



# Coimisiún na Scrúduithe Stáit State Examinations Commission

**JUNIOR CERTIFICATE EXAMINATION, 2006**

**MATHEMATICS – HIGHER LEVEL**

**PAPER 2 (300 marks)**


**MONDAY, 12 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 9 cm in length.

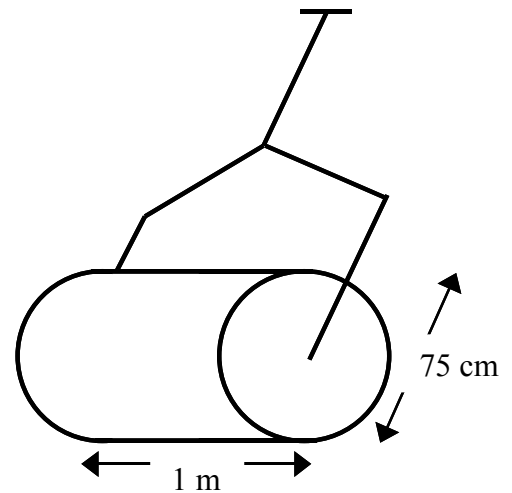
 Find the volume of the cylinder correct to one decimal place.


(b) (i) The perimeter of a square lawn is 96 m.

 Find the area of the lawn in  $\text{m}^2$ .


(ii) A garden roller, in the shape of a cylinder, has a diameter of 75 cm and is 1 m wide as shown in the diagram.


 Calculate the curved surface area of the roller in  $\text{m}^2$ , correct to one decimal place.

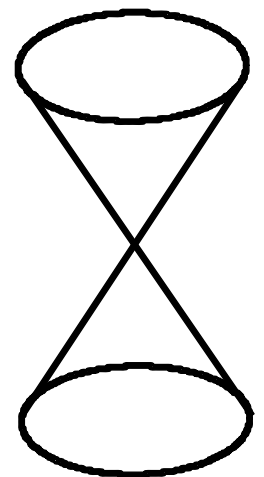


(iii)  What percentage of the lawn will be rolled when the roller has completed 9 revolutions?


(c) An egg-timer consists of two identical cones of height 6 cm and base radius 4 cm. Sand occupies half the volume of one cone and flows from one to the other at a rate of  $\frac{4\pi}{45}$   $\text{cm}^3$  per second.

(i)  Calculate the volume of each cone in terms of  $\pi$ .


(ii)  Calculate the length of time it takes for the sand to flow from one cone into the other.





**2. (a)**  $a(4, -6)$  and  $b(6, -2)$  are two points.

 Write  $|ab|$  in surd form.


**(b)**  $p(-1, 2)$  and  $r(3, 4)$  are two points.


**(i)**  Find  $m$ , the midpoint of  $[pr]$ .

**(ii)**  Find the slope of  $pr$ .

**(iii)**  Find the equation of the line  $L$ , the perpendicular bisector of  $[pr]$ .

**(iv)** The equation of the line  $K$  is  $x - 2y = 0$ .

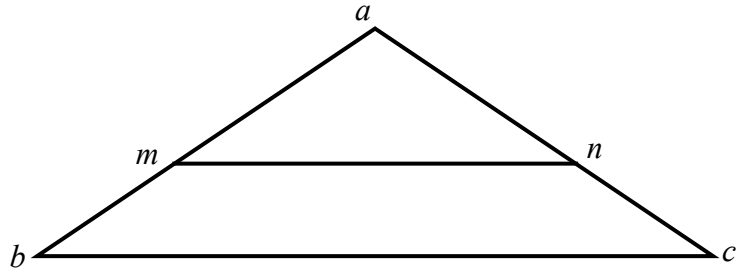
 Find  $n$ , the point of intersection of  $L$  and  $K$ .


**(c)**  Prove that the opposite sides and opposite angles of a parallelogram are respectively equal in measure.


3. (a) The triangle  $abc$  has  $|ab| = |ac|$ .


The line  $mn$  is parallel to  $bc$

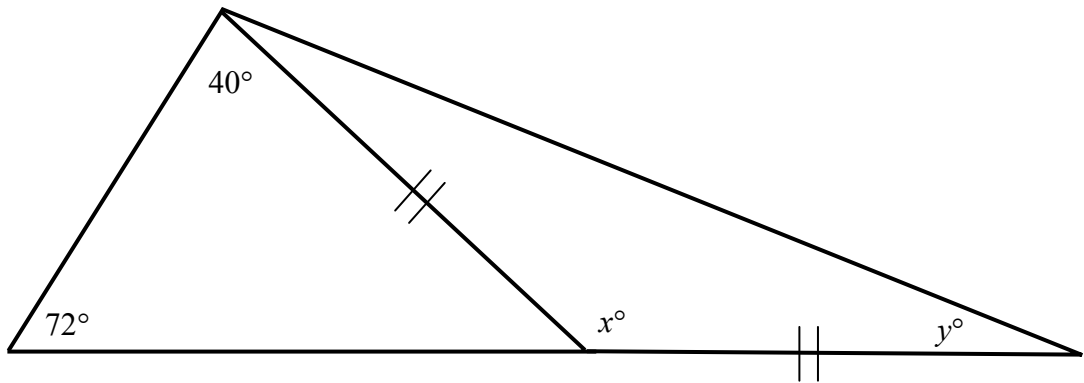
and  $|\angle nmb| = 115^\circ$ .





 Find  $|\angle abc|$  and  $|\angle bac|$ .

- (b) (i)  Prove that an exterior angle of a triangle equals the sum of the two interior opposite angles in measure.

- (ii)  Calculate the value of  $x$  and the value of  $y$  in the diagram.



- (c) (i)  Construct a triangle of sides 8 cm, 7 cm and 6 cm.

- (ii)  Construct the incircle of the triangle.

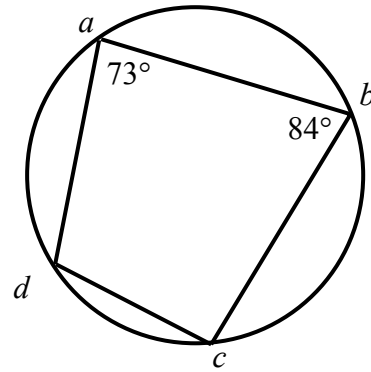
All construction lines must be clearly shown in each case.

4. (a)  $abcd$  is a cyclic quadrilateral.

$\pencil$  Given that  $|\angle dab| = 73^\circ$  and

$$|\angle abc| = 84^\circ,$$

find  $|\angle adc|$  and  $|\angle bcd|$ .

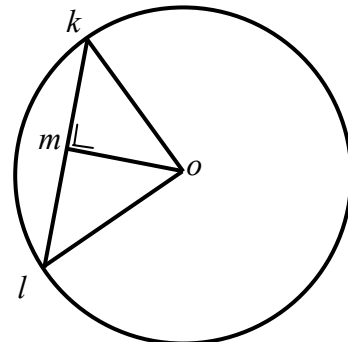


(b)  $\pencil$  Prove that in a right-angled triangle, the square of the length of the side opposite to the right angle is equal to the sum of the squares of the lengths of the other two sides.

(c) A circle, centre  $o$ , has a radius of length 17.

$[lk]$  is a chord of length 30.

$m$  is a point on  $[lk]$  and  $lk$  is perpendicular to  $mo$ .



(i)  $\pencil$  Write down the length of  $[km]$ , giving a reason for your answer.

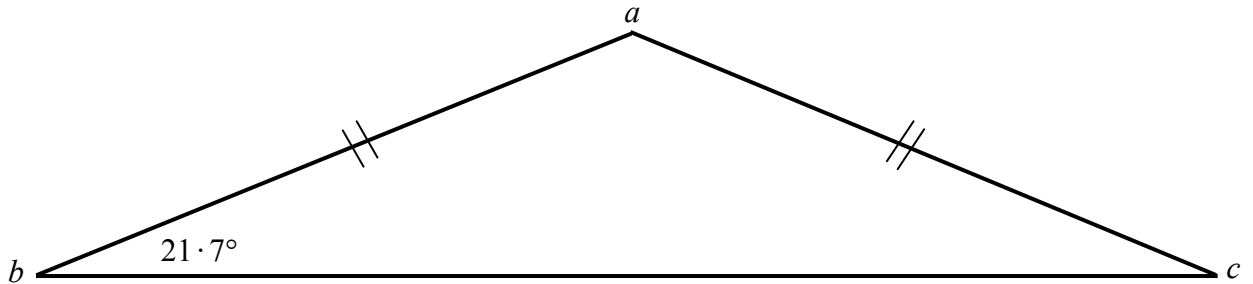
(ii)  $\pencil$  Calculate  $|om|$ .

(iii)  $\pencil$  Find the area of the triangle  $klo$ .

5. (a) ✎ Without using a calculator or the tables, construct the angle  $A$  such that

$$\tan A = \frac{3}{4}.$$

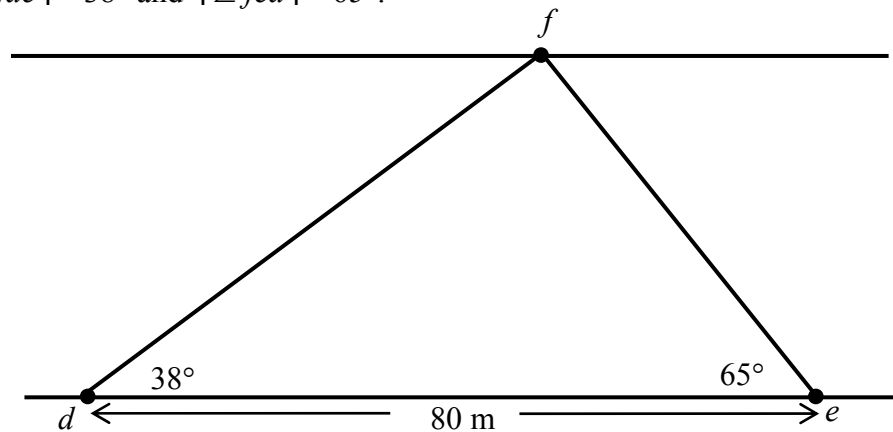
- (b)  $abc$  is an isosceles triangle with  $|ab| = |ac| = 9$ .



- ✎ Given that  $|\angle abc| = 21.7^\circ$ , calculate the area of the triangle  $abc$ , giving your answer correct to two decimal places.

- (c)  $d$  and  $e$  are points on a river bank 80 m apart and  $f$  is a point on the opposite bank as shown in the diagram.

$$|\angle fde| = 38^\circ \text{ and } |\angle fed| = 65^\circ.$$



- (i) ✎ Find  $|ef|$ , correct to the nearest metre.
- (ii) ✎ Find the width of the river, as measured from  $f$ , correct to the nearest metre.

6. (a) ✍ Draw a pie chart to indicate how a lottery prize could be divided in the ratio of 3 : 2 : 1.

- (b) The marks obtained by 25 candidates in an exam are as follows:

25	85	55	74	60
54	48	41	79	81
88	74	38	57	65
76	98	42	50	59
68	79	20	64	45

- (i) Complete the following frequency table.

Marks	0 – 40	40 – 60	60 – 80	80 – 100
Number of students				

[Note: 40 – 60 means 40 or more but less than 60, etc.]

- (ii) ✍ Taking mid-interval values, calculate the student mean mark.
- (c) The cumulative frequency table below shows the times in minutes that 100 Olympic athletes completed the marathon after the winner crossed the line.

Time in minutes	< 2	< 5	< 7	< 9	< 12
Number of athletes	10	25	55	70	100

- (i) Complete the following frequency table.

Time in minutes	0 – 2	2 – 5	5 – 7	7 – 9	9 – 12
Number of athletes					

[Note: 2 – 5 means 2 or more but less than 5, etc.]

- (ii) Draw a histogram to illustrate the data in the frequency table.
- (iii) ✍ In which class interval does the 63<sup>rd</sup> athlete to finish lie?

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