C

2500/405

NATIONAL QUALIFICATIONS 2001

WEDNESDAY, 16 MAY
1.30 PM – 2.25 PM

MATHEMATICS STANDARD GRADE

Credit Level
Paper 1
(Non-calculator)

1 **You may NOT 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.

SCOTTISH QUALIFICATIONS AUTHORITY

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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 $= \frac{1}{2}ab \sin C$

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

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.

	KU	RE

1. Evaluate

$$3{\cdot}1 + 2{\cdot}6 \times 4.$$

2

2. Evaluate

$$3\tfrac{5}{8} + 4\tfrac{2}{3}.$$

2

3. Given that $f(m) = m^2 - 3m$, evaluate $f(-5)$.

2

4. Solve **algebraically** the equation

$$2x - \frac{(3x-1)}{4} = 4.$$

3

5. A furniture maker investigates the delivery times, in days, of two local wood companies and obtains the following data.

Company	*Minimum*	*Maximum*	*Lower Quartile*	*Median*	*Upper Quartile*
Timberplan	16	56	34	38	45
Allwoods	18	53	22	36	49

(*a*) Draw an appropriate statistical diagram to illustrate these two sets of data.

3

(*b*) Given that consistency of delivery is the most important factor, which company should the furniture maker use? Give a reason for your answer.

1

[Turn over

KU	RE

6. A is the point (a^2, a).

T is the point (t^2, t), $a \neq t$

Find the gradient of the line AT.

Give your answer in its simp **3**

7. A garage carried out a survey on 600 cars.

The results are shown in the table below.

		Engine size (cc)			
		0–1000	1001–1500	1501–2000	2001+
Age	Less than 3 years	50	80	160	20
	3 years or more	60	100	120	10

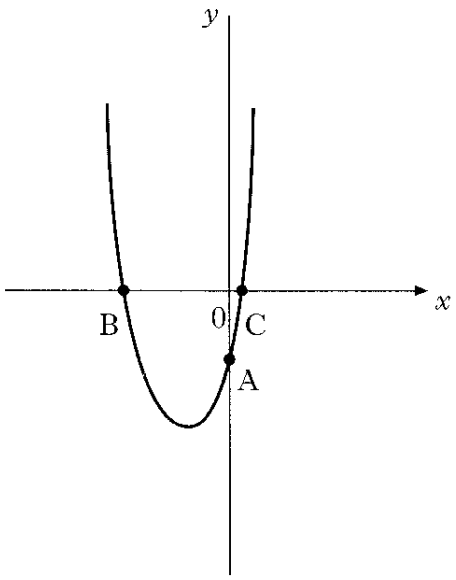
(*a*) What is the probability that a car, chosen at random, is less than 3 years old? **1**

(*b*) In a sample of 4200 cars, how many would be expected to have an engine size greater than 2000cc **and** be 3 or more years old? **2**

	KU	RE

8. The diagram below shows part of the graph of $y = 4x^2 + 4x - 3$.

The graph cuts the y-axis at A and the x-axis at B and C.



(*a*) Write down the coordinates of A. **1**

(*b*) Find the coordinates of B and C. **3**

(*c*) Calculate the minimum value of $4x^2 + 4x - 3$. **2**

9. A number pattern is shown below.

$$1^3 + 1 = (1 + 1)(1^2 - 1 + 1)$$
$$2^3 + 1 = (2 + 1)(2^2 - 2 + 1)$$
$$3^3 + 1 = (3 + 1)(3^2 - 3 + 1)$$

(*a*) Write down a similar expression for $7^3 + 1$. **1**

(*b*) Hence write down an expression for $n^3 + 1$. **1**

(*c*) Hence find an expression for $8p^3 + 1$. **2**

[Turn over

	KU	RE
10. Simplify $\frac{\sqrt{3}}{\sqrt{24}}$. Express your answer as a fraction with a rational denominator.	**3**	
11. The intensity of light, I, emerging after passing through a liquid with concentration, c, is given by the equation $I = \frac{20}{2^c} \quad c \geq 0.$		
(*a*) Find the intensity of light when the concentration is 3.	**1**	
(*b*) Find the concentration of the liquid when the intensity is 10.	**2**	
(*c*) What is the maximum possible intensity?		**3**

[END OF QUESTION PAPER]