

2500/406

NATIONAL
QUALIFICATIONS
2007THURSDAY, 3 MAY
2.45 PM – 4.05 PMMATHEMATICS
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: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, where n is the sample size.

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1. Alistair buys an antique chair for £600.
It is expected to increase in value at the rate of 4.5% each year.
How much is it expected to be worth in 3 years?

2. Solve the equation

$$3x^2 - 2x - 10 = 0.$$

Give your answer **correct to 2 significant figures**.

3. (a) During his lunch hour, Luke records the number of birds that visit his bird-table.

The numbers recorded last week were:

28 32 14 19 18 26 31.

Find the mean and standard deviation for this data.

- (b) Over the same period, Luke's friend, Erin also recorded the number of birds visiting her bird-table.

Erin's recordings have a mean of 25 and a standard deviation of 5.

Make **two** valid comparisons between the friends' recordings.

4. Solve the inequality

$$\frac{x}{4} - \frac{1}{2} < 5.$$

[Turn over

5. Mark takes some friends out for a meal.

The restaurant adds a 10% service charge to the price of the meal.

The **total** bill is £148.50.

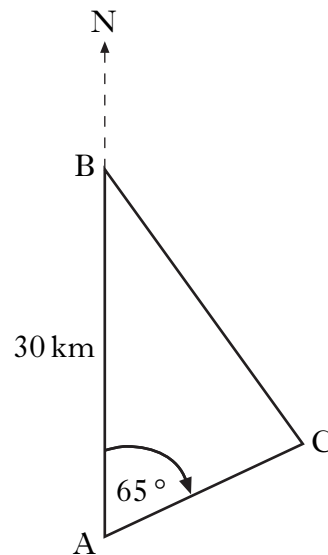
What was the price of the meal?

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6. Brunton is 30 kilometres due North of Appleton.

From Appleton, the bearing of Carlton is 065° .

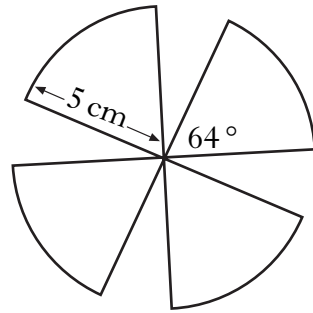
From Brunton, the bearing of Carlton is 153° .



Calculate the distance between Brunton and Carlton.

4

7. A fan has four identical plastic blades.



Each blade is a sector of a circle of radius 5 centimetres.

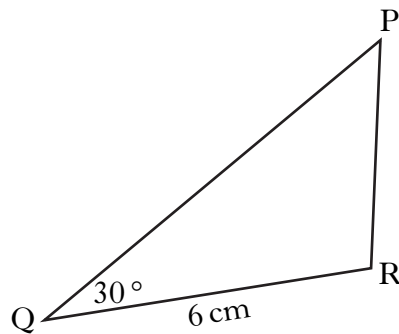
The angle at the centre of each sector is 64° .

Calculate the **total** area of plastic required to make the blades.

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8. In triangle PQR:

- $QR = 6$ centimetres
- angle $PQR = 30^\circ$
- area of triangle $PQR = 15$ square centimetres.



Calculate the length of PQ.

3

[Turn over

9. To make “14 carat” gold, copper and pure gold are mixed in the ratio 5:7.
A jeweller has 160 grams of copper and 245 grams of pure gold.
What is the maximum weight of “14 carat” gold that the jeweller can make?

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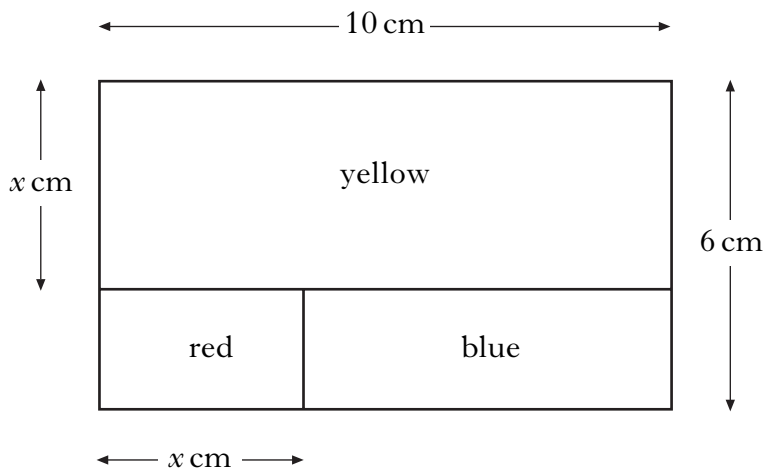
10. Solve **algebraically** the equation

$$5 \cos x^\circ + 4 = 0, \quad 0 \leq x < 360.$$

3

11. (a) A decorator’s logo is rectangular and measures 10 centimetres by 6 centimetres.

It consists of three rectangles: one red, one yellow and one blue.



The yellow rectangle measures 10 centimetres by x centimetres.

The width of the red rectangle is x centimetres.

Show that the area, A , of the blue rectangle is given by the expression

$$A = x^2 - 16x + 60.$$

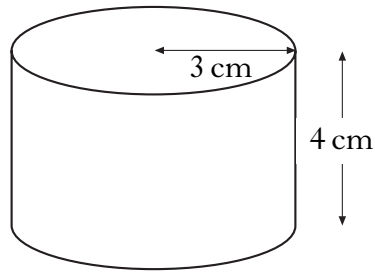
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- (b) The area of the blue rectangle is equal to $\frac{1}{5}$ of the total area of the logo.

Calculate the value of x .

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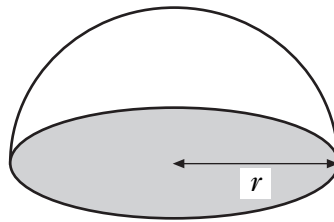
12. (a) A cylindrical paperweight of radius 3 centimetres and height 4 centimetres is filled with sand.



Calculate the volume of sand in the paperweight.

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- (b) Another paperweight, in the shape of a hemisphere, is filled with sand.



It contains the same volume of sand as the first paperweight.

Calculate the radius of the hemisphere.

[The volume of a hemisphere with radius r is given by the formula, $V = \frac{2}{3}\pi r^3$].

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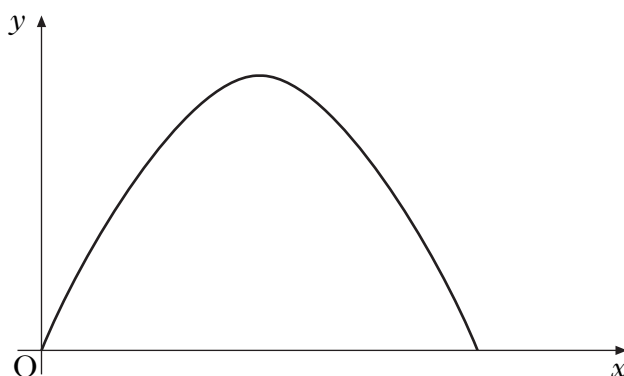
[Turn over for Question 13 on *Page eight*

13. The profit made by a publishing company of a magazine is calculated by the formula

$$y = 4x(140 - x),$$

where y is the profit (in pounds) and x is the selling price (in pence) of the magazine.

The graph below represents the profit y against the selling price x .



Find the maximum profit the company can make from the sale of the magazine.

4

[END OF QUESTION PAPER]