

# **ELGIN ACADEMY**

*Prelim Examination 2007 / 08*

<p><b>MATHEMATICS</b> <b>National Qualifications - Intermediate 2</b> <b>Maths 1, 2 and 3</b> <b>Paper 2</b></p>
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**Time allowed - 1 hour 30 minutes**

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**Read carefully**

- 1. Calculators may be used in this paper.**
- 2. Full credit will be given only where the solution contains appropriate working.**
- 3. Square-ruled paper is provided.**

## FORMULAE LIST

The roots of  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$  or  $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle:  $\text{Area} = \frac{1}{2} ab \sin C$

Volume of a sphere:  $\text{Volume} = \frac{4}{3} \pi r^3$

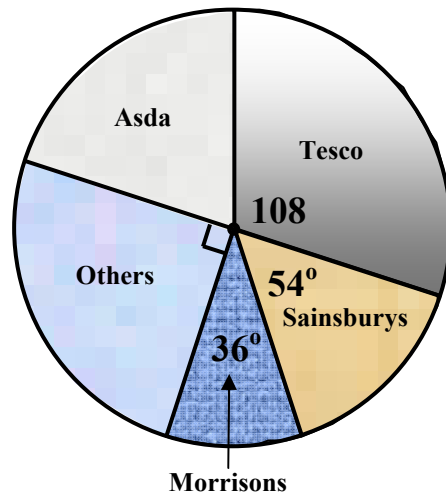
Volume of a cone:  $\text{Volume} = \frac{1}{3} \pi r^2 h$

Volume of a cylinder:  $\text{Volume} = \pi r^2 h$

Standard deviation:  $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n - 1}}$ , where n is the sample size.

**All questions should be attempted**

1. The pie chart shows the approximate share of the market held by several leading supermarkets.



If £9 000 000 000 was spent in Britain's supermarkets last year, calculate how much was spent in Asda.

[3]

2. Bill invested £10 000 in the Dodgy Building Society but his money lost 5% per annum over the first 2 years.

At the end of this time he decided to move his money to the Goody Building Society which guaranteed that his money would gain 6% per annum over the next 2 years.

How much did Bill gain or lose over the four years?

[5]

3. (a) 6 patients were asked how long past their appointment time they had waited to see their doctor at their last visit.  
Here are the times (in minutes).

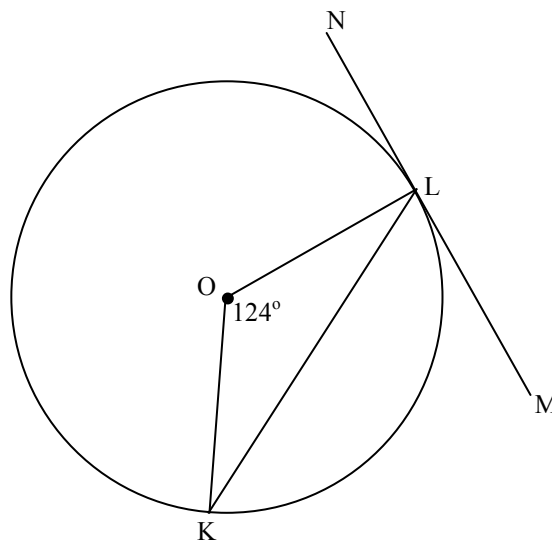
8      9      10      12      14      19

Calculate (i) the mean [1]  
(ii) the standard deviation [3]  
of these times.

- (b) At their next visit the same six patients were asked the same question and it was found that although the mean waiting time was the same the standard deviation was 3.

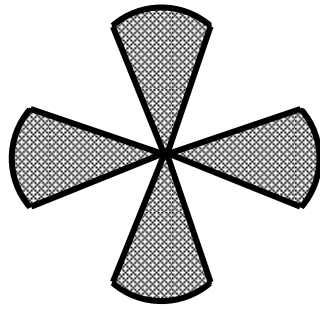
Make a valid comment about this second set of times with particular reference to the standard deviation. [1]

4. K and L are points on the circumference of a circle centre O. NM is a tangent to the circle with L the point of contact.

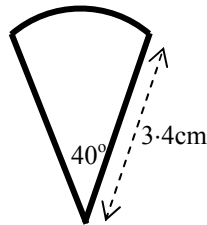


If  $\angle LOK = 124^\circ$ , calculate the size of  $\angle KLM$ . [3]

5. A blazer badge has a logo like the one shown. The logo has to be outlined in gold braiding.



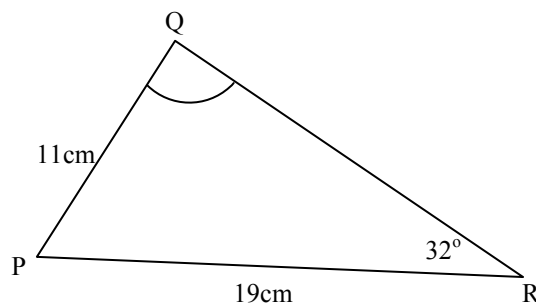
It is made up from 4 identical sectors of a circle with radius 3.4cm all meeting at a point.



If the angle at the centre of each sector is  $40^\circ$ , calculate how much braiding would be required to outline the whole logo.

[5]

6. Calculate the size of the obtuse angle at Q given that  $PQ = 11\text{cm}$ ,  $PR = 19\text{cm}$  and  $\angle PRQ = 32^\circ$ .



[4]

7. Change the subject of the formula

$$k = 5mn^2 + 2 \quad \text{to} \quad 'n'$$

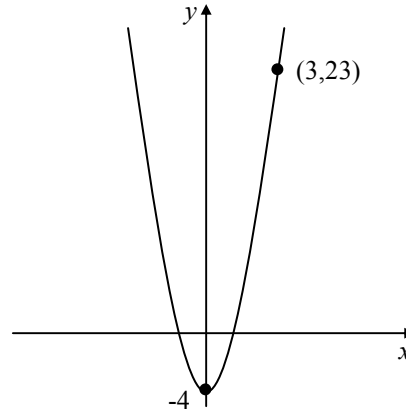
[3]

8. Find the equation of the line which is parallel to the line with equation  $3y + 5x = 4$  and passes through the point  $(0, -3)$ . [3]

9. The graph in the diagram has equation of the form:

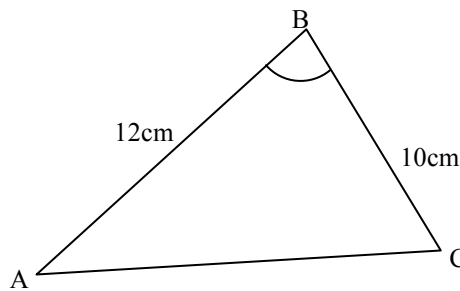
$$y = kx^2 - 4.$$

Find the value of  $k$ .



10. Express as a single fraction  $\frac{3x}{2} + \frac{4}{5x}$  [2]

11. The area of triangle ABC is  $51.4\text{cm}^2$ .  $AB = 12\text{cm}$  and  $BC = 10\text{cm}$ .



- (a) Calculate the size of the acute angle ABC. [2]

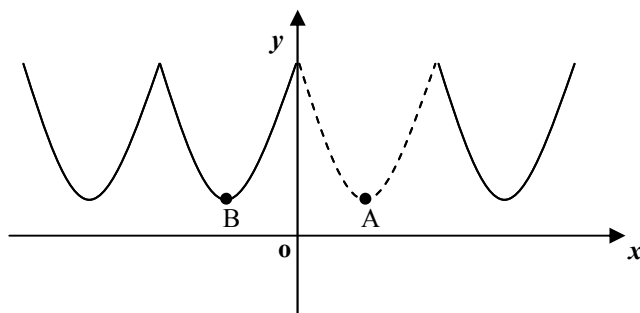
- (b) Hence, or otherwise, calculate the length of AC. [3]

12. A wallpaper border pattern consists of a series of identical parabolas and dots.



Part of the pattern can be represented on a set of coordinate axes.

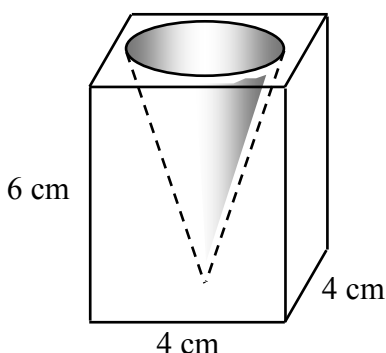
The parabola shown as a broken line has equation  $y = (x - 3)^2 + 2$ . The point A is its minimum turning point.



- (a) Write down the coordinates of the point A. [2]
- (b) What is the equation of the axis of symmetry of this parabola? [1]
- (c) Point B is the minimum turning point of another parabola making up the pattern and is the image of A after reflection in the  $y$ -axis.

Establish the coordinates of B and hence write down the equation of the parabola with B as its turning point. [3]

- 13.



A glass candle holder is in the shape of a cuboid with a cone removed. The cuboid measures 4 cm by 4 cm by 6 cm. The cone has a diameter of 3 cm and a height of 5 cm.

Calculate the volume of glass in the candle holder. [4]

**END OF QUESTION PAPER**