

# 2500/405

---

NATIONAL  
QUALIFICATIONS  
2010

WEDNESDAY, 5 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.



| KU | RE |
|----|----|
| 1  | 1  |
| 3  |    |

5. A bag contains 27 marbles. Some are black and some are white.

The probability that a marble chosen at random is black is  $\frac{4}{9}$ .

(a) What is the probability that a marble chosen at random is white?

(b) How many white marbles are in the bag?

6. Cleano washing powder is on special offer.



Each box on special offer contains 20% more powder than the standard box.

A box on special offer contains 900 grams of powder.

How many grams of powder does the standard box contain?

7. A straight line has equation  $y = mx + c$ , where  $m$  and  $c$  are constants.

(a) The point  $(2, 7)$  lies on this line.

Write down an equation in  $m$  and  $c$  to illustrate this information.

(b) A second point  $(4, 17)$  also lies on this line.

Write down another equation in  $m$  and  $c$  to illustrate this information.

(c) Hence calculate the values of  $m$  and  $c$ .

(d) Write down the gradient of this line.

8. (a) Simplify  $\sqrt{2} \times \sqrt{18}$ .

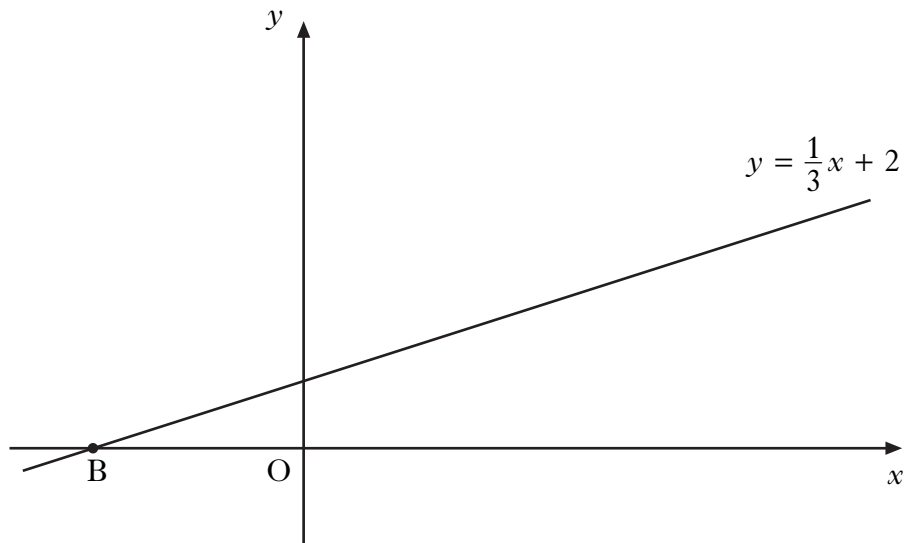
(b) Simplify  $\sqrt{2} + \sqrt{18}$ .

(c) Hence show that  $\frac{\sqrt{2} \times \sqrt{18}}{\sqrt{2} + \sqrt{18}} = \frac{3\sqrt{2}}{4}$ .

| KU | RE |
|----|----|
| 1  |    |
| 1  |    |
|    | 3  |
|    | 1  |
| 1  |    |
| 1  |    |
| 2  |    |

[Turn over

9. Part of the graph of the straight line with equation  $y = \frac{1}{3}x + 2$ , is shown below.



- (a) Find the coordinates of the point B.
- (b) For what values of  $x$  is  $y < 0$ ?

2

1

10. A number pattern is shown below.

$$1^3 = \frac{1^2 \times 2^2}{4}$$

$$1^3 + 2^3 = \frac{2^2 \times 3^2}{4}$$

$$1^3 + 2^3 + 3^3 = \frac{3^2 \times 4^2}{4}$$

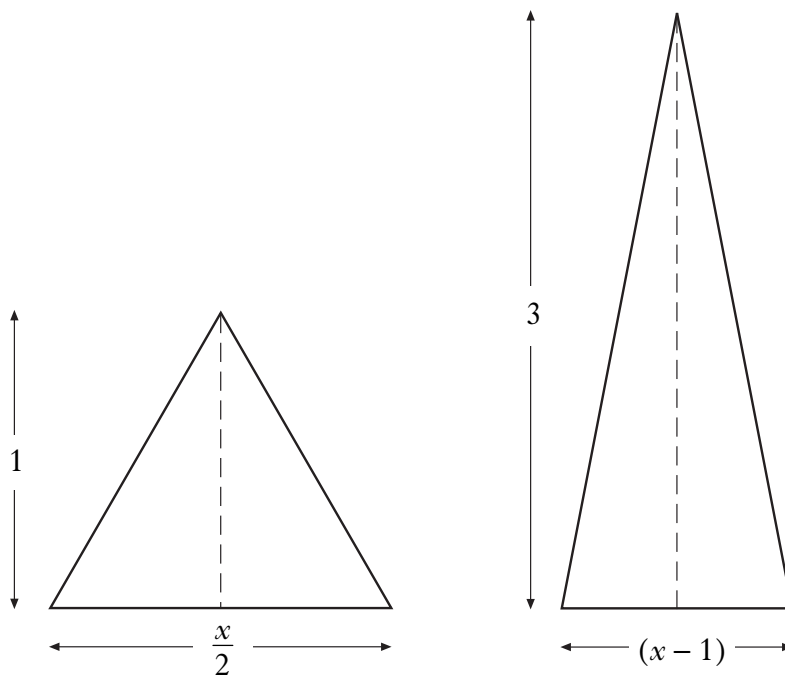
- (a) Write down a similar expression for  $1^3 + 2^3 + 3^3 + 4^3 + 5^3$ .
- (b) Write down a similar expression for  $1^3 + 2^3 + 3^3 + \dots + n^3$ .
- (c) Hence **evaluate**  $1^3 + 2^3 + 3^3 + \dots + 9^3$ .

1

2

2

11. Two triangles have dimensions as shown.



The triangles are equal in area.

**Calculate** the value of  $x$ .

4

[END OF QUESTION PAPER]

**[BLANK PAGE]**



**2500/406**

NATIONAL  
QUALIFICATIONS  
2010

WEDNESDAY, 5 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.

| KU | RE |
|----|----|
| 4  |    |
| 2  |    |
| 3  | 2  |
| 4  |    |

1. It is estimated that an iceberg weighs 84 000 tonnes.  
 As the iceberg moves into warmer water, its weight decreases by 25% each day.  
 What will the iceberg weigh after 3 days in the warmer water?  
 Give your answer **correct to three significant figures**.

2. Expand fully and simplify

$$x(x - 1)^2.$$

3. A machine is used to put drawing pins into boxes.  
 A sample of 8 boxes is taken and the number of drawing pins in each is counted.  
 The results are shown below:

102    102    101    98    99    101    103    102

- (a) Calculate the mean and standard deviation of this sample.

- (b) A sample of 8 boxes is taken from another machine.

This sample has a mean of 103 and a standard deviation of 2.1.

Write down two valid comparisons between the samples.

4. Use the quadratic formula to solve the equation,

$$3x^2 + 5x - 7 = 0.$$

Give your answers correct to **1 decimal place**.

[Turn over



7. Shampoo is available in travel size and salon size bottles.  
The bottles are mathematically similar.



The travel size contains 200 millilitres and is 12 centimetres in height.

The salon size contains 1600 millilitres.

Calculate the height of the salon size bottle.

3

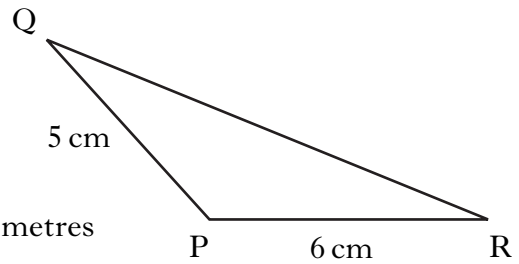
**[Turn over**



| KU | RE |
|----|----|
|    |    |
|    | 4  |
|    | 2  |
|    | 3  |

10. In triangle PQR:

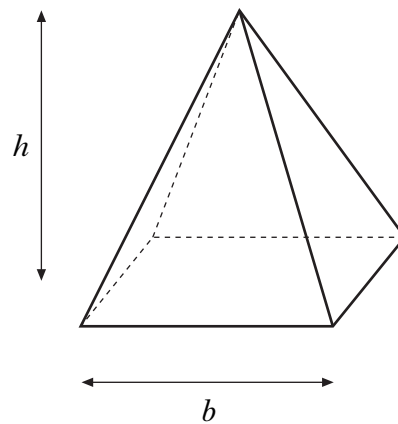
- $PQ = 5$  centimetres
- $PR = 6$  centimetres
- area of triangle PQR = 12 square centimetres
- angle QPR is **obtuse**.



Calculate the size of angle QPR.

11. The height,  $h$ , of a square-based pyramid varies directly as its volume,  $V$ , and inversely as the square of the length of the base,  $b$ .

- (a) Write down an equation connecting  $h$ ,  $V$  and  $b$ .



A square-based pyramid of height 12 centimetres has a volume of 256 cubic centimetres and length of base 8 centimetres.

- (b) Calculate the height of a square-based pyramid of volume 600 cubic centimetres and length of base 10 centimetres.

**[Turn over for Questions 12 and 13 on Page eight**

