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2500/405

NATIONAL QUALIFICATIONS 2005

FRIDAY, 6 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.

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

$$3{\cdot}8 - (7{\cdot}36 \div 8).$$ 2

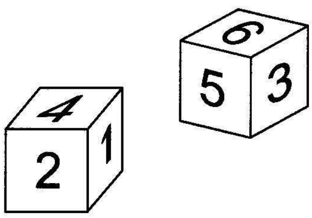
2. Evaluate

$$2\tfrac{1}{3} + \tfrac{5}{6} \text{ of } 1\tfrac{2}{5}.$$ 3

3. Evaluate

12·5% of £140. 2

4. Two identical dice are rolled simultaneously.



Find the probability that the total score on adding both numbers will be greater than 7 but less than 10. 2

[Turn over

KU	RE

5. In an experiment involving two variables, the following values for x and y were recorded.

x	0	1	2	3	4
y	6	4	2	0	–2

The results were plotted, and a straight line was drawn through the points.

Find the gradient of the line **and** write down its equation. 3

6. Solve the equation

$$\frac{2}{x}+1=6.$$

3

7. The speeds (measured to the nearest 10 kilometres per hour) of 200 vehicles are recorded as shown.

Speed (km/hr)	30	40	50	60	70	80	90	100	110
Frequency	1	4	9	14	38	47	51	32	4

Construct a cumulative frequency table and hence find the median for this data. 3

8. A number pattern is given below.

1st term: $2^2 - 0^2$
2nd term: $3^2 - 1^2$
3rd term: $4^2 - 2^2$

(*a*) Write down a similar expression for the 4^{th} term. 1

(*b*) Hence or otherwise find the n^{th} term in its simplest form. 3

KU	RE
2	
	3
	5

9. (*a*) Emma puts £30 worth of petrol into the empty fuel tank of her car.

Petrol costs 75 pence per litre.
Her car uses 5 litres of petrol per hour, when she drives at a particular constant speed.

At this constant speed, how many litres of petrol will remain in the car after 3 hours. **2**

(*b*) The next week, Emma puts £20 worth of petrol into the empty fuel tank of her car.

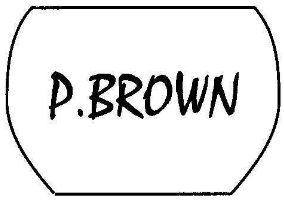
Petrol costs c pence per litre.
Her car uses k litres of petrol per hour, when she drives at another constant speed.

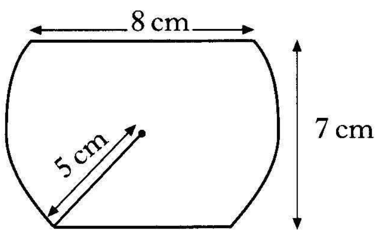
Find a formula for R, the amount of petrol remaining in the car after t hours. **3**

10. A badge is made from a circle of radius 5 centimetres.

Segments are taken off the top and the bottom of the circle as shown.

The straight edges are parallel.





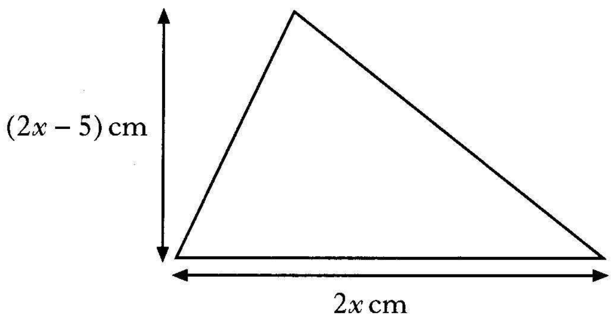
The badge measures 7 centimetres from the top to the bottom.
The top is 8 centimetres wide.

Calculate the width of the base. **5**

[Turn over

	KU	RE
11. $f(x) = 4\sqrt{x} + \sqrt{2}$		
(*a*) Find the value of $f(72)$ as a surd in its simplest form.	3	
(*b*) Find the value of t, given that $f(t) = 3\sqrt{2}$.		3

12. The height of a triangle is $(2x - 5)$ centimetres and the base is $2x$ centimetres.



The area of the triangle is 7 square centimetres.

Calculate the value of x. **5** (RE)

[*END OF QUESTION PAPER*]

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NATIONAL QUALIFICATIONS 2005

FRIDAY, 6 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.

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FORMULAE LIST

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KU	RE

1. $$E = mc^2.$$

Find the value of E when $m = 3{\cdot}6 \times 10^{-2}$ and $c = 3 \times 10^8$.

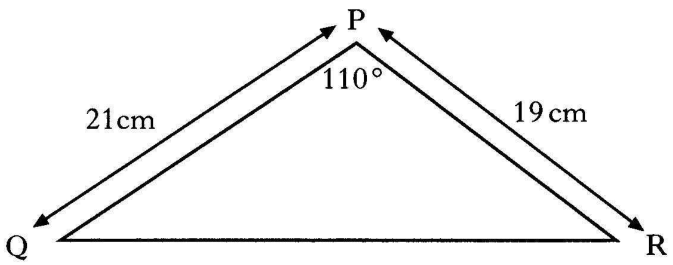
Give your answer **in scientific notation**. 3

2. The running times in minutes, of 6 television programmes are:

77 91 84 71 79 75.

Calculate the mean and standard deviation of these times. 4

3.



Calculate the area of triangle PQR. 4

4. Solve the equation

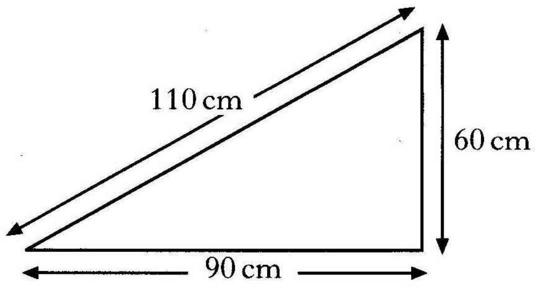
$$x^2 + 2x = 9.$$

Give your answers **correct to 1 decimal place**. 3

[Turn over

KU	RE

5. A triangular paving slab has measurements as shown.

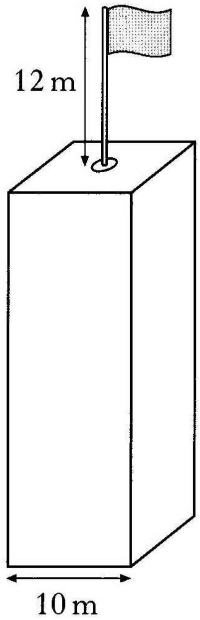


Is the slab in the shape of a right angled triangle?

Show your working. **3** (RE)

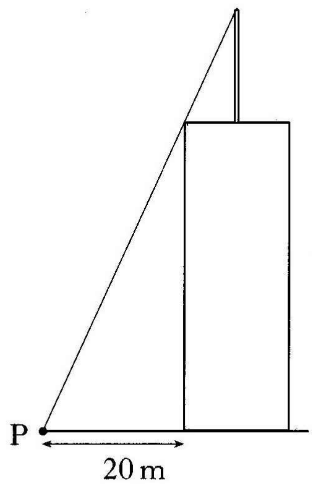
6. A vertical flagpole 12 metres high stands at the centre of the roof of a tower.

The tower is cuboid shaped with a square base of side 10 metres.



At a point P on the ground, 20 metres from the base of the tower, the top of the flagpole is just visible, as shown.

Calculate the height of the tower. **4** (RE)

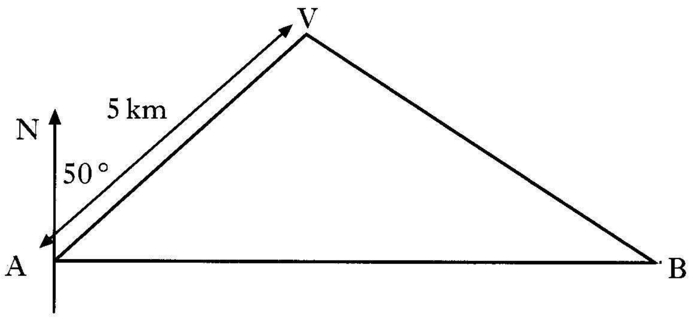


KU	RE

7. David walks on a bearing of 050° from hostel A to a viewpoint V, 5 kilometres away.

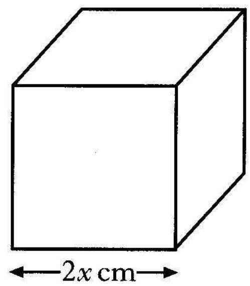
Hostel B is due east of hostel A.

Susie walks on a bearing of 294° from hostel B to the same viewpoint.



Calculate the length of AB, the distance between the two hostels. **5** (KU)

8. The side length of a cube is $2x$ centimetres.



The expression for the volume in cubic centimetres is equal to the expression for the surface area in square centimetres.

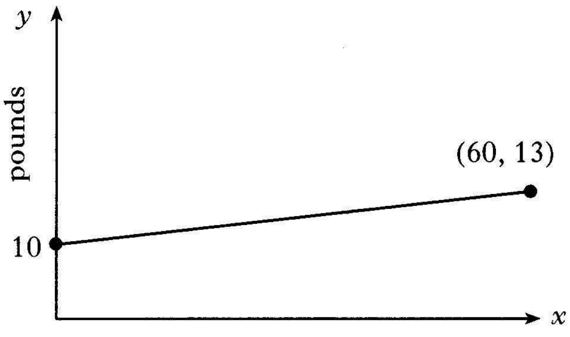
Calculate the side length of the cube. **5** (RE)

[Turn over

KU	RE

9. The monthly bill for a mobile phone is made up of a fixed rental plus call charges. Call charges vary as the time used.

The relationship between the monthly bill, y (pounds), and the time used, x (minutes) is represented in the graph below.

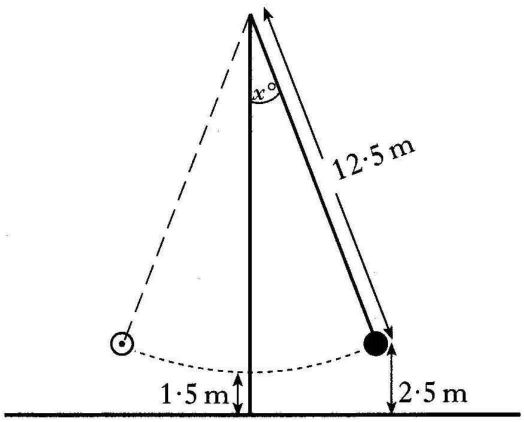


(*a*) Write down the fixed rental. 1

(*b*) Find the call charge per minute. 3

10. The chain of a demolition ball is 12·5 metres long.

When vertical, the end of the chain is 1·5 metres from the ground.



It swings to a maximum height of 2·5 metres above the ground on both sides.

(*a*) At this maximum height, show that the angle x°, which the chain makes with the vertical, is approximately 23°. 4

(*b*) Calculate the maximum length of the arc through which the end of the chain swings. Give your answer **to 3 significant figures**. 4

	KU	RE
11. (*a*) Solve algebraically the equation $\sqrt{3}\sin x° - 1 = 0 \qquad 0 \le x < 360.$	3	
(*b*) Hence write down the solution of the equation $\sqrt{3}\sin 2x° - 1 = 0 \qquad 0 \le x < 90.$		1

[*END OF QUESTION PAPER*]