



# 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**

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Attempt **ALL** questions.


Each question carries 50 marks.

**Graph paper may be obtained from the superintendent.**

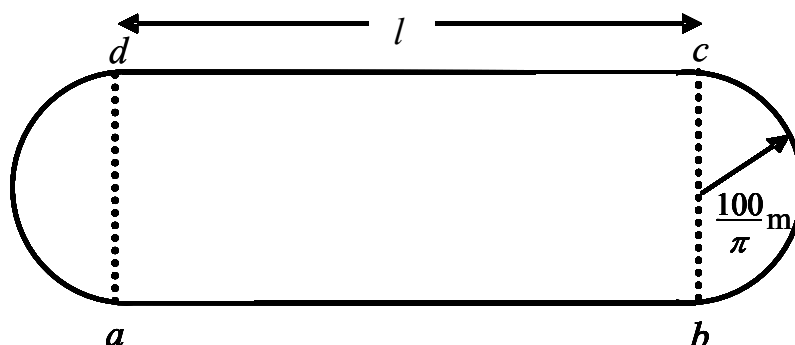
The symbol  indicates that supporting work must be shown to obtain full marks.

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1. (a) The 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.

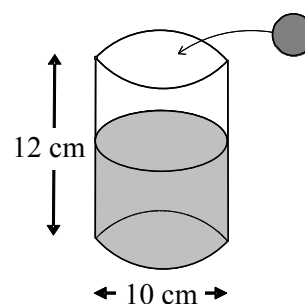
(i)  Find the volume of the golf ball in terms of  $\pi$ .

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  $\pi$ .

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.


 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  $\Delta cde$ .


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

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

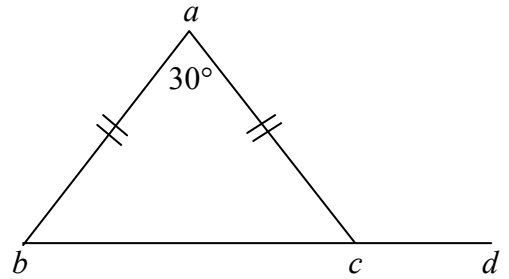
$K$  is the line through  $r$ , perpendicular to  $[pq]$ .

(ii)  Find the equation of  $K$ .

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

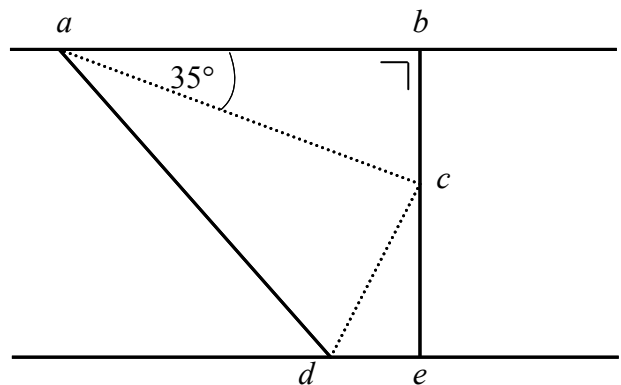
(iv)  Prove that the triangle  $\Delta pqs$  is isosceles.

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



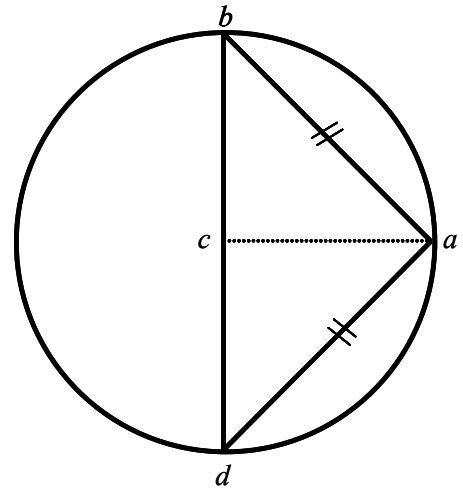
- (b) (i) ✎ Construct a triangle of sides 11 cm, 8 cm and 6 cm.  
 (ii) ✎ Prove that the measures of the three angles of a triangle sum to  $180^\circ$ .

- (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  $m, n \in \mathbf{N}$ .

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

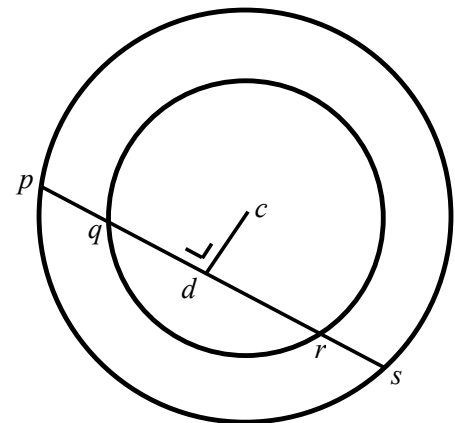


Find (i)  $|\angle adb|$ ,

(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  $ps$ .



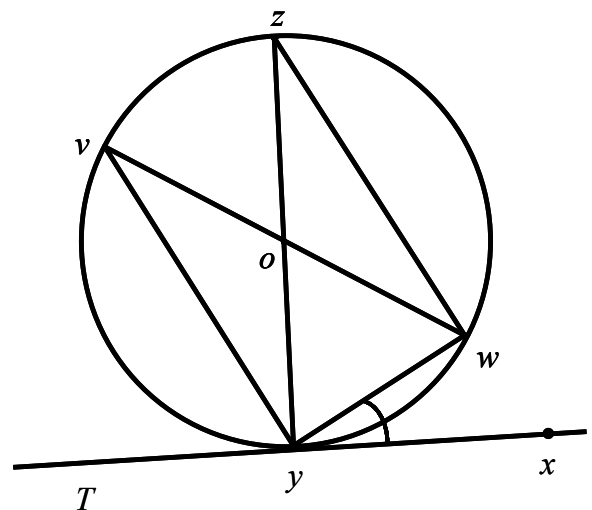
Prove  $|pq| = |rs|$ .

- (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  $\frac{1}{\sqrt{x}}$ ,  $x \in \mathbf{N}$ .

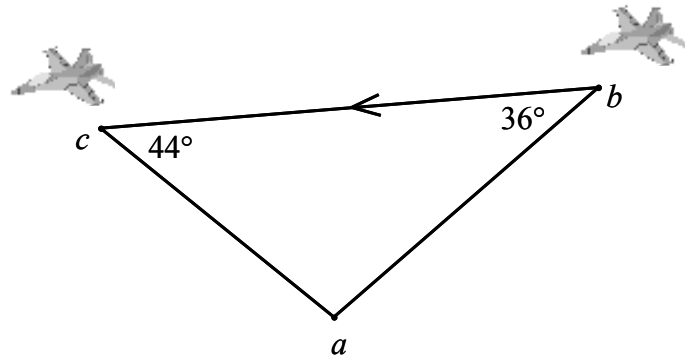
(b)  $b$  and  $c$  are two airports as shown.

When airport  $b$  is viewed from  $a$ ,

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

When airport  $c$  is viewed from  $a$ ,

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

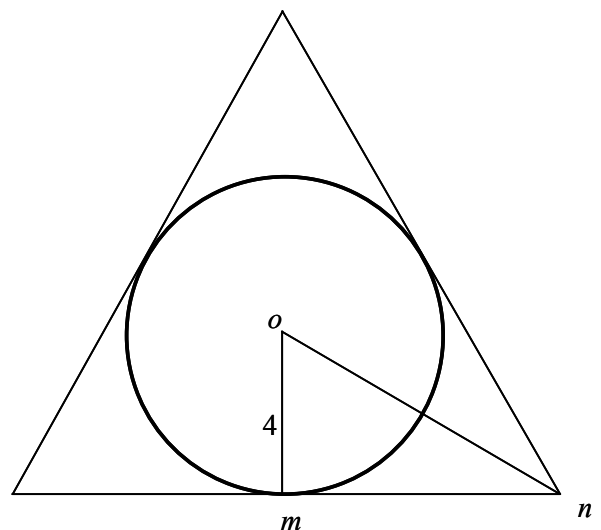


It takes a plane 25 minutes travelling at a speed of 384 km/h to go from airport  $b$  to airport  $c$ .

- 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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