2500/406

NATIONAL QUALIFICATIONS 2011 WEDNESDAY, 4 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. 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 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

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

- Olga normally runs a total distance of 28 miles per week. She decides to increase her distance by 10% a week for the next four weeks. How many miles will she run in the fourth week?
- **2.** Expand and simplify

$$(3x + 1)(x^2 - 5x + 4).$$

3. Solve the equation

$$2x^2 + 3x - 7 = 0.$$

Give your answers correct to 2 significant figures.

4. A car is valued at \pounds 3780.

This is 16% less than last year's value. What was the value of the car last year?

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5. A spiral staircase is being designed.



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Each step is made from a sector of a circle as shown.

The radius is 1.2 metres.

Angle BAC is 42°.

For the staircase to pass safety regulations, the arc BC must be at least 0.9 metres.

Will the staircase pass safety regulations?

6. Two rectangular solar panels, A and B, are mathematically similar.

Panel A has a diagonal of 90 centimetres and an area of 4020 square centimetres.



A salesman claims that panel B, with a diagonal of 125 centimetres, will be double the area of panel A.

Is this claim justified?

Show all your working.

 ABCDE is a regular pentagon with each side 1 centimetre. Angle CDF is 72°.

EDF is a straight line.



- (a) Write down the size of angle ABC.
- (*b*) Calculate the length of AC.
- 8. A pipe has water in it as shown.



The depth of the water is 5 centimetres.

The width of the water surface, AB, is 18 centimetres.

Calculate r, the radius of the pipe.

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 Paper is wrapped round a cardboard cylinder exactly 3 times. The cylinder is 70 centimetres long.



The area of the paper is 3000 square centimetres. Calculate the diameter of the cylinder.

12. Part of the graph of $y = 4 \sin x^{\circ} - 3$ is shown below.



The graph cuts the *x*-axis at Q and R.

- P is the maximum turning point.
- (a) Write down the coordinates of P.
- (*b*) Calculate the *x*-coordinates of Q and R.

[Turn over for Question 13 on Page eight

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13. The diagram shows the path of a flare after it is fired. The height, *h* metres above sea level, of the flare is given by $h = 48 + 8t - t^2$ where *t* is the number of seconds after firing.



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Calculate, **algebraically**, the time taken for the flare to enter the sea.

[END OF QUESTION PAPER]