X100/11/01

NATIONAL
QUALIFICATIONS
2012

MONDAY, 21 MAY
9.00 AM – 9.45 AM

MATHEMATICS
INTERMEDIATE 2
Units 1, 2 and 3
Paper 1
(Non-calculator)

Read carefully

1   **You may NOT use a calculator.**

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

3   Square-ruled paper is provided. If you make use of this, you should write your name on it clearly and put it inside your answer booklet.

FORMULAE LIST

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

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

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

ALL questions should be attempted.

1. The National Debt of the United Kingdom was recently calculated as

   £1 157 818 887 139.

   Round this amount to four significant figures.   **1**

2. A teacher recorded the marks, out of ten, of a group of pupils for a spelling test.

Mark	Frequency
5	2
6	5
7	6
8	11
9	9
10	2

   (*a*) Copy the frequency table and add a cumulative frequency column.   **1**

   (*b*) For this data, find:

      (i)   the median;   **1**

      (ii) the lower quartile;   **1**
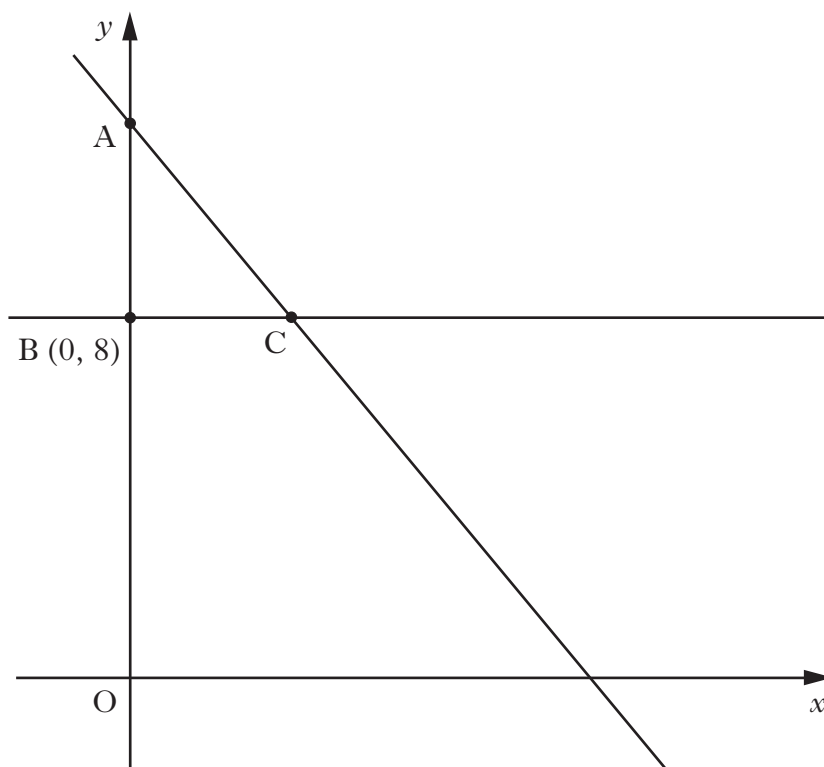
      (iii) the upper quartile.   **1**

   (*c*) Draw a boxplot to illustrate this data.   **2**

   [Turn over

3. The straight line with equation $4x + 3y = 36$ cuts the y-axis at A.
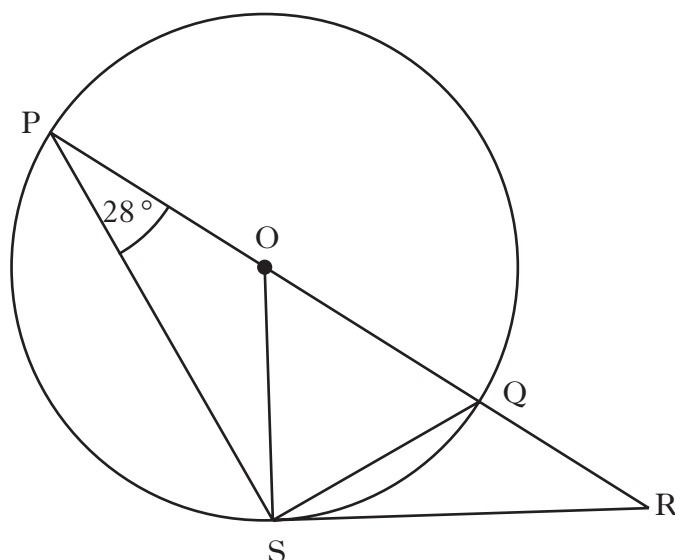

(*a*) Find the coordinates of A. **1**

This line meets the line through B (0, 8), parallel to the x-axis, at C as shown above.

(*b*) Find the coordinates of C. **2**

4.

In the above diagram,

- O is the centre of the circle
- PQ is a diameter of the circle
- PQR is a straight line
- RS is a tangent to the circle at S
- angle OPS is 28°.

Calculate the size of angle QRS.

3

5. One weekend, the attendances at five Premier League football matches were recorded.

| 8 900 | 12 700 | 59 200 | 10 300 | 9 700 |

The median attendance is 10 300.

(*a*) Calculate the mean attendance.

1

(*b*) Which of the two "averages" – the mean or the median – is more representative of the data?
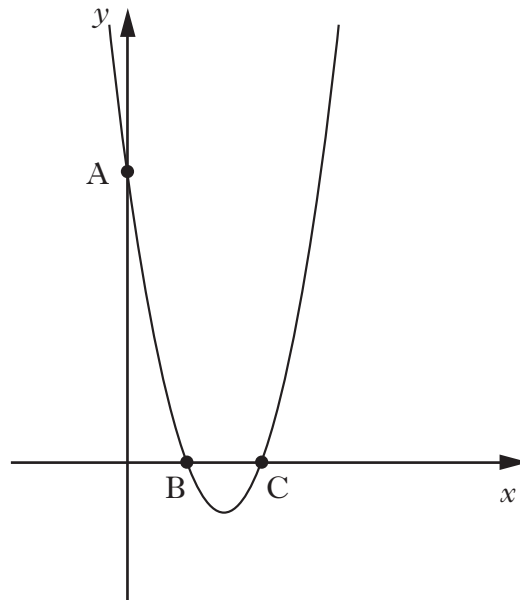
You must explain your answer.

1

[Turn over

6. The equation $x^2 - 6x + 8 = 0$ can also be written as $(x - 2)(x - 4) = 0$.

    (*a*) Write down the roots of the equation $x^2 - 6x + 8 = 0$.   **1**

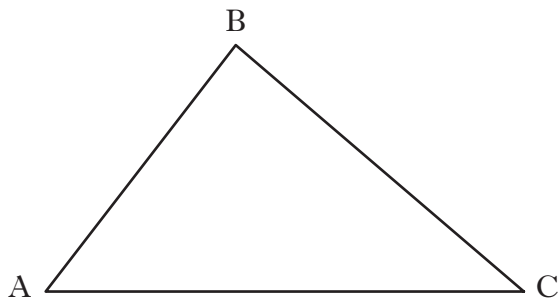   Part of the graph of $y = x^2 - 6x + 8$ is shown below.

    (*b*) State the coordinates of the points A, B and C.   **3**

    (*c*) What is the equation of the axis of symmetry of this graph?   **1**

7.

The area of triangle ABC is 20 square centimetres.

AC = 16 centimetres and $\sin C = \frac{1}{4}$.

Calculate the length of BC. **2**

8. (*a*) Factorise

$$a^2 + 2ab + b^2.$$ **1**

(*b*) Hence, or otherwise, find the value of

$$94^2 + 2 \times 94 \times 6 + 6^2.$$ **2**

9. Sketch the graph of $y = -2\sin x°$, $0 \leq x \leq 360$. **3**

10. Simplify $\sqrt{2}\left(\sqrt{3} + \sqrt{2}\right) - \sqrt{6}.$ **2**

[*END OF QUESTION PAPER*]