

(i) Given that $|om| = 4$,
find $|mn|$, giving your
answer in surd form.

(ii) Find $|on|$.

(iii) Write down the height of the
equilateral triangle.

(iv) Calculate the area of the equilateral triangle, giving your answer in surd form.



- 6.** (a) 60 people were asked how they travelled to work. The following table is a summary of the results:

Type of transport	Public Transport	Car	Walk
No. of people	35	15	10



Draw a pie chart to illustrate the above information.

- (b) A professional golfer plays 50 rounds of golf over a season. The following were the number of shots taken in each round:

69	66	70	70	71	70	68	71	76	72
69	74	75	73	77	70	73	74	66	74
69	74	74	70	75	73	69	76	80	72
73	69	79	72	69	74	79	73	77	72
69	67	70	69	68	70	70	71	68	66



(i) Complete the following frequency table.

No. shots per round	66 – 69	69 – 72	72 – 75	75 – 81
Number of rounds				

[Note: 66 – 69 means 66 or more but less than 69, etc.]



(ii) Using mid interval values, calculate the mean number of shots per round, giving your answer correct to the nearest whole number.

- (c) At a Garda checkpoint, the speed of 100 vehicles passing was recorded. The following were the results:

Speed in km/h	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of cars	8	24	40	18	10

[Note: 20 – 40 means 20 or more but less than 40, etc.]



(i) Construct the cumulative frequency table.



(ii) On graph paper construct the ogive.



(iii) Use your graph to estimate the median.



(iv) Use your graph to estimate the number of vehicles with a speed of at least 70 km/h.

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