C

2500/406

NATIONAL QUALIFICATIONS 2003

THURSDAY, 8 MAY
2.45 PM – 4.05 PM

MATHEMATICS STANDARD GRADE

Credit Level
Paper 2

1 **You may use a calculator.**

2 Answer as many questions as you can.

3 Full credit will be given only where the solution contains appropriate working.

4 Square-ruled paper is provided.

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SCOTTISH QUALIFICATIONS AUTHORITY

FORMULAE LIST

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

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

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

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

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

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1. Bacteria in a test-tube increase at the rate of 0·6% per hour.

At 12 noon, there are 5000 bacteria.

At 3pm, how many bacteria will be present?

Give your answer **to 3 significant figures.** | **4** |

2. Fiona checks out the price of a litre of milk in several shops.

The prices in pence are:

49 44 41 52 47 43.

(*a*) Find the mean price of a litre of milk. | **1** |

(*b*) Find the standard deviation of the prices. | **2** |

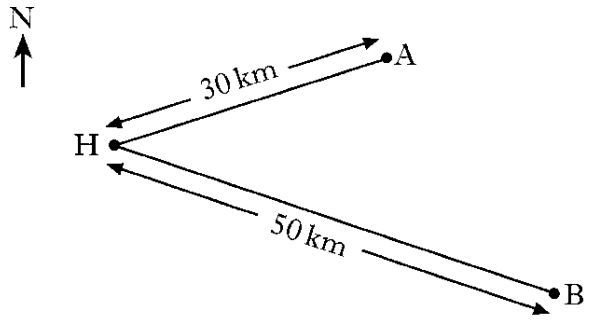
(*c*) Fiona also checks out the price of a kilogram of sugar in the same shops and finds that the standard deviation of the prices is 2·6.

Make one valid comparison between the two sets of prices. | | **1**

3. Two yachts leave from harbour H.

Yacht A sails on a bearing of 072° for 30 kilometres and stops.

Yacht B sails on a bearing of 140° for 50 kilometres and stops.



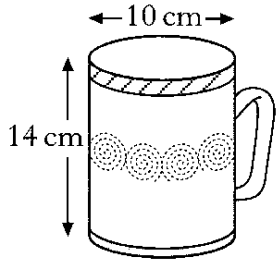
How far apart are the two yachts when they have both stopped?

Do not use a scale drawing. | | **4**

[Turn over

	KU	RE

4. A mug is in the shape of a cylinder with diameter 10 centimetres and height 14 centimetres.



(*a*) Calculate the volume of the mug. **2**

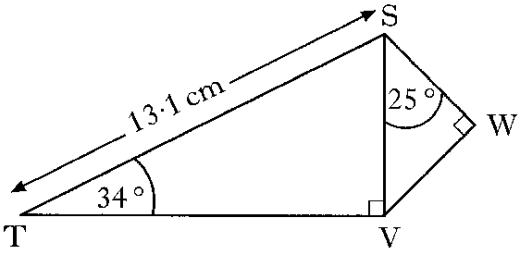
(*b*) 600 millilitres of coffee are poured in.
Calculate the depth of the coffee in the cup. **3**

5. The number of diagonals, d, in a polygon with n sides is given by the formula

$$d = \frac{n(n-3)}{2}.$$

A polygon has 20 diagonals.
How many sides does it have? **4**

6. In the diagram,
Angle STV = 34°
Angle VSW = 25°
Angle SVT = Angle SWV = 90°
ST = 13·1 centimetres.



Calculate the length of SW. **4**

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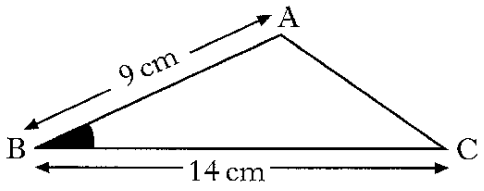
7. The area of triangle ABC is 38 square centimetres.

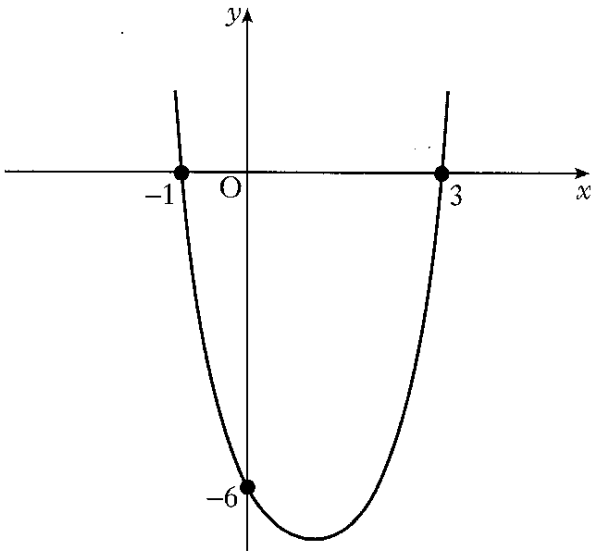
AB is 9 centimetres and BC is 14 centimetres.



Calculate the size of the acute angle ABC. **3**

8. The diagram below shows part of the graph of a quadratic function, with equation of the form $y = k(x - a)(x - b)$.

The graph cuts the y-axis at $(0, -6)$ and the x-axis at $(-1, 0)$ and $(3, 0)$.



(*a*) Write down the values of a and b. **2**

(*b*) Calculate the value of k. **2**

(*c*) Find the coordinates of the minimum turning point of the function. **2**

[Turn over

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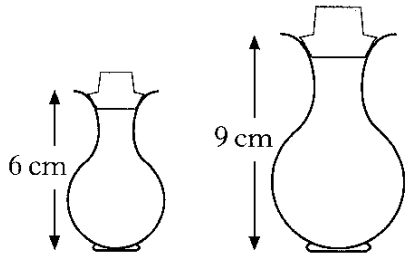
9. Two perfume bottles are mathematically similar in shape.



The smaller one is 6 centimetres high and holds 30 millilitres of perfume.

The larger one is 9 centimetres high.

What volume of perfume will the larger one hold? **3**

10. A sheep shelter is part of a cylinder as shown in Figure 1.

It is 6 metres wide and 2 metres high.

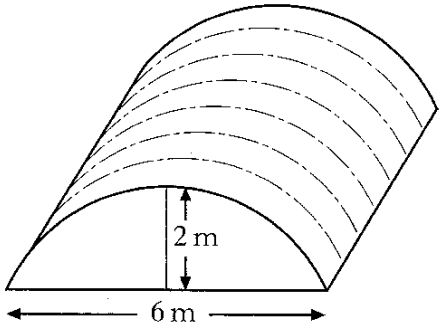


Figure 1

The cross-section of the shelter is a segment of a circle with centre O, as shown in Figure 2.

OB is the radius of the circle.

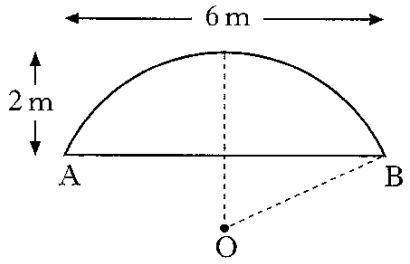


Figure 2

Calculate the length of OB. **4**

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11. (*a*) A driver travels from A to B, a distance of x miles, at a constant speed of 75 kilometres per hour. Find the time taken for this journey in terms of x.	**1**	
(*b*) The time for the journey from B to A is $\frac{x}{50}$ hours. Hence calculate the driver's average speed for the whole journey.		**4**

[END OF QUESTION PAPER]