

ELGIN ACADEMY

Prelim Examination 2005 / 06

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

Time allowed - 1 hour 30 minutes

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. Three years ago I bought a new car which cost £10 500.

The car depreciated in value by 20% during the first year and by 15% in subsequent years.

Calculate the value of my car after 3 years.

3

2. A group of students were asked to investigate the effect on the Ph value of adding a certain chemical to soil. They began by testing the Ph value of six samples taken from various regions in the country.

The results are given here:

4.2 3.9 5.5 4.9 6.1 2.4

The Mean Ph value for the sample is 4.5.

- (a) Calculate the Standard Deviation for these results.

3

- (b) After adding the chemical to the soil the mean Ph value was 4 and the Standard Deviation was 2.3

Comment on the effect of the chemical on the Ph value of the soil samples.

1

3. Tax for the year 2004-2005 was paid at the following rates.

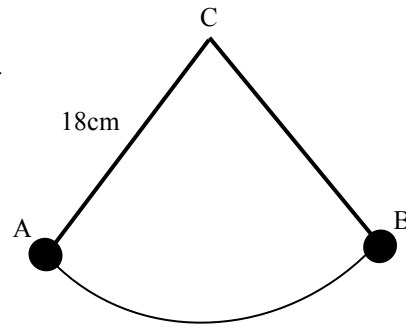
	2004-2005
Starting rate	10% on the first £2 020
Basic rate	22% on the next £29 380
Higher rate	40% on income over £31 400

In this tax year Janine earned a salary of £11 844 per annum selling window blinds. She also got paid a bonus of £150 in each of the 9 months that she met her sales target. Her tax allowance was £4745.

Calculate Janine's tax bill for 2004 – 2005.

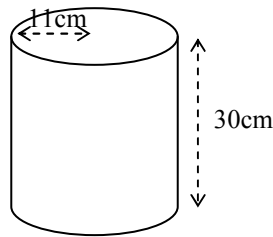
6

4. A pendulum travels along an arc of a circle, centre C.
 The length of the pendulum is 18cm.
 The pendulum swings from A to B
 The length of the arc is 26.1cm.
 Find the angle through which the pendulum swings from A to B



4

5. Pot pourri is packaged in large cylindrical containers of radius 11 cm and height 30cm.



- (a) Calculate the volume of one cylindrical container

2

For the Christmas Gift market the pot pourri is packaged into glass spheres.

- (b) How many spheres of radius 3.3cm can be filled from one cylinder of pot pourri?

4

6. The formula $C = \frac{5(F - 32)}{9}$ is used to change temperatures in degrees Fahrenheit (F) to degrees Celsius (C).

Carla is baking a cake and the recipe says to set the oven to 220°F. Her oven has a celsius scale so she sets it at 90°C and hopes for the best!

Has Carla set her oven too hot or too cold? By how many degrees?

You must give a reason for your answer.

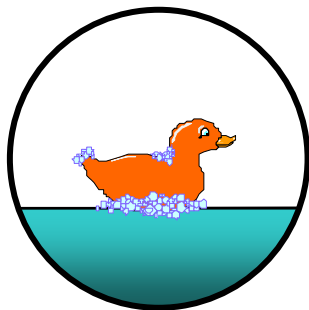
3

7. At a party, Peter bought 3 cans of cola and 2 bottle of orange juice costing a total of £2.55.
- (a) Taking the cost of a can of cola as 'x' pence and 'y' as the cost of a bottle of orange juice, write an equation to illustrate this. 1

Later Billy bought 2 cans of cola and 3 bottles of orange juice and was charged £2.70.

- (b) Construct a second equation to illustrate this. 1
- (c) Calculate the cost of a can of cola and the cost of a bottle of orange juice. 4

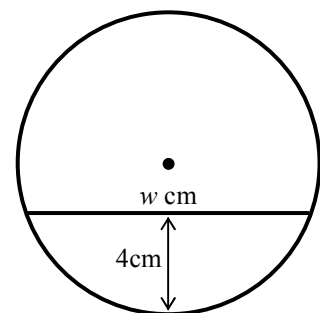
8. A child's toy is in the shape of a sphere with a duck and some water inside.



As the ball rolls around the water remains at the same level.

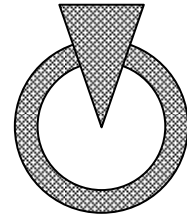
The diagram opposite shows the cross section when the sphere has been halved.

Given that the radius of the sphere is 6 cm and that the depth of the water is 4cm, calculate the width of the water surface (w cm).

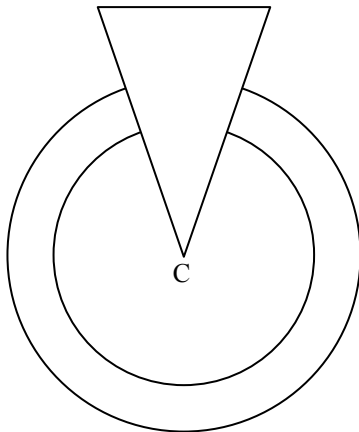


4

9. A charity produced this badge to promote itself in the community.



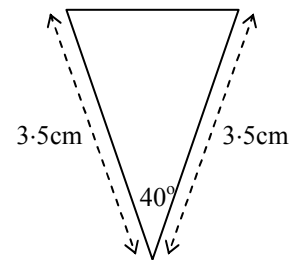
It is made up from a circular hoop of metal with an isosceles triangle set into it as shown in the diagram below.



C is the centre of the circles.

The radii of the circles are 2.5cm and 3cm.

The dimensions of the isosceles triangle are as shown in this diagram.

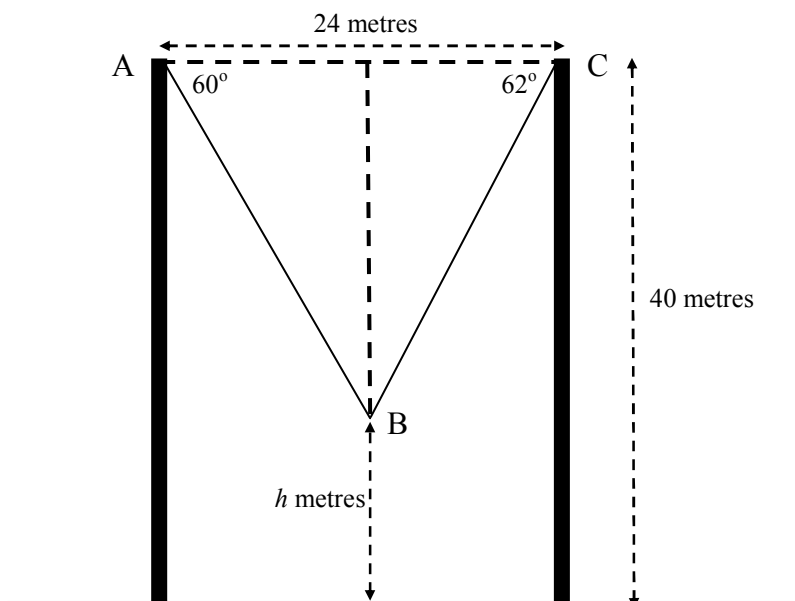


Calculate the area of metal required to make the badge.

7

10. The upright posts on a bungee jump are 24 metres apart and 40 metres high.

For one jump the initial fall was not exactly half way between the posts but made angles of depression of 60° and 62° with the horizontal as shown in the diagram.



Calculate how far from the ground (h metres) the bungee jumper will be after this initial fall.

6

END OF QUESTION PAPER