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2500/405

NATIONAL QUALIFICATIONS 2006

FRIDAY, 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.

SCOTTISH QUALIFICATIONS AUTHORITY

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{\left(b^2 - 4ac\right)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: Area $= \frac{1}{2}ab \sin C$

Standard deviation: $s = \sqrt{\dfrac{\sum(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\sum x^2 - (\sum x)^2/n}{n-1}}$, where n is the sample size.

KU	RE

1. Evaluate

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

2

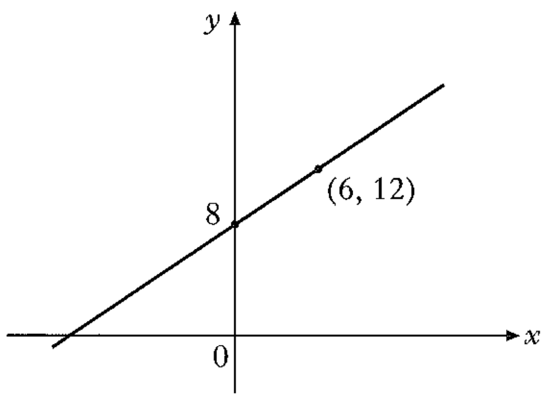
2. Evaluate

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

2

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

4.



Find the equation of the given straight line. 3

[Turn over

	KU	RE

5. (*a*) Factorise

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

1

(*b*) Hence simplify

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

2

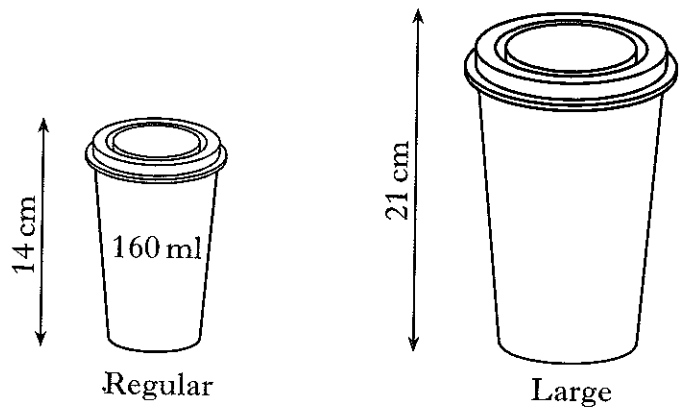
6. Solve the equation

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

3

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. 4

KU	RE

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

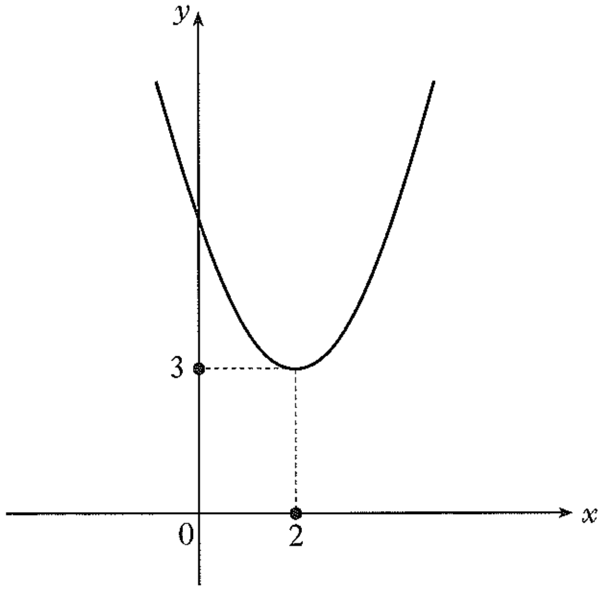


Figure 1

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.

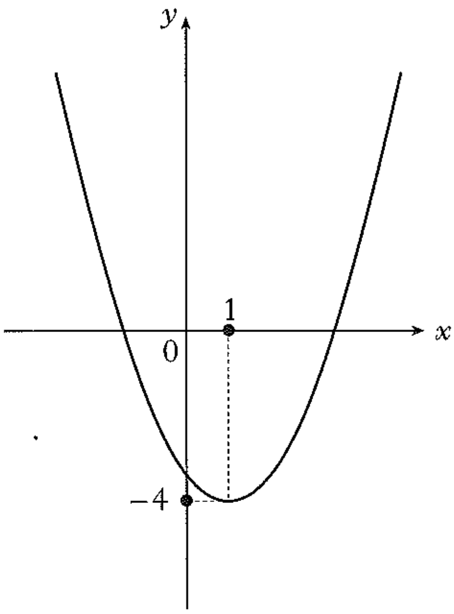


Figure 2

Write down the equation of the graph in Figure 2. **2**

[Turn over

	KU	RE

9. Euan plays in a snooker tournament which consists of 20 games.

He wins x games and loses y games.

(*a*) Write down an equation in x and y to illustrate this information. **1** (KU)

(*b*) He is paid £5 for each game he wins and £2 for each game he loses.

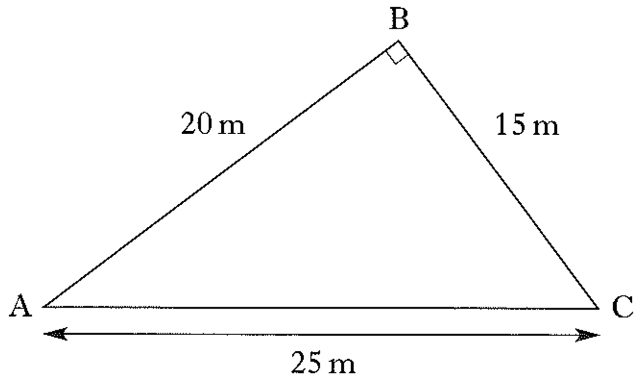
He is paid a **total** of £79.

Write down another equation in x and y to illustrate this information. **2** (RE)

(*c*) How many games did Euan **win**? **3** (RE)

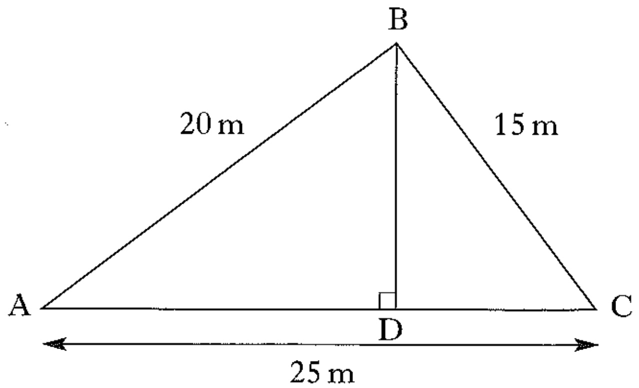
10. Triangle ABC is right-angled at B.

The dimensions are as shown.



(*a*) Calculate the area of triangle ABC. **1** (KU)

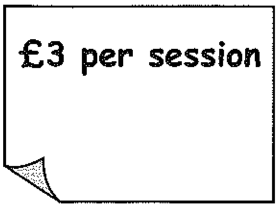
(*b*) BD, the height of triangle ABC, is drawn as shown.



Use your answer to part (*a*) to calculate the height BD. **3** (RE)

KU | RE

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



Write down an algebraic expression for the cost of x sessions. 1 (RE)

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

(i) Find the **total** cost of a monthly card and 15 sessions. 1 (KU)

(ii) Write down an algebraic expression for the **total** cost of a monthly card and x **sessions**, where x is greater than 6. 2 (RE)

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

Show all working. 3 (RE)

[*END OF QUESTION PAPER*]

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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.

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4 Square-ruled paper is provided.

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FORMULAE LIST

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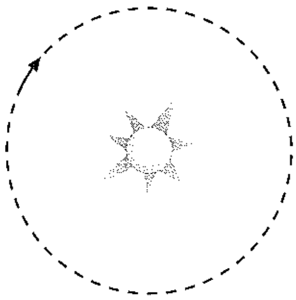
	KU	RE

1. The orbit of a planet around a star is circular.



The radius of the orbit is $4 \cdot 96 \times 10^7$ kilometres.

Calculate the circumference of the orbit.

Give your answer **in scientific notation**. — KU 3

2. (*a*) The pulse rates, in beats per minute, of 6 adults in a hospital waiting area are:

68 73 86 72 82 78.

Calculate the mean and standard deviation of this data. — KU 3

(*b*) 6 children in the same waiting area have a mean pulse rate of 89·6 beats per minute and a standard deviation of 5·4.

Make **two** valid comparisons between the children's pulse rates and those of the adults. — RE 2

3. Harry bids successfully for a painting at an auction.

An "auction tax" of 8% is added to his bid price.

He pays £324 in total.

Calculate his bid price. — KU 3

[Turn over

	KU	RE

4. (*a*) Expand and simplify

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

1

(*b*) Expand

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

2

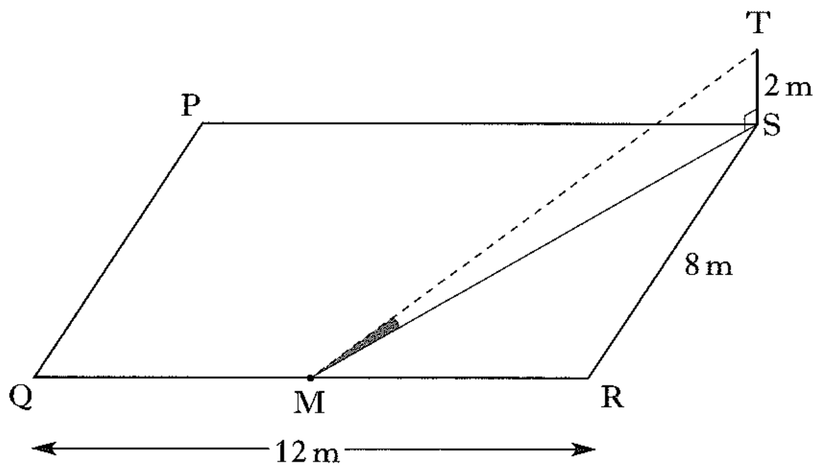
(*c*) Simplify, leaving your answer as a surd

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

2

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.

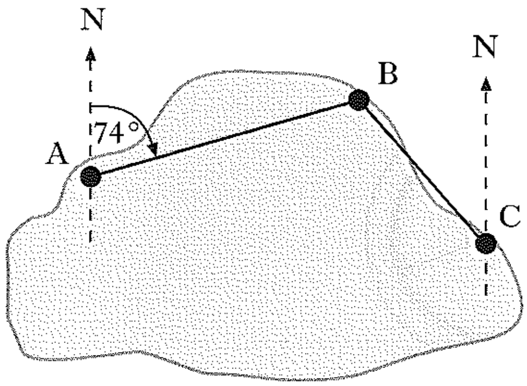
The shadow reaches M, the midpoint of QR.

Calculate the size of the shaded angle TMS.

4

KU | RE

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°.

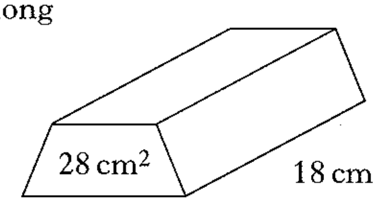
Calculate the size of angle ABC. **2** (RE)

(*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**. **4** (RE)

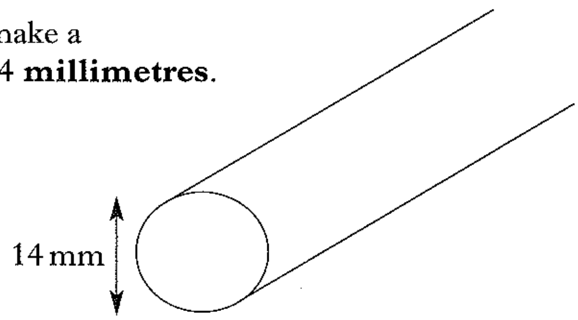
7. (*a*) A block of copper 18 centimetres long is prism shaped as shown.



The area of its cross section is 28 square centimetres.

Find the volume of the block. **1** (KU)

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



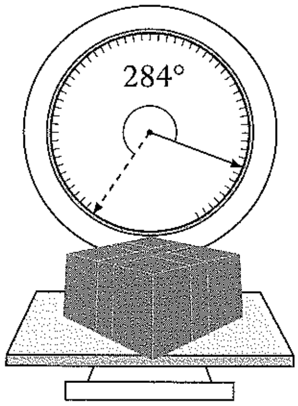
Calculate the length of the cable. **4** (RE)

KU	RE

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. **4** (RE)

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

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

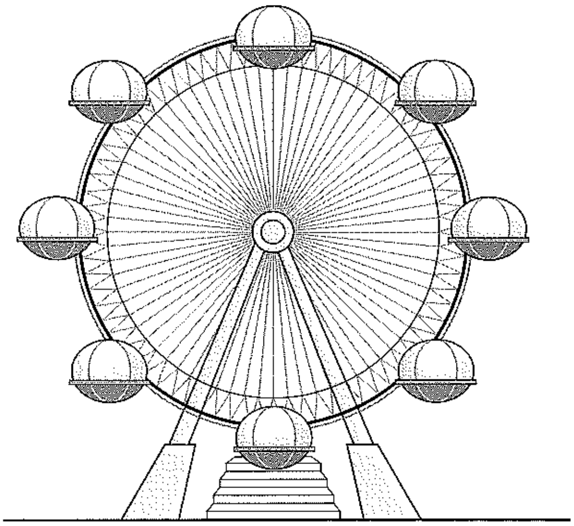
(*a*) How many diagonals does a polygon of 7 sides have? **2** (KU)

(*b*) A polygon has 65 diagonals.

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

(*c*) Hence find the number of sides in this polygon. **3** (RE)

	KU	RE
10. Emma goes on the "Big Eye".		



Her height, h metres, above the ground is given by the formula

$$h = -31 \cos t° + 33$$

where t is the number of seconds after the start.

	KU	RE
(*a*) Calculate Emma's height above the ground 20 seconds after the start.	2	
(*b*) When will Emma first reach a height of 60 metres above the ground?		3
(*c*) When will she next be at a height of 60 metres above the ground?		1

[Turn over for Question 11 on *Page eight*

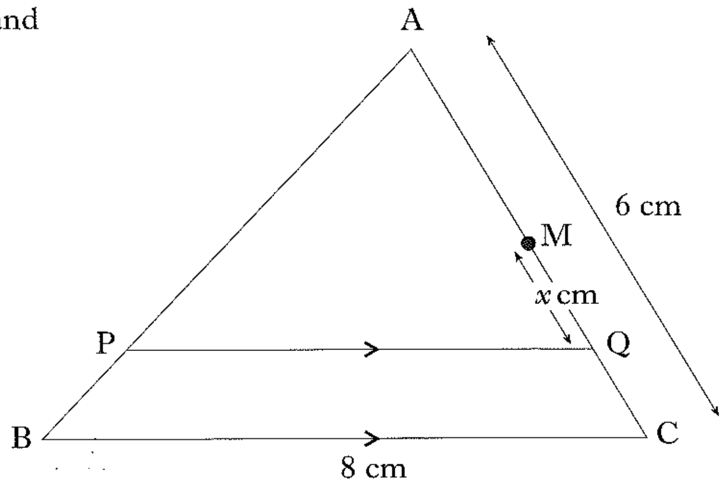
KU	RE

11. In triangle ABC,

BC = 8 centimetres,

AC = 6 centimetres and

PQ is parallel to BC.



M is the midpoint of AC.

Q lies on AC, x centimetres from M, as shown on the diagram.

(*a*) Write down an expression for the length of AQ. **1**

(*b*) Show that PQ = $(4 + \frac{4}{3}x)$ centimetres. **3**

[*END OF QUESTION PAPER*]