

# ELGIN ACADEMY

*Prelim Examination 2006 / 07*

<p><b>MATHEMATICS</b> <b>National Qualifications - Intermediate 2</b> <b>Maths 1, 2 and Applications</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.

1. Bath bombs are in the shape of a sphere and have diameter 7cm.

In parts (a) and (b) of this question give your answers to the nearest  $\text{cm}^3$ .



- (a) Calculate the volume of one bath bomb. [3]

- (b) When these bombs are dropped into a bath they lose 20% of their volume every minute.

Calculate what volume of the bath bomb remains after it has been in the bath for 3 minutes. [3]

- (c) Assuming that bath bomb remains spherical as it loses volume, calculate the radius of it after the 3 minutes. [3]

2. The ages of 20 members of the Stagestruck Drama Club are shown in this table:

31	20	28	32	18	22	32	28	15	21
38	36	24	21	23	13	30	17	42	43

- (a) Construct an ordered stem and leaf diagram for this data. [3]

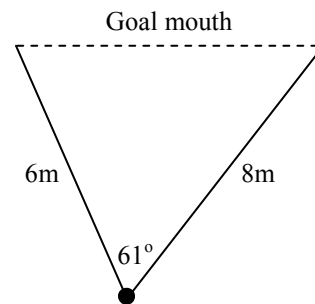
- (b) Hence, or otherwise, find the lower quartile, median and upper quartile for the data. [3]

3. A ball is placed in front of a set of goal posts.



The direct path to one post is 6m and to the other post is 8m.

The angle between the paths is  $61^\circ$ .



Calculate the width of the goal mouth giving your answer correct to **three significant figures**.

[4]

4. Simple interest can be calculated using the formula  $I = \frac{PTR}{100}$ .  $P$  is the amount invested,  $R$  is the rate of interest and  $T$  is the time in years.

(a) Calculate the interest on £6700 invested for 4 years at 5.4%.

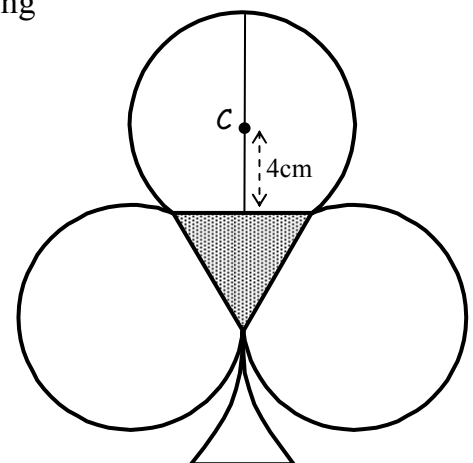
[2]

(b) When £2300 is invested for 2 years the interest received is £276. Calculate the rate of interest.

[3]

5. A logo for a Bridge Playing Club is based on 3 intersecting circles with an equilateral triangle in the centre.

The radius of each circle is 5 cm and the distance from the midpoint of a side of the triangle to the centre of a circle is 4cm.



(a) Calculate the length of a side of the triangle.

[4]

(b) Calculate the area of this triangle.

[3]

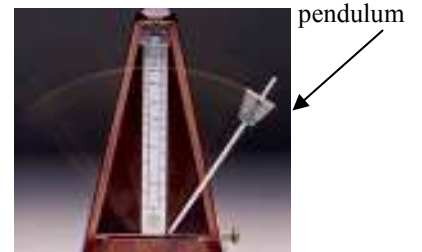
6. Tommy works as a gardener and last week he earned a gross salary of £513. In this week he paid £93.23 income tax, £28.78 National Insurance and other deductions amounting to £12.96.

Calculate Tommy's net pay in this week?

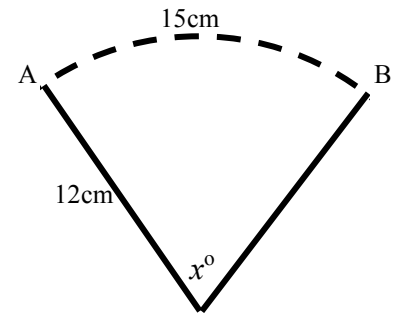
[2]

7. A metronome is a music tool which helps players with rhythm and tempo.

A weight on the pendulum is adjusted so that the metronome swings back and forth to give the correct tempo for a piece of music.



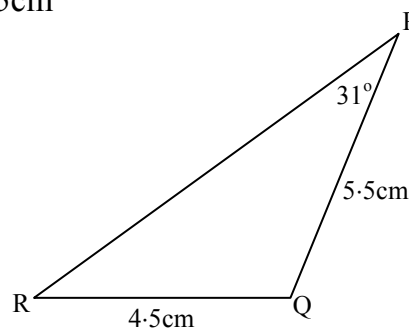
For one particular piece the pendulum is set to a length of 12cm and as it swings it traces out an arc of a circle, AB, of length 15cm.



Calculate, **to the nearest degree**, the angle,  $x^\circ$ , through which the pendulum swings.

[3]

8. In triangle PQR, PQ is 5.5cm, RQ is 4.5cm and angle QPR is  $31^\circ$ .



Calculate the size of angle PQR.

[5]

9. On testing a new type of battery, the following data was produced for the time (in hours) before the battery needs replacing.

48    56    53    72    81    59

For this sample data, calculate:

- a) the mean; [1]  
b) the standard deviation. [3]

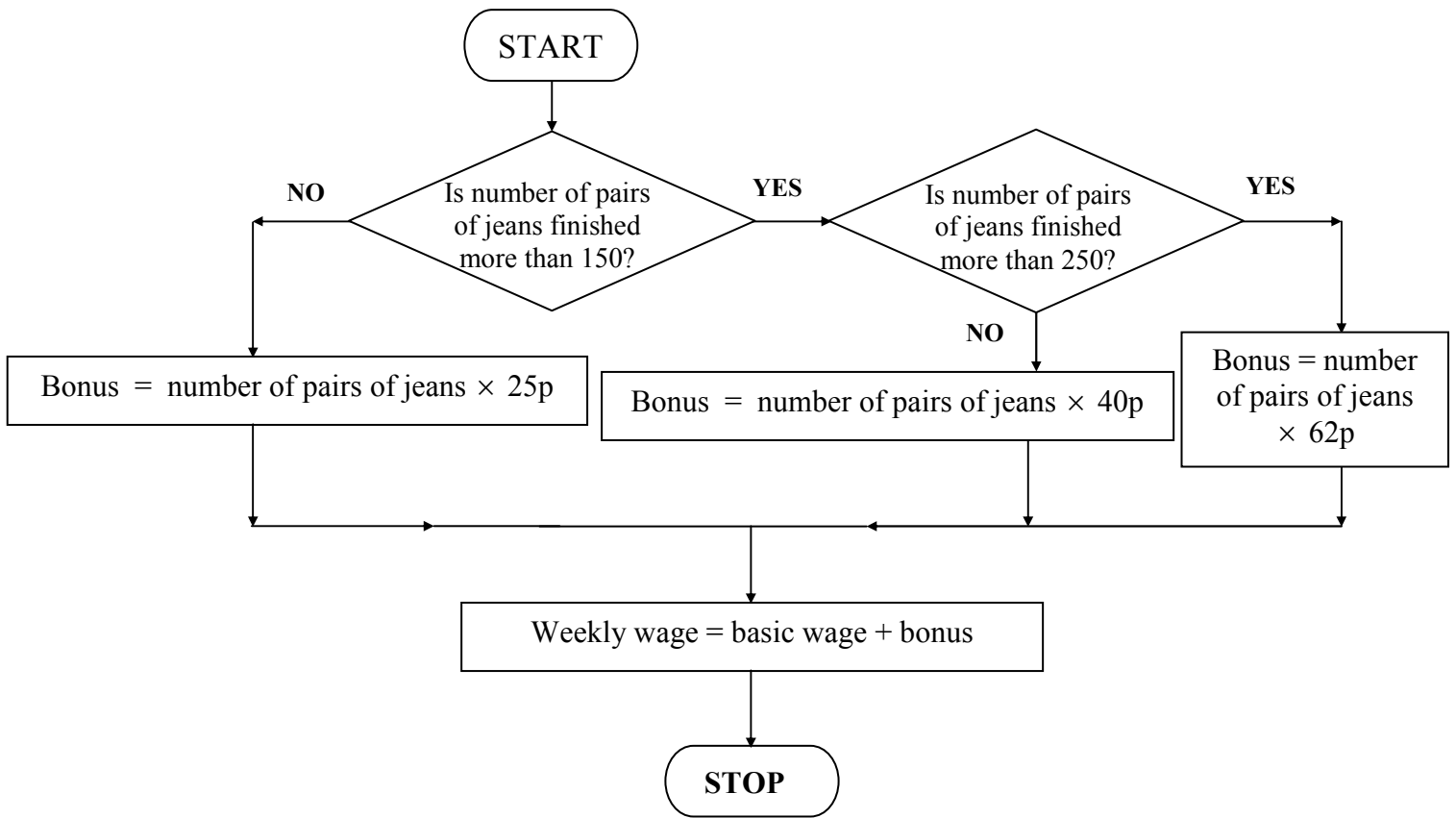
**Show clearly all your working.**

10. A spreadsheet was used to record the number of visitors to a Home Show over 5 days.

	A	B	C	D	E
1	<b>DAY</b>	<b>MORNING</b>	<b>AFTERNOON</b>	<b>EVENING</b>	
2	Thursday	324	545	576	
3	Friday	265	657	784	
4	Saturday	567	754	268	
5	Sunday	421	1279	835	
6	Monday	532	345	238	
7					

- (a) What formula should be entered into cell E2 to find the total number of visitors to the exhibition on Thursday? [1]  
(b) What number will appear in this cell when this formula is entered? [1]

11. Anna works in a factory putting the finishing touches to jeans. She gets a basic wage of £145 a week plus a bonus if she meets certain targets. This flowchart is used to work out her weekly wage.



Use the flowchart to calculate Anna’s wage in a week when she manages to ‘finish’ 280 pairs of jeans.

[3]

**END OF QUESTION PAPER**