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2500/405

NATIONAL QUALIFICATIONS 2011

WEDNESDAY, 4 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. If you make use of this, you should write your name on it clearly and put it inside your answer booklet.

FORMULAE LIST

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

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.

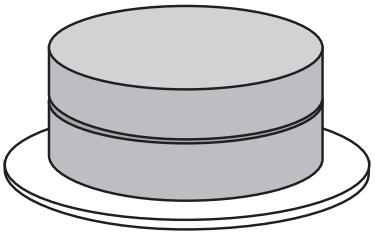
	KU	RE
1. Evaluate $2{\cdot}4 + 5{\cdot}46 \div 60$.	**2**	
2. Factorise fully $2m^2 - 18$.	**2**	
3. Given that $f(x) = 5 - x^2$, evaluate $f(-3)$.	**2**	
4. Solve the equation $3x + 1 = \frac{x-5}{2}$.	**3**	

[Turn over

KU	RE

5. Jamie is going to bake cakes for a party.

He needs $\frac{2}{5}$ of a block of butter for 1 cake.



He has 7 blocks of butter.

How many cakes can Jamie bake?

3

6. A driving examiner looks at her diary for the next 30 days.

She writes down the number of driving tests booked for each day as shown below.

Number of tests booked	0	1	2	3	4	5	6
Frequency	1	1	3	2	9	10	4

(*a*) Find the median for this data. **2**

(*b*) Find the probability that **more than** 4 tests are booked for one day. **1**

	KU	RE

7. (*a*) Brian, Molly and their four children visit Waterworld.

The total cost of their tickets is £56.

Let a pounds be the cost of an adult's ticket and c pounds the cost of a child's ticket.

Write down an equation in terms of a and c to illustrate this information. **1**

(*b*) Sarah and her three children visit Waterworld.

The total cost of their tickets is £36.

Write down another equation in terms of a and c to illustrate this information. **1**

(*c*) (i) Calculate the cost of a child's ticket. **2**

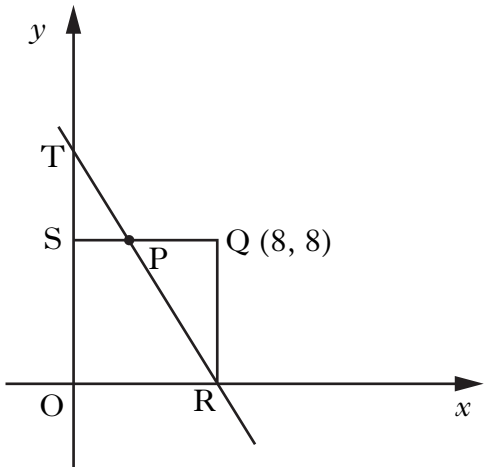
(ii) Calculate the cost of an adult's ticket. **1**

[Turn over

	KU	RE

8. A square, OSQR, is shown below.

Q is the point (8, 8).



The straight line TR cuts the y-axis at T (0, 12) and the x-axis at R.

(*a*) Find the equation of the line TR. **3**

The line TR also cuts SQ at P.

(*b*) Find the coordinates of P. **4**

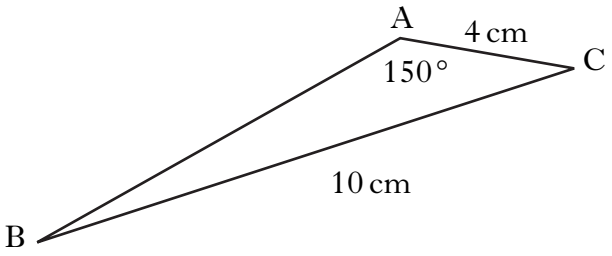
9. (*a*) Simplify $2a \times a^{-4}$. **1**

(*b*) Solve for x, $\sqrt{x} + \sqrt{18} = 4\sqrt{2}$. **3**

	KU	RE

10. In triangle ABC

- AC = 4 centimetres
- BC = 10 centimetres
- angle BAC = 150°



Given that $\sin 30° = \frac{1}{2}$, show that $\sin B = \frac{1}{5}$. **4**

11. F varies directly as s and inversely as the square of d.

(*a*) Write down a relationship connecting F, s and d. **1**

(*b*) What is the effect on F when s is halved and d is doubled? **3**

12. The sums, S_2, S_3 and S_4 of the first 2, 3 and 4 natural numbers are given by:

$$S_2 = 1 + 2 \qquad = \frac{1}{2}(2 \times 3) = 3$$

$$S_3 = 1 + 2 + 3 \qquad = \frac{1}{2}(3 \times 4) = 6$$

$$S_4 = 1 + 2 + 3 + 4 \quad = \frac{1}{2}(4 \times 5) = 10$$

(*a*) Find S_{10}, the sum of the first 10 natural numbers. **1**

(*b*) Write down the formula for the sum, S_n, of the first n natural numbers. **1**

[*END OF QUESTION PAPER*]

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NATIONAL QUALIFICATIONS 2011

WEDNESDAY, 4 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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FORMULAE LIST

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

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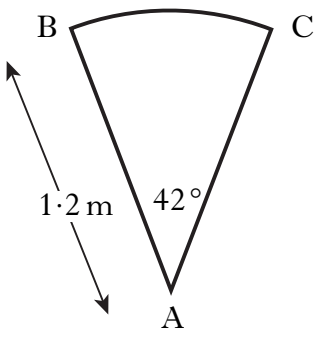
	KU	RE
1. Olga normally runs a total distance of 28 miles per week. She decides to increase her distance by 10% a week for the next four weeks. How many miles will she run in the fourth week?	**3**	
2. Expand and simplify $(3x + 1)(x^2 - 5x + 4)$.	**3**	
3. Solve the equation $2x^2 + 3x - 7 = 0$. Give your answers **correct to 2 significant figures**.	**4**	
4. A car is valued at £3780. This is 16% less than last year's value. What was the value of the car last year?	**3**	

[Turn over

KU	RE

5. A spiral staircase is being designed.



Each step is made from a sector of a circle as shown.

The radius is 1·2 metres.

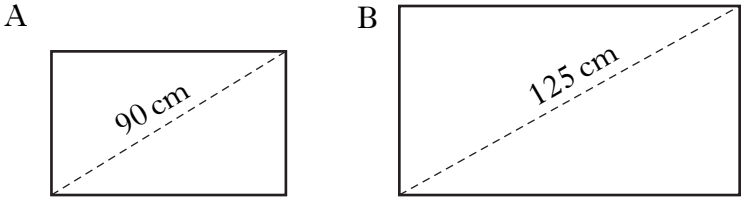
Angle BAC is 42°.

For the staircase to pass safety regulations, the arc BC must be at least 0·9 metres.

Will the staircase pass safety regulations? **4**

6. Two rectangular solar panels, A and B, are mathematically similar.

Panel A has a diagonal of 90 centimetres and an area of 4020 square centimetres.



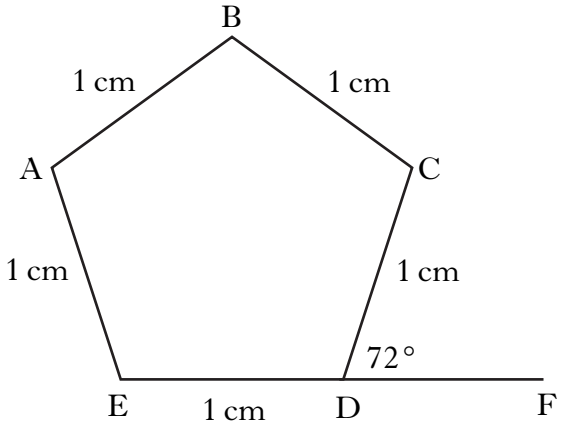
A salesman claims that panel B, with a diagonal of 125 centimetres, will be double the area of panel A.

Is this claim justified?

Show all your working. **4**

	KU	RE

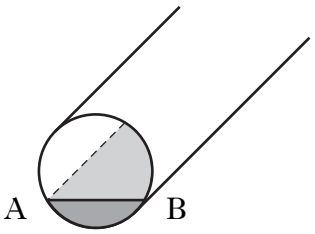
7. ABCDE is a regular pentagon with each side 1 centimetre.
Angle CDF is 72°.
EDF is a straight line.

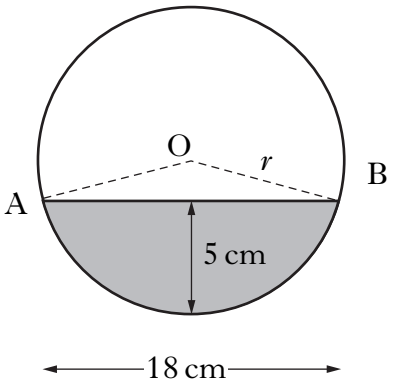


(*a*) Write down the size of angle ABC. **1**

(*b*) Calculate the length of AC. **3**

8. A pipe has water in it as shown.





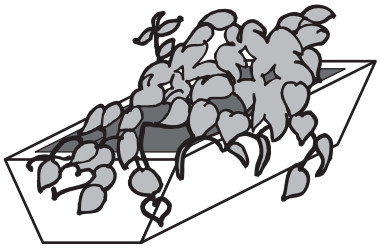
The depth of the water is 5 centimetres.
The width of the water surface, AB, is 18 centimetres.
Calculate *r*, the radius of the pipe. **3**

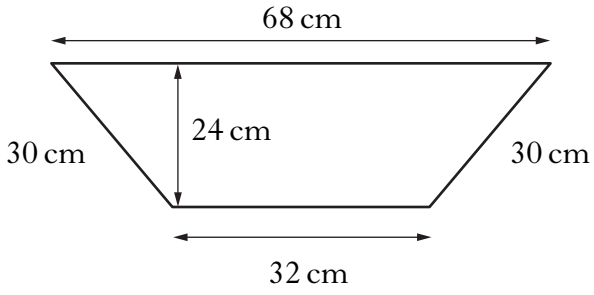
[Turn over

	KU	RE

9. A flower planter is in the shape of a prism.

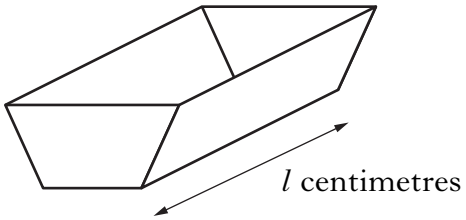
The cross-section is a trapezium with dimensions as shown.





(*a*) Calculate the area of the cross-section of the planter. **2**

(*b*) The volume of the planter is 156 litres.



Calculate the length, l centimetres, of the planter. **3**

10. Tom and Samia are paid the same hourly rate.

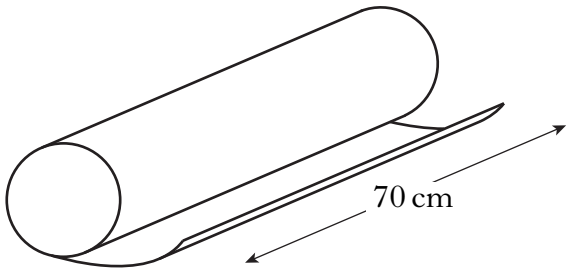
Harry is paid $\frac{1}{3}$ more per hour than Tom.

Tom worked 15 hours, Samia worked 8 hours and Harry worked 12 hours.
They were paid a total of £429.

How much was Tom paid? **3**

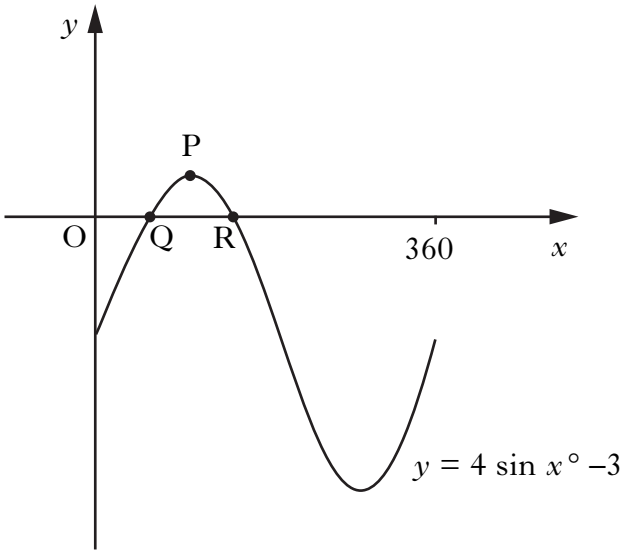
KU	RE

11. Paper is wrapped round a cardboard cylinder **exactly** 3 times.
The cylinder is 70 centimetres long.



The area of the paper is 3000 square centimetres.
Calculate the diameter of the cylinder. **4**

12. Part of the graph of $y = 4 \sin x° - 3$ is shown below.



The graph cuts the x-axis at Q and R.
P is the maximum turning point.

(*a*) Write down the coordinates of P. **1**

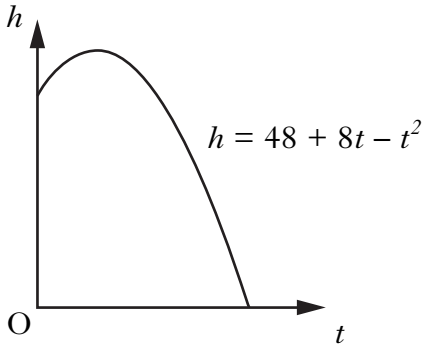
(*b*) Calculate the x-coordinates of Q and R. **4**

[Turn over for Question 13 on *Page eight*

KU	RE

13. The diagram shows the path of a flare after it is fired.

The height, h metres above sea level, of the flare is given by $h = 48 + 8t - t^2$ where t is the number of seconds after firing.



Calculate, **algebraically**, the time taken for the flare to enter the sea. **4**

[*END OF QUESTION PAPER*]