C

2500/405

NATIONAL QUALIFICATIONS 2007

THURSDAY, 3 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.

LI 2500/405 6/31570

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.

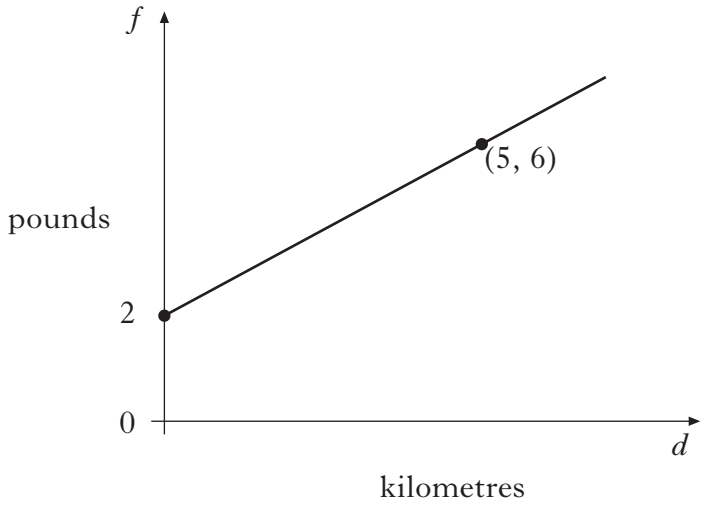
	KU	RE
1. Evaluate $6{\cdot}04 + 3{\cdot}72 \times 20$.	**2**	
2. Evaluate $3\frac{1}{6} \div 1\frac{2}{3}$.	**2**	
3. There are 400 people in a studio audience. The probability that a person chosen at random from this audience is male is $\frac{5}{8}$. How many males are in this audience?		**2**
4. $P = \dfrac{2(m-4)}{3}$ Change the subject of the formula to m.	**3**	
5. Remove brackets and simplify $(2x + 3)^2 - 3(x^2 - 6)$.	**3**	

[Turn over

	KU	RE

6. A taxi fare consists of a £2 "call-out" charge **plus** a fixed amount per kilometre.

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



The taxi fare for a 5 kilometre journey is £6.

Find the equation of the straight line in terms of d and f. **4**

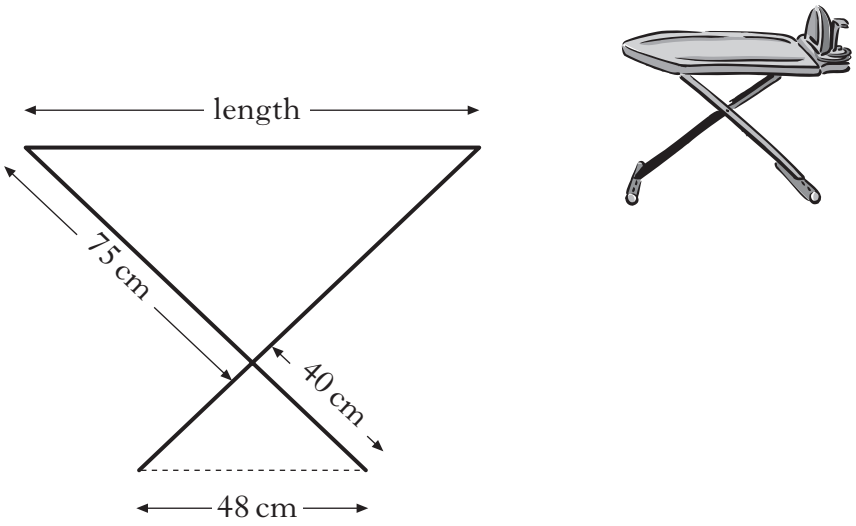
7. Remove brackets and simplify

$$a^{\frac{1}{2}}(a^{\frac{1}{2}} - 2).$$ **2**

KU	RE

8. Mick needs an ironing board.

He sees one in a catalogue with measurements as shown in the diagram below.



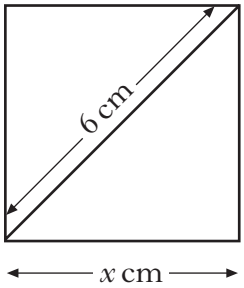
When the ironing board is set up, two similar triangles are formed.

Mick wants an ironing board which is at least 80 centimetres in length.

Does this ironing board meet Mick's requirements?

Show all your working. **3**

9. A square of side x centimetres has a diagonal 6 centimetres long.



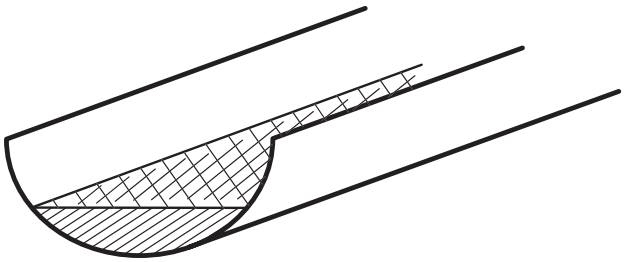
Calculate the value of x, giving your answer as a surd in its simplest form. **3**

[Turn over

	KU	RE
10. A relationship between T and L is given by the formula, $T = \frac{k}{L^3}$ where k is a constant.		
When L is doubled, what is the effect on T?		**2**
11. (*a*) A cinema has 300 seats which are either standard or deluxe.		
Let x be the number of standard seats and y be the number of deluxe seats.		
Write down an algebraic expression to illustrate this information.	**1**	
(*b*) A standard seat costs £4 and a deluxe seat costs £6.		
When all the seats are sold the ticket sales are £1380.		
Write down an algebraic expression to illustrate this information.	**2**	
(*c*) How many standard seats and how many deluxe seats are in the cinema?		**3**

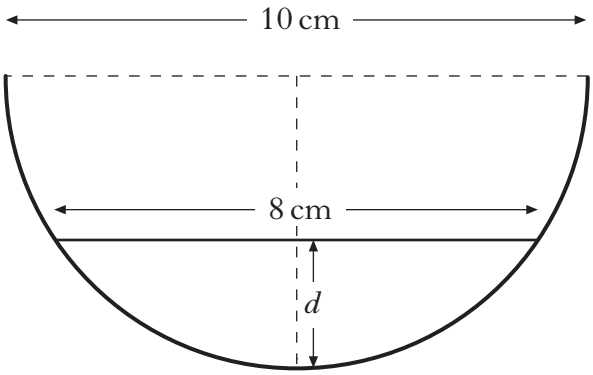
KU	RE

12. The diagram shows water lying in a length of roof guttering.



The cross-section of the guttering is a semi-circle with diameter 10 centimetres.

The water surface is 8 centimetres wide.

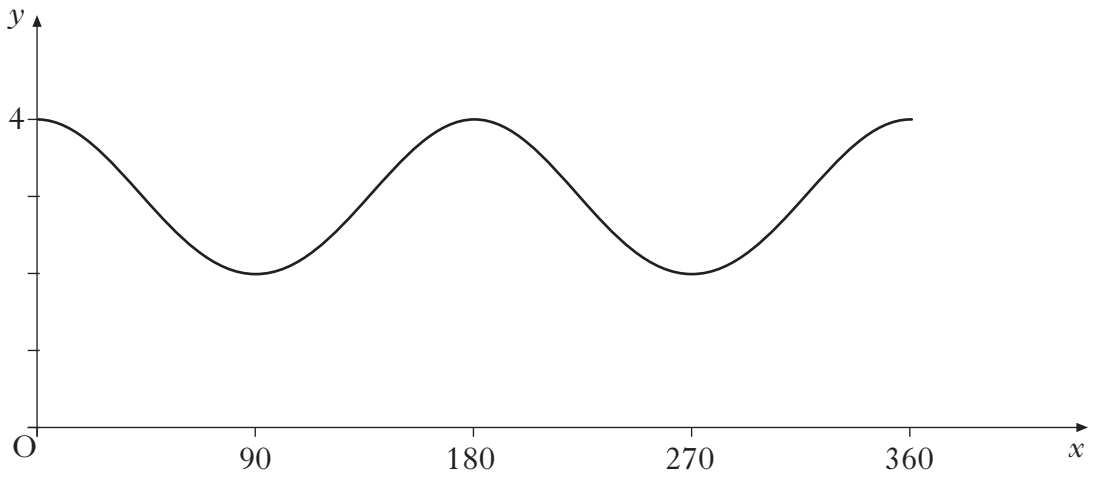


Calculate the depth, d, of water in the guttering. **4**

[Turn over for Questions 13 and 14 on *Page eight*

	KU	RE

13. Part of the graph of $y = \cos bx^\circ + c$ is shown below.



Write down the values of b and c. **2**

14. The **sum** S_n of the first n terms of a sequence, is given by the formula

$$S_n = 3^n - 1.$$

(*a*) Find the **sum** of the first 2 terms. **1**

(*b*) When $S_n = 80$, calculate the value of n. **2**

[*END OF QUESTION PAPER*]

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2500/406

NATIONAL QUALIFICATIONS 2007

THURSDAY, 3 MAY
2.45 PM – 4.05 PM

MATHEMATICS
STANDARD GRADE
Credit Level
Paper 2

1 **You may use a calculator**.

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LI 2500/406 6/31570

SCOTTISH QUALIFICATIONS AUTHORITY

FORMULAE LIST

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

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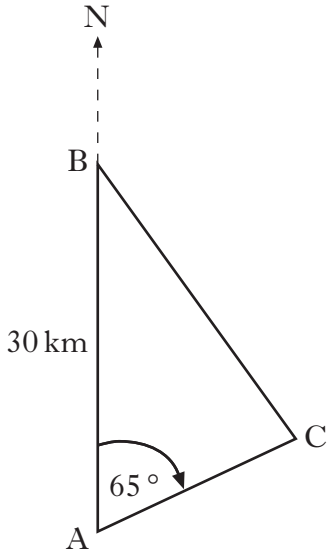
Standard deviation: $s = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\dfrac{\sum x^2 - (\sum x)^2 / n}{n - 1}}$, where n is the sample size.

	KU	RE
1. Alistair buys an antique chair for £600. It is expected to increase in value at the rate of 4·5% each year. How much is it expected to be worth in 3 years?	**3**	
2. Solve the equation $3x^2 - 2x - 10 = 0.$ Give your answer **correct to 2 significant figures**.	**4**	
3. (*a*) During his lunch hour, Luke records the number of birds that visit his bird-table. The numbers recorded last week were: 28 32 14 19 18 26 31. Find the mean and standard deviation for this data.	**4**	
(*b*) Over the same period, Luke's friend, Erin also recorded the number of birds visiting her bird-table. Erin's recordings have a mean of 25 and a standard deviation of 5. Make **two** valid comparisons between the friends' recordings.		**2**
4. Solve the inequality $\frac{x}{4} - \frac{1}{2} < 5.$	**2**	

[Turn over

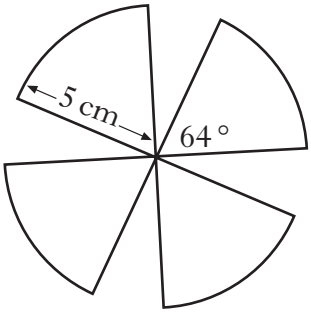
	KU	RE
5. Mark takes some friends out for a meal. The restaurant adds a 10% service charge to the price of the meal. The **total** bill is £148·50. What was the price of the meal?	**3**	
6. Brunton is 30 kilometres due North of Appleton. From Appleton, the bearing of Carlton is 065°. From Brunton, the bearing of Carlton is 153°.		



Calculate the distance between Brunton and Carlton. **4**

	KU	RE

7. A fan has four identical plastic blades.



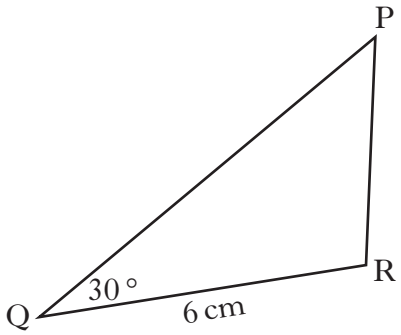
Each blade is a sector of a circle of radius 5 centimetres.

The angle at the centre of each sector is 64 °.

Calculate the **total** area of plastic required to make the blades. **3**

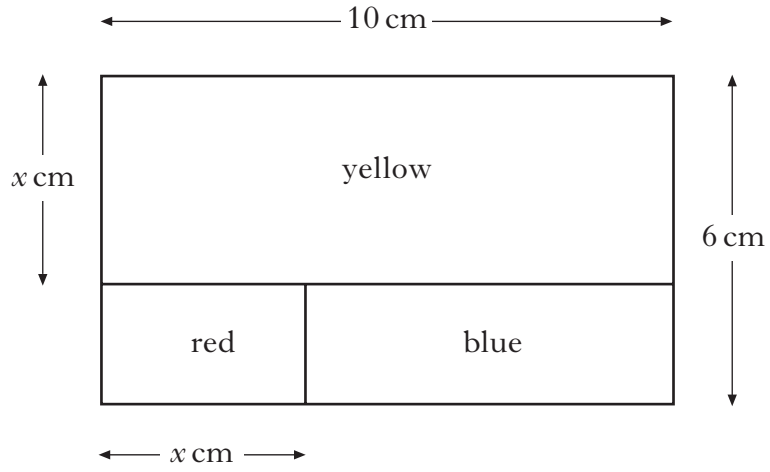
8. In triangle PQR:

- QR = 6 centimetres
- angle PQR = 30 °
- area of triangle PQR = 15 square centimetres.



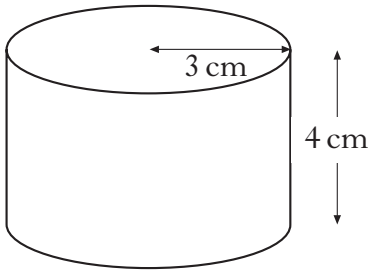
Calculate the length of PQ. **3**

[Turn over

	KU	RE
9. To make "14 carat" gold, copper and pure gold are mixed in the ratio 5:7. A jeweller has 160 grams of copper and 245 grams of pure gold. What is the maximum weight of "14 carat" gold that the jeweller can make?		**3**
10. Solve **algebraically** the equation $5 \cos x° + 4 = 0, \quad 0 \leq x < 360.$	**3**	
11. (*a*) A decorator's logo is rectangular and measures 10 centimetres by 6 centimetres. It consists of three rectangles: one red, one yellow and one blue.  The yellow rectangle measures 10 centimetres by x centimetres. The width of the red rectangle is x centimetres. Show that the area, A, of the blue rectangle is given by the expression $A = x^2 - 16x + 60.$		**2**
(*b*) The area of the blue rectangle is equal to $\frac{1}{5}$ of the total area of the logo. Calculate the value of x.		**4**

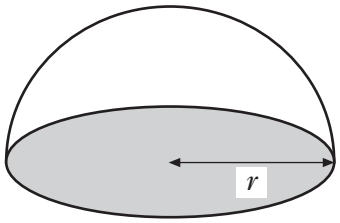
KU	RE

12. (*a*) A cylindrical paperweight of radius 3 centimetres and height 4 centimetres is filled with sand.



Calculate the volume of sand in the paperweight. **2**

(*b*) Another paperweight, in the shape of a hemisphere, is filled with sand.



It contains the same volume of sand as the first paperweight.

Calculate the radius of the hemisphere.

[The volume of a hemisphere with radius r is given by the formula, $V = \frac{2}{3}\pi r^3$]. **3**

[Turn over for Question 13 on *Page eight*

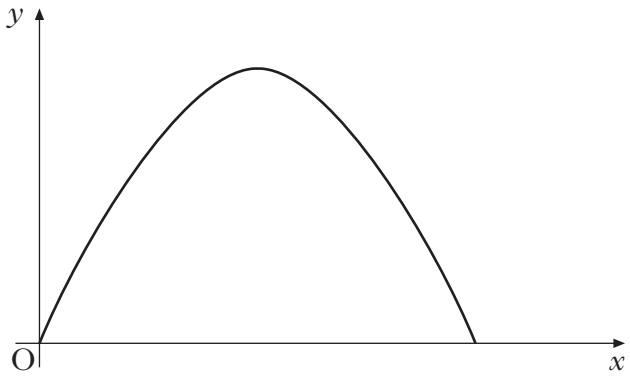
KU	RE

13. The profit made by a publishing company of a magazine is calculated by the formula

$$y = 4x(140 - x),$$

where y is the profit (in pounds) and x is the selling price (in pence) of the magazine.

The graph below represents the profit y against the selling price x.



Find the maximum profit the company can make from the sale of the magazine. **4**

[*END OF QUESTION PAPER*]