C

2500/31/02

NATIONAL QUALIFICATIONS 2012

WEDNESDAY, 2 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. 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 $x = \dfrac{-b \pm \sqrt{\left(b^2 - 4ac\right)}}{2a}$

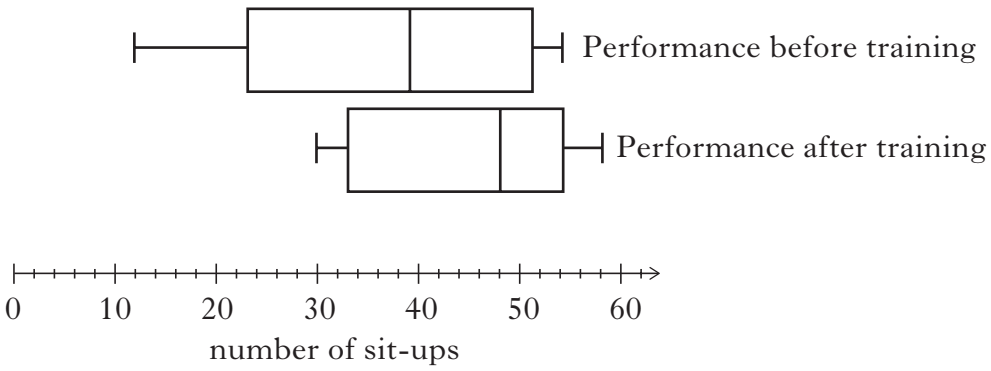
Sine rule: $\dfrac{a}{\sin\ \mathrm{A}} = \dfrac{b}{\sin\ \mathrm{B}} = \dfrac{c}{\sin\ \mathrm{C}}$

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

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

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. There are 2·69 million vehicles in Scotland. It is estimated that this number will increase at a rate of 4% each year. If this estimate is correct, how many vehicles will there be in 3 years' time? Give your answer **correct to 3 significant figures**.	**4**	
2. Before training, athletes were tested on how many sit-ups they could do in one minute. The following information was obtained: lower quartile (Q_1) 23; median (Q_2) 39; upper quartile (Q_3) 51		
(*a*) Calculate the semi-interquartile range.	**1**	
After training, the athletes were tested again. **Both** sets of data are displayed as boxplots.		



(*b*) Make **two** valid statements to compare the performances before and after training.		**2**

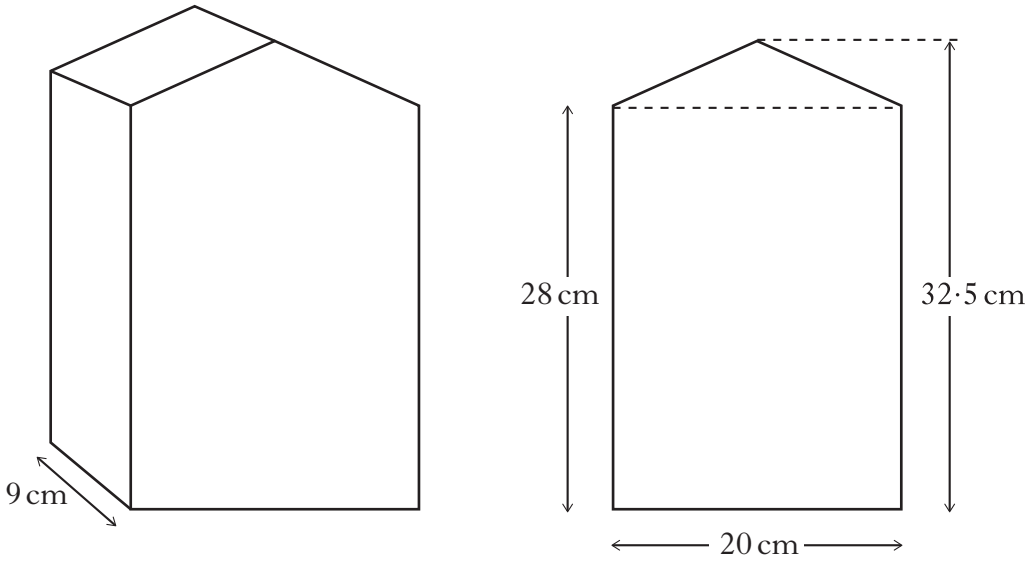
[Turn over

	KU	RE

3. A container for oil is in the shape of a prism.

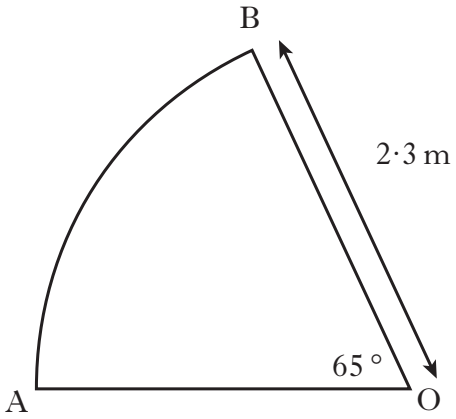
The width of the container is 9 centimetres.

The uniform cross section of the container consists of a rectangle and a triangle with dimensions as shown.



Calculate the volume of the container, **correct to the nearest litre.** | **4** |

4. A sector of a circle, centre O, is shown below.



The radius of the circle is 2·3 metres.

Angle AOB is 65 °.

Find the length of the arc AB. | **3** |

	KU	RE

5. The depth, d, of water in a tank, varies directly as the volume, v, of water in the tank and inversely as the square of the radius, r, of the tank.

When the volume of water is 60 000 cm^3, the depth of water is 50 cm and the radius of the tank is 20 cm.

Calculate the depth of the water, when the volume of water is 75 000 cm^3 and the radius of the tank is 25 cm. | **4** |

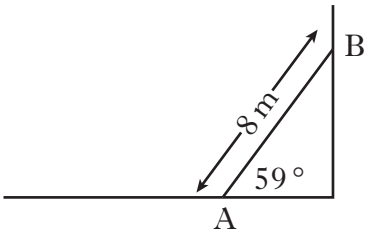
6. The price for Paul's summer holiday is £894·40.

The price includes a 4% booking fee.

What is the price of his holiday without the booking fee? | **3** |

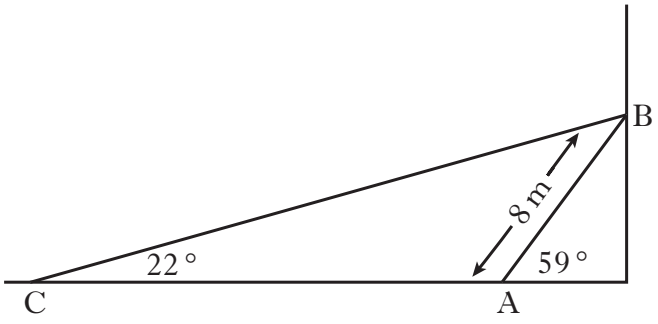
7. A heavy metal beam, AB, rests against a vertical wall as shown.

The length of the beam is 8 metres and it makes an angle of 59 ° with the ground.



A cable, CB, is fixed to the ground at C and is attached to the top of the beam at B.

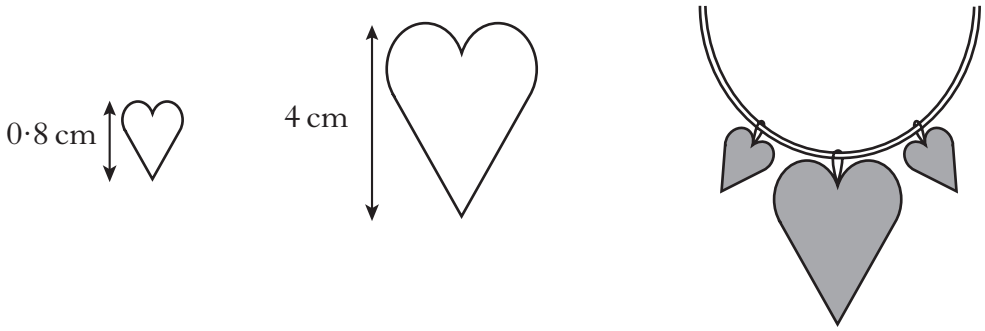
The cable makes an angle of 22 ° with the ground.



Calculate the length of cable CB. | | **4** |

	KU	RE

8. A necklace is made of beads which are mathematically similar.

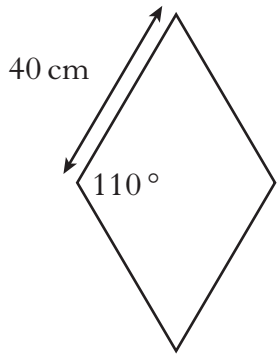


The height of the smaller bead is 0·8 centimetres and its area is 0·6 square centimetres.

The height of the larger bead is 4 centimetres.

Find the area of the larger bead. **3**

9. Paving stones are in the shape of a rhombus.



The side of each rhombus is 40 centimetres long.

The obtuse angle is 110 °.

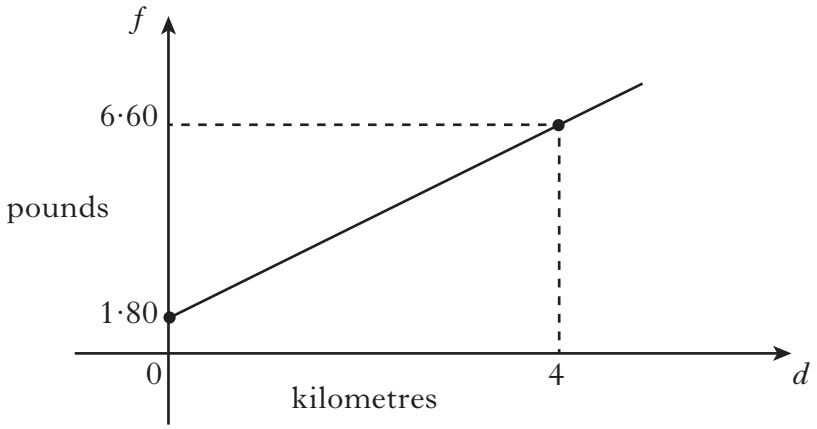
Find the area of one paving stone. **4**

	KU	RE

10. A taxi fare consists of a call-out charge of £1·80 **plus** a fixed cost per kilometre.

A journey of 4 kilometres costs £6·60.

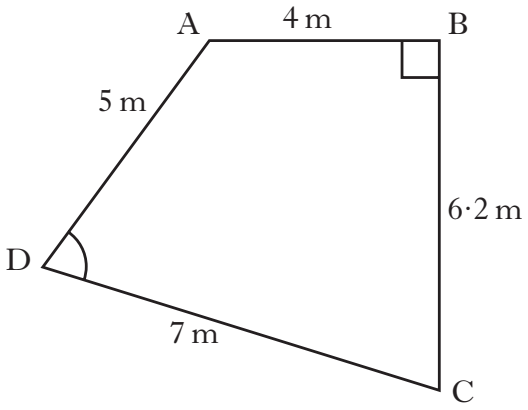
The straight line graph shows the fare, f pounds, for a journey of d kilometres.



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

(*b*) Calculate the fare for a journey of 7 kilometres. **2**

11. Quadrilateral ABCD with angle ABC = 90 ° is shown below.



- AB = 4 metres
- BC = 6·2 metres
- CD = 7 metres
- AD = 5 metres

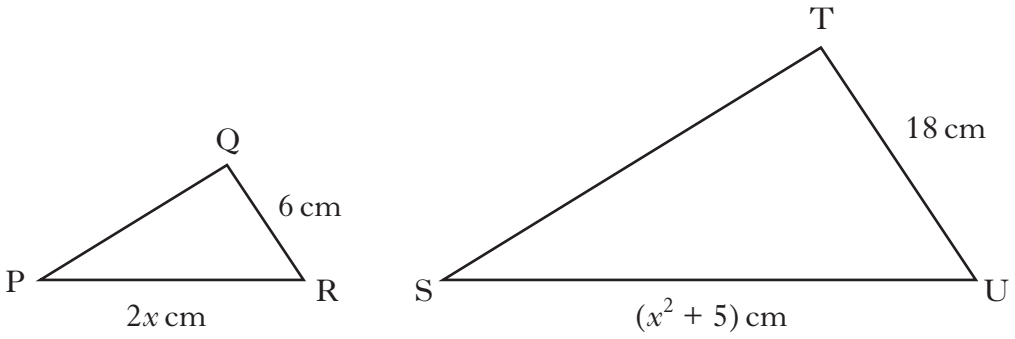
(*a*) Calculate the length of AC. **2**

(*b*) Calculate the size of angle ADC. **4**

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

	KU	RE
12. $f(x) = 3 \sin x°, \quad 0 \leq x < 360$		
(*a*) Find $f(270)$.	**1**	
(*b*) $f(t) = 0{\cdot}6$. Find the two possible values of t.		**4**

13. Triangles PQR and STU are mathematically similar.
The scale factor is 3 and PR corresponds to SU.



(*a*) Show that $x^2 - 6x + 5 = 0$. **2**

(*b*) Given QR is the shortest side of triangle PQR, find the value of x. **3**

[*END OF QUESTION PAPER*]