

2500/405

NATIONAL
QUALIFICATIONS
2008

THURSDAY, 8 MAY
1.30 PM – 2.25 PM

MATHEMATICS
STANDARD GRADE
Credit Level
Paper 1
(Non-calculator)

- 1 You may **NOT** 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. Evaluate

$$24 \cdot 7 - 0 \cdot 63 \times 30.$$

2

2. Factorise fully

$$5x^2 - 45.$$

2

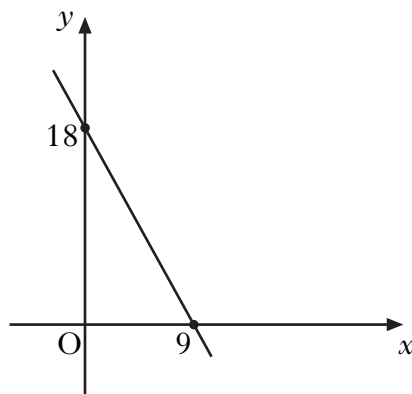
3.

$$W = BH^2.$$

Change the subject of the formula to H .

2

4. A straight line cuts the x -axis at the point $(9, 0)$ and the y -axis at the point $(0, 18)$ as shown.



Find the equation of this line.

3

[Turn over

KU	RE
2	
1	
1	
	3
1	
	1
	2

5. Express as a single fraction in its simplest form

$$\frac{1}{p} + \frac{2}{(p+5)}$$

6. Jane enters a two-part race.

(a) She cycles for 2 hours at a speed of $(x + 8)$ kilometres per hour.

Write down an expression in x for the distance cycled.

(b) She then runs for 30 minutes at a speed of x kilometres per hour.

Write down an expression in x for the distance run.

(c) The **total** distance of the race is 46 kilometres.

Calculate Jane's **running** speed.

7. The 4th term of each number pattern below is the **mean** of the previous three terms.

(a) When the first three terms are 1, 6, and 8, calculate the 4th term.

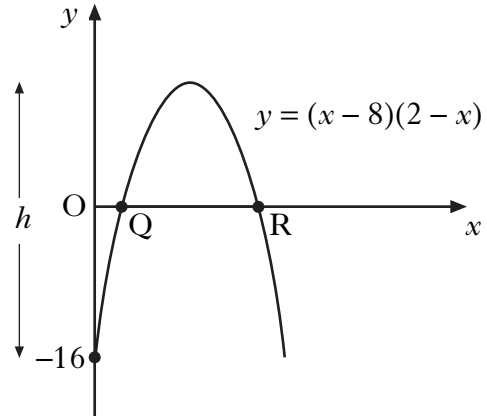
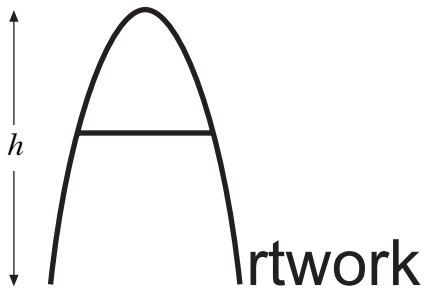
(b) When the first three terms are x , $(x + 7)$ and $(x + 11)$, calculate the 4th term.

(c) When the first, second and fourth terms are

$$-2x, \quad (x + 5), \quad \text{---}, \quad (2x + 4),$$

calculate the 3rd term.

8. The curved part of the letter A in the *Artwork* logo is in the shape of a parabola.
The equation of this parabola is $y = (x - 8)(2 - x)$.



- (a) Write down the coordinates of Q and R.
(b) Calculate the height, h , of the letter A.

2

3

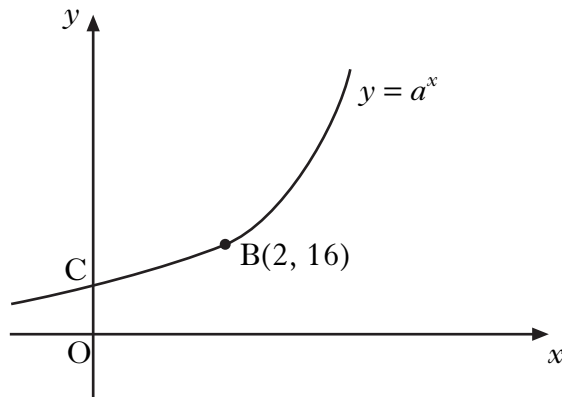
9. Simplify

$$m^3 \times \sqrt{m}.$$

2

[Turn over

10. Part of the graph of $y = a^x$, where $a > 0$, is shown below.



The graph cuts the y-axis at C.

(a) Write down the coordinates of C.

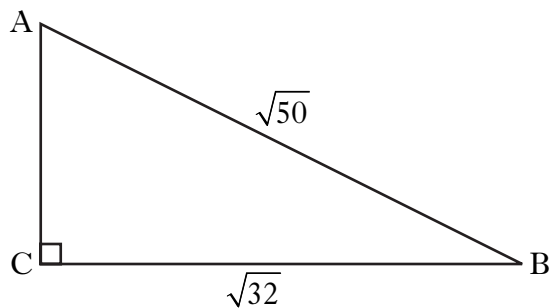
1

B is the point (2, 16).

(b) Calculate the value of a .

2

11. A right angled triangle has dimensions as shown.



Calculate the length of AC, leaving your answer as a surd **in its simplest form**.

3

KU	RE
3	
	3

12. Given that

$$x^2 - 10x + 18 = (x - a)^2 + b,$$

find the values of a and b .

13. A new fraction is obtained by adding x to the numerator and denominator of the fraction $\frac{17}{24}$.

This new fraction is equivalent to $\frac{2}{3}$.

Calculate the value of x .

[END OF QUESTION PAPER]

[BLANK PAGE]

2500/406

NATIONAL
QUALIFICATIONS
2008

THURSDAY, 8 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: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, 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

$n = 30$

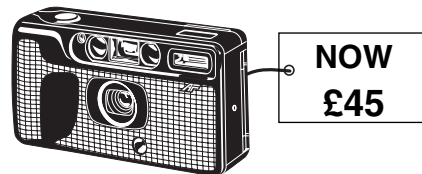
$1 \mid 6 = 16$

- (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.

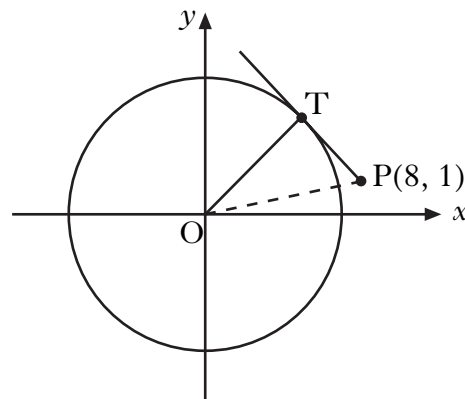
1

- (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.

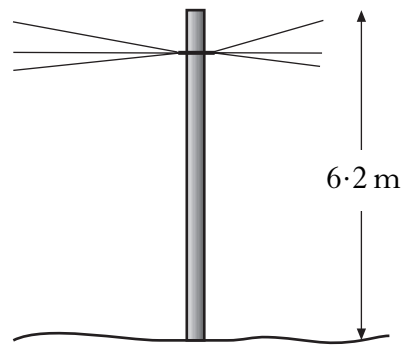
A boat is 20 kilometres from a cliff whose top is 40 metres above sea level.

Is the boat beyond the horizon?

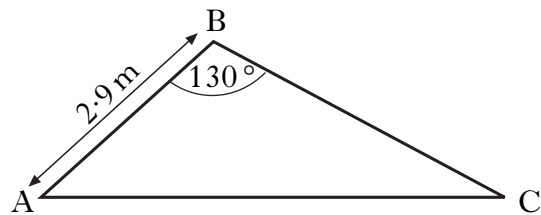
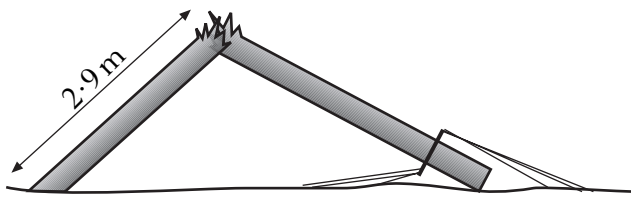
Justify your answer.

5

7. A telegraph pole is 6.2 metres high.



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



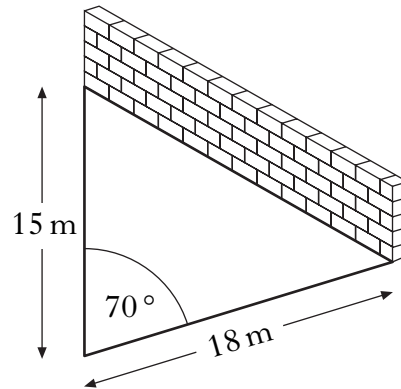
AB is 2.9 metres and angle ABC is 130° .

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° .
- (b) What angle between the fencing would give the farmer the largest possible area?

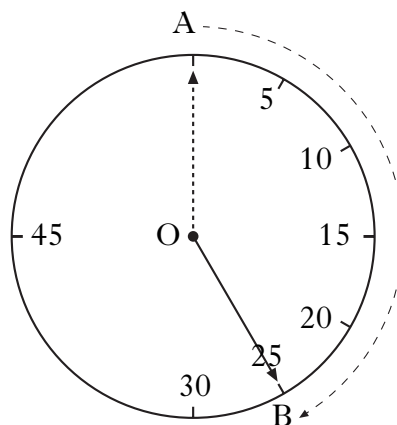
3

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

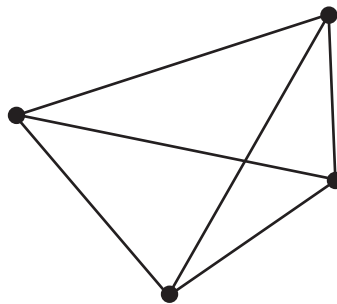
- **first 200** miles free
- each additional mile only 12p

- (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

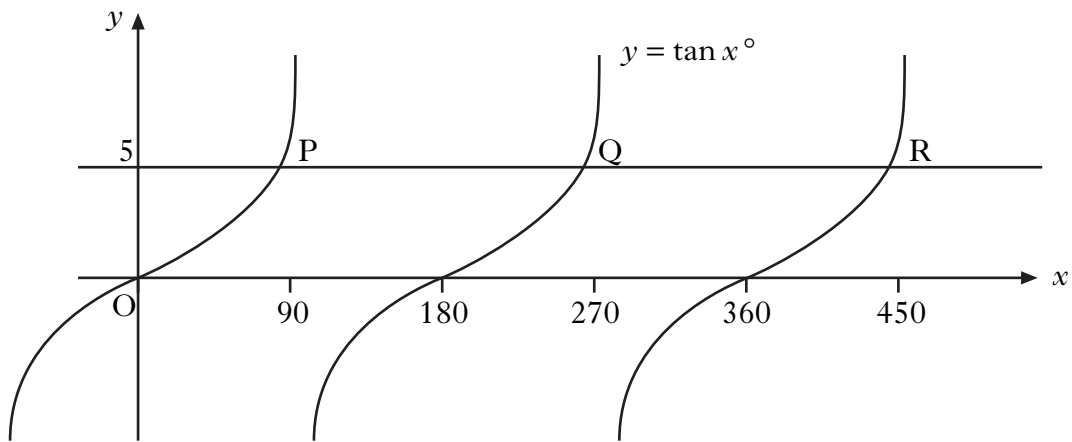
2

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]