

2500/405

NATIONAL
QUALIFICATIONS
2006FRIDAY, 5 MAY
1.30 PM – 2.25 PMMATHEMATICS
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
2	
2	
2	
3	

1. Evaluate

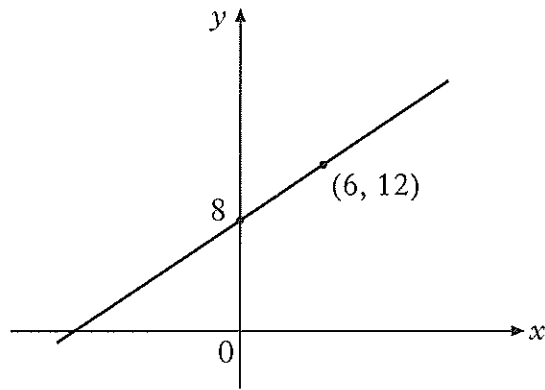
$$56 \cdot 4 - 1 \cdot 25 \times 40.$$

2. Evaluate

$$1\frac{3}{5} + 2\frac{4}{7}.$$

3. Given that $f(x) = 4 - x^2$, evaluate $f(-3)$.

4.



Find the equation of the given straight line.

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KU	RE
1	
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5. (a) Factorise

$$4x^2 - y^2.$$

(b) Hence simplify

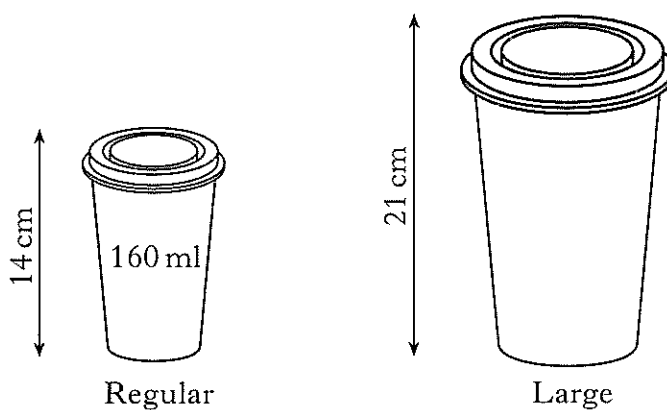
$$\frac{4x^2 - y^2}{6x + 3y}.$$

6. Solve the equation

$$x - 2(x + 1) = 8.$$

7. Coffee is sold in regular cups and large cups.

The two cups are mathematically similar in shape.



The regular cup is 14 centimetres high and holds 160 millilitres.

The large cup is 21 centimetres high.

Calculate how many millilitres the large cup holds.

8. The graph of $y=x^2$ has been moved to the position shown in Figure 1.

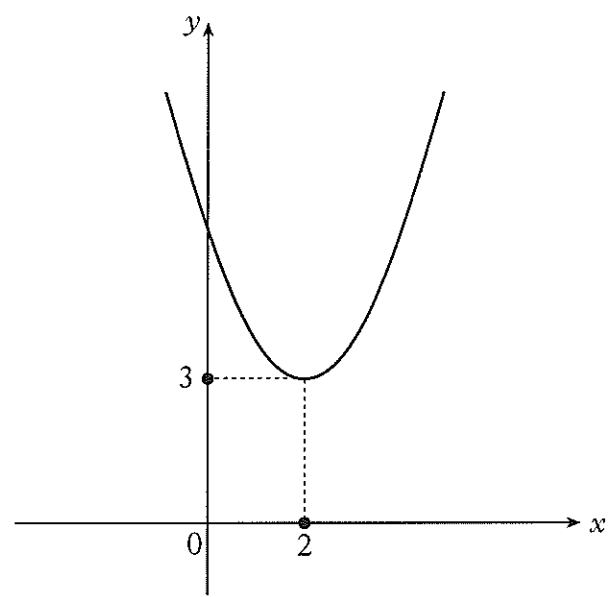


Figure 1

The equation of this graph is $y=(x-2)^2+3$.

The graph of $y=x^2$ has now been moved to the position shown in Figure 2.

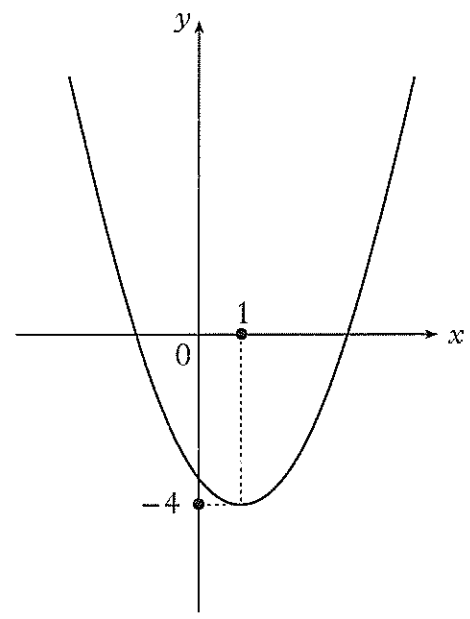


Figure 2

Write down the equation of the graph in Figure 2.

[Turn over

11. (a) One session at the Leisure Centre costs £3.

£3 per session

Write down an algebraic expression for the cost of x sessions.

(b) The Leisure Centre also offers a monthly card costing £20. The **first 6** sessions are then free, with each additional session costing £2.

Monthly card
£20
* first 6 sessions free
* each additional session £2

(i) Find the **total** cost of a monthly card and 15 sessions.

(ii) Write down an algebraic expression for the **total** cost of a monthly card and x **sessions**, where x is greater than 6.

(c) Find the minimum number of sessions required for the monthly card to be the cheaper option.

Show all working.

[END OF QUESTION PAPER]

KU	RE
	1
1	2
	3

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NATIONAL
QUALIFICATIONS
2006

FRIDAY, 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: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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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	
2	
2	
4	

4. (a) Expand and simplify

$$(x + 4)(3x - 1).$$

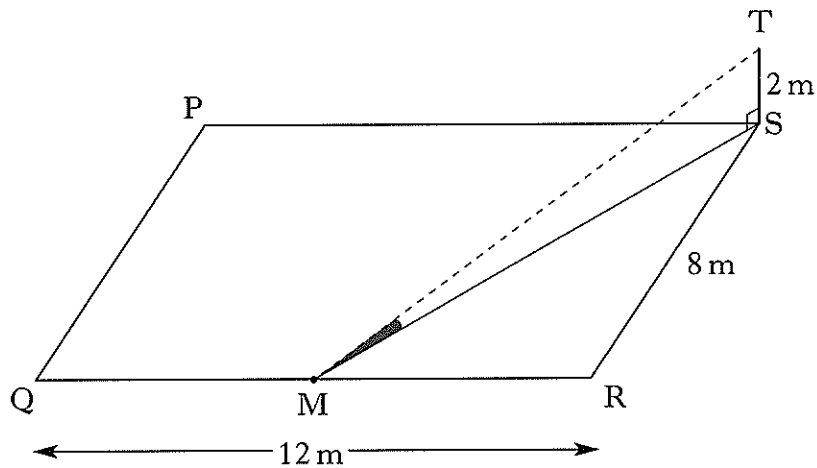
(b) Expand

$$m^{\frac{1}{2}}(2 + m^2).$$

(c) Simplify, leaving your answer as a surd

$$2\sqrt{20} - 3\sqrt{5}.$$

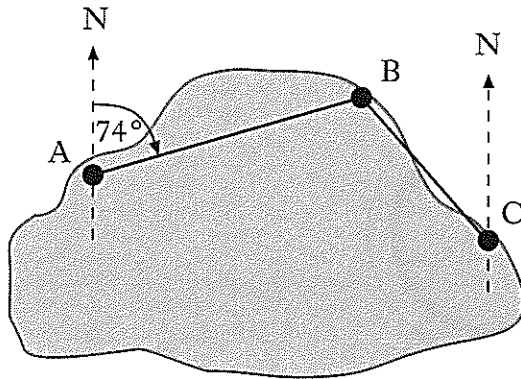
5. ST, a vertical pole 2 metres high, is situated at the corner of a rectangular garden, PQRS.
RS is 8 metres long and QR is 12 metres long.



The pole casts a shadow over the garden.
The shadow reaches M, the midpoint of QR.
Calculate the size of the shaded angle TMS.

KU	RE
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	1
	4

6. (a) There are three mooring points A, B and C on Lake Sorling.



From A, the bearing of B is 074° .

From C, the bearing of B is 310° .

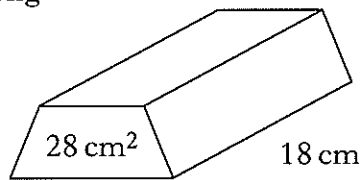
Calculate the size of angle ABC.

(b) B is 230 metres from A and 110 metres from C.

Calculate the direct distance from A to C.

Give your answer to **3 significant figures**.

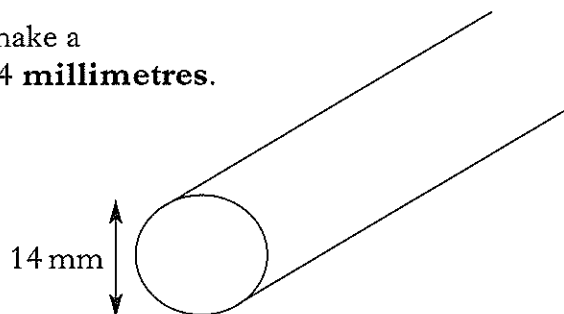
7. (a) A block of copper 18 centimetres long is prism shaped as shown.



The area of its cross section is 28 square centimetres.

Find the volume of the block.

(b) The block is melted down to make a cylindrical cable of diameter 14 millimetres.



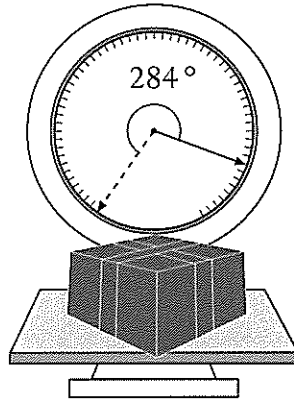
Calculate the length of the cable.

KU	RE
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	2
	2
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8. A set of scales has a circular dial.

The pointer is 9 centimetres long.

The tip of the pointer moves through an arc of 2 centimetres for each 100 grams of weight on the scales.



A parcel, placed on the scales, moves the pointer through an angle of 284° . Calculate the weight of the parcel.

9. The number of diagonals, d , in a polygon of n sides is given by the formula

$$d = \frac{1}{2}n(n-3).$$

(a) How many diagonals does a polygon of 7 sides have?

(b) A polygon has 65 diagonals.

Show that for this polygon, $n^2 - 3n - 130 = 0$.

(c) Hence find the number of sides in this polygon.

