

**2500/406**

---

NATIONAL  
QUALIFICATIONS  
2008THURSDAY, 8 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.

1. A local council recycles 42 000 tonnes of waste a year.  
 The council aims to increase the amount of waste recycled by 8% each year.  
 How much waste does it expect to recycle in 3 years time?  
 Give your answer **to three significant figures.**

4

2. In a class, 30 pupils sat a test.  
 The marks are illustrated by the stem and leaf diagram below.

**Test Marks**

0	9
1	6 6 7 8
2	0 4 5 7 9 9 9
3	2 2 3 5 5 6 8
4	0 2 3 4 5 5 7 7 8
5	0 0

$n = 30$

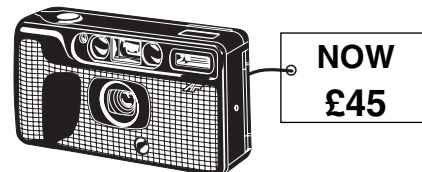
$1 \mid 6 = 16$

- (a) Write down the median and the modal mark.
- (b) Find the probability that a pupil selected at random scored **at least** 40 marks.

2

1

3. In a sale, all cameras are reduced by 20%.  
 A camera now costs £45.  
 Calculate the **original** cost of the camera.



3

[Turn over

4. Aaron saves 50 pence and 20 pence coins in his piggy bank.

Let  $x$  be the number of 50 pence coins in his bank.

Let  $y$  be the number of 20 pence coins in his bank.



- (a) There are 60 coins in his bank.

Write down an equation in  $x$  and  $y$  to illustrate this information.

1

- (b) The total value of the coins is £17.40.

Write down another equation in  $x$  and  $y$  to illustrate this information.

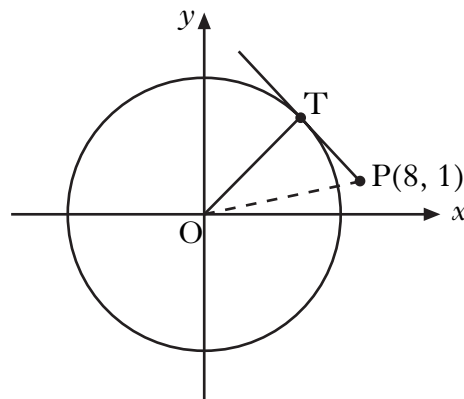
1

- (c) Hence find **algebraically** the number of 50 pence coins Aaron has in his piggy bank.

3

5. A circle, centre the origin, is shown.

P is the point (8, 1).



- (a) Calculate the length of OP.

2

The diagram also shows a tangent from P which touches the circle at T.

The radius of the circle is 5 units.

- (b) Calculate the length of PT.

2

6. The distance,  $d$  kilometres, to the horizon, when viewed from a cliff top, varies directly as the square root of the height,  $h$  metres, of the cliff top above sea level.

From a cliff top 16 metres above sea level, the distance to the horizon is 14 kilometres.

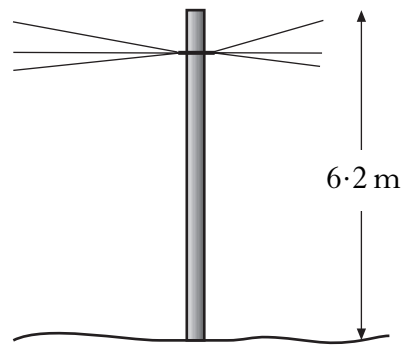
A boat is 20 kilometres from a cliff whose top is 40 metres above sea level.

Is the boat beyond the horizon?

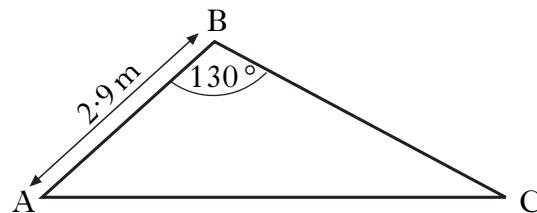
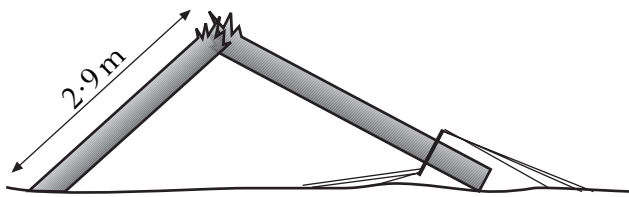
**Justify your answer.**

5

7. A telegraph pole is 6.2 metres high.



The wind blows the pole over into the position as shown below.



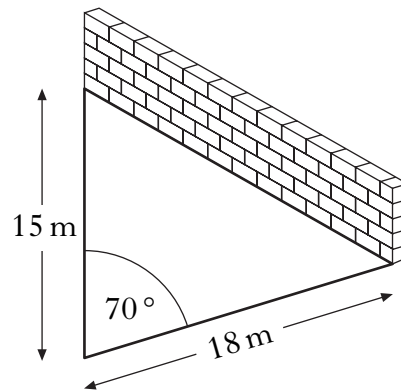
AB is 2.9 metres and angle ABC is  $130^\circ$ .

Calculate the length of AC.

4

**[Turn over**

8. A farmer builds a sheep-pen using two lengths of fencing and a wall.



The two lengths of fencing are 15 metres and 18 metres long.

- (a) Calculate the area of the sheep-pen, when the angle between the fencing is  $70^\circ$ .
- (b) What angle between the fencing would give the farmer the largest possible area?

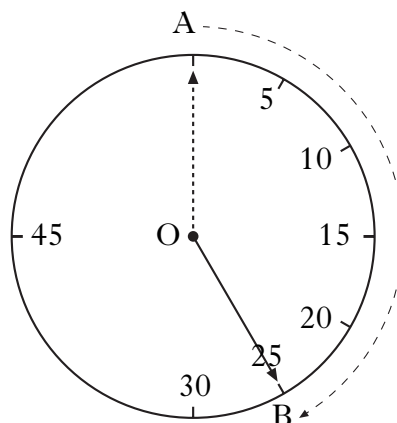
3

1

9. Contestants in a quiz have 25 seconds to answer a question.

This time is indicated on the clock.

The tip of the clock hand moves through the arc AB as shown.



- (a) Calculate the size of angle AOB.
- (b) The length of arc AB is 120 centimetres.  
Calculate the length of the clock hand.

1

4

10. To hire a car costs £25 per day plus a mileage charge.  
The first 200 miles are free with each additional mile charged at 12 pence.

## CAR HIRE

**£25 per day**

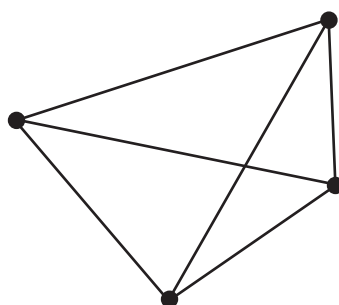
- **first 200** miles free
- each additional mile only 12p

- (a) Calculate the cost of hiring a car for 4 days when the mileage is 640 miles.
- (b) A car is hired for  $d$  days and the mileage is  $m$  miles where  $m > 200$ .  
Write down a formula for the cost £ $C$  of hiring the car.

1

3

11. The minimum number of roads joining 4 towns to each other is 6 as shown.



The minimum number of roads,  $r$ , joining  $n$  towns to each other is given by the formula

$$r = \frac{1}{2}n(n-1).$$

- (a) State the minimum number of roads needed to join 7 towns to each other.
- (b) When  $r = 55$ , show that  $n^2 - n - 110 = 0$ .
- (c) Hence find **algebraically** the value of  $n$ .

1

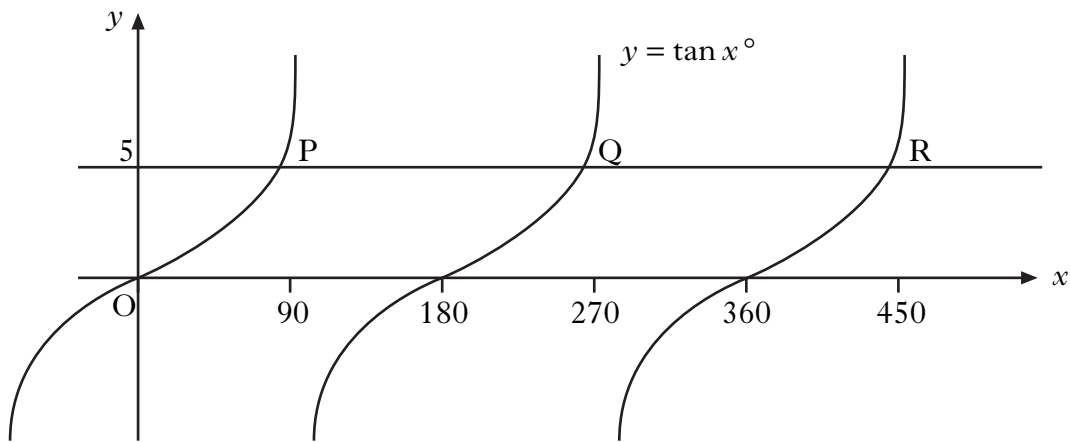
2

3

[Turn over for Question 12 on Page eight]

12. The diagram shows part of the graph of  $y = \tan x^\circ$ .

The line  $y = 5$  is drawn and intersects the graph of  $y = \tan x^\circ$  at P and Q.



(a) Find the  $x$ -coordinates of P and Q.

(b) Write down the  $x$ -coordinate of the point R, where the line  $y = 5$  next intersects the graph of  $y = \tan x^\circ$ .

3

1

[END OF QUESTION PAPER]