## 2500/406

NATIONAL QUALIFICATIONS 2005 FRIDAY, 6 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.





## 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.

$$E = mc^2$$
.

Find the value of E when  $m = 3.6 \times 10^{-2}$  and  $c = 3 \times 10^{8}$ .

Give your answer in scientific notation.

2. The running times in minutes, of 6 television programmes are:

77 91

84

71

79 75.

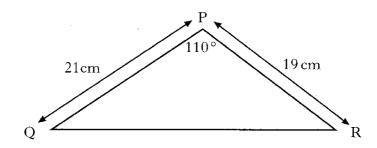
Calculate the mean and standard deviation of these times.

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3.



Calculate the area of triangle PQR.

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## 4. Solve the equation

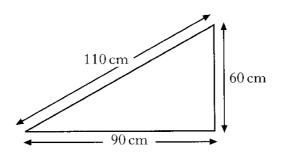
$$x^2 + 2x = 9$$
.

Give your answers correct to 1 decimal place.

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5. A triangular paving slab has measurements as shown.

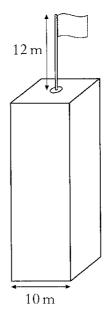


Is the slab in the shape of a right angled triangle?

Show your working.

**6.** A vertical flagpole 12 metres high stands at the centre of the roof of a tower.

The tower is cuboid shaped with a square base of side 10 metres.

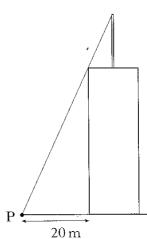


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At a point P on the ground, 20 metres from the base of the tower, the top of the flagpole is just visible, as shown.

Calculate the height of the tower.

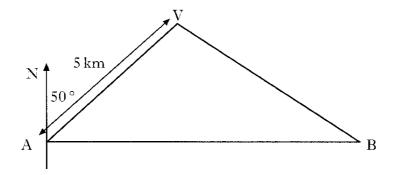


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7. David walks on a bearing of  $050^{\circ}$  from hostel A to a viewpoint V, 5 kilometres away.

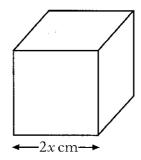
Hostel B is due east of hostel A.

Susie walks on a bearing of 294° from hostel B to the same viewpoint.



Calculate the length of AB, the distance between the two hostels.

8. The side length of a cube is 2x centimetres.



The expression for the volume in cubic centimetres is equal to the expression for the surface area in square centimetres.

Calculate the side length of the cube.

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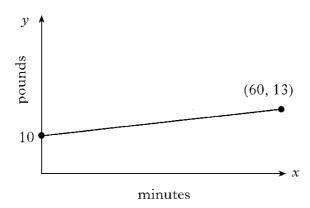
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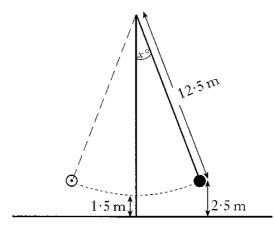
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**9.** The monthly bill for a mobile phone is made up of a fixed rental plus call charges. Call charges vary as the time used.

The relationship between the monthly bill, y (pounds), and the time used, x (minutes) is represented in the graph below.



- (a) Write down the fixed rental.
- (b) Find the call charge per minute.
- 10. The chain of a demolition ball is 12.5 metres long.When vertical, the end of the chain is 1.5 metres from the ground.



It swings to a maximum height of 2.5 metres above the ground on both sides.

- (a) At this maximum height, show that the angle  $x^{\circ}$ , which the chain makes with the vertical, is approximately 23°.
- (b) Calculate the maximum length of the arc through which the end of the chain swings. Give your answer to 3 significant figures.

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11.	(a)	Solve algebraically the equation
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$$\sqrt{3}\sin x^{\circ} - 1 = 0$$
  $0 \le x < 360$ .

(b) Hence write down the solution of the equation

$$\sqrt{3}\sin 2x^{\circ} - 1 = 0 \qquad 0 \le x < 90.$$

 $[END\ OF\ QUESTION\ PAPER]$ 

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