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2500/31/02

NATIONAL QUALIFICATIONS 2013

FRIDAY, 3 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 inside your answer booklet.

Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.

FORMULAE LIST

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

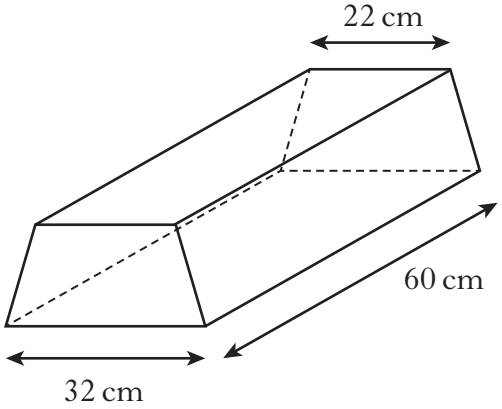
Sine rule: $\dfrac{a}{\sin\ \mathrm{A}} = \dfrac{b}{\sin\ \mathrm{B}} = \dfrac{c}{\sin\ \mathrm{C}}$

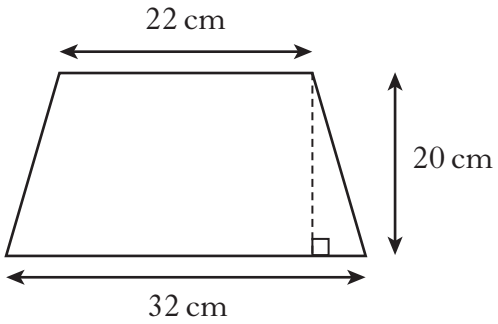
Cosine rule: $a^2 = b^2 + c^2 - 2bc\ \cos\ \mathrm{A}$ or $\cos\ \mathrm{A} = \dfrac{b^2 + c^2 - a^2}{2bc}$

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. A snail crawls 3 kilometres in 16 days. What is the average speed of the snail in metres per second? Give your answer **in scientific notation correct to 2 significant figures**.	**4**	
2. Solve the equation $2x^2 + 7x - 3 = 0.$ Give your answers **correct to 1 decimal place**.	**4**	
3. A concrete block is in the shape of a prism.		





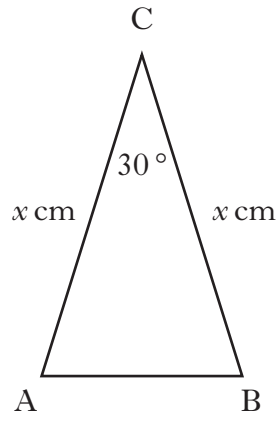
The cross section of the prism is a trapezium with dimensions as shown.

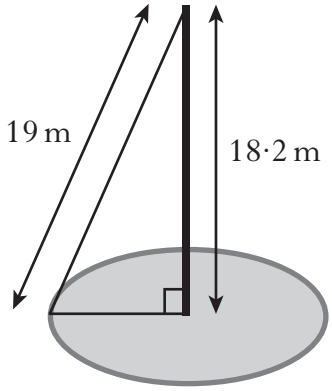
(*a*) Calculate the area of the cross section. **3**

(*b*) Calculate the volume of the concrete block. **1**

[Turn over

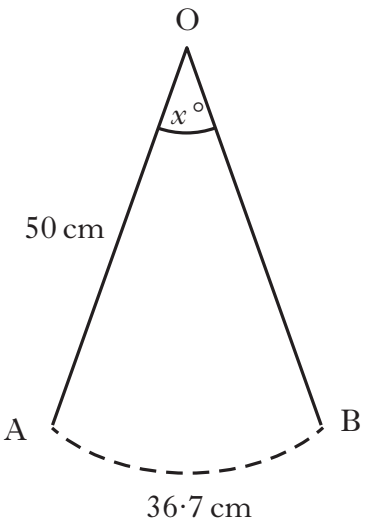
	KU	RE
4. Last year, 1296 learner drivers from "Topflight" school of motoring passed their driving test. This was 72% of those who sat their driving test from Topflight. How many **failed** their driving test?		**3**
5. ABC is an isosceles triangle with angle ACB = 30 °. AC = BC = x centimetres. The area of triangle ABC is 9 square centimetres. Calculate the value of x.		**3**
6. A mobile phone mast, 18·2 metres high, stands vertically in the centre of a circle. It is supported by a wire rope, 19 metres long, attached to the ground at a point on the circumference of the circle, as shown. Calculate the circumference of the circle.	**3**	

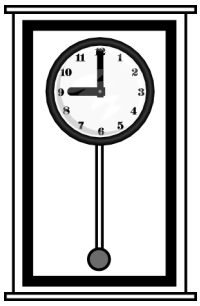




	KU	RE
7. Jack weighs 94 kilograms. On the 1st of January, he starts a diet which is designed to reduce his weight by 7% per month. During which month should he achieve his target weight of 73 kilograms? **Show all your working.**		**4**

8. As the pendulum of a clock swings, its tip moves through an arc of a circle.





The length of the pendulum is 50 centimetres.
The length of the arc is 36·7 centimetres.

Calculate $x°$, the angle through which the pendulum swings. **3**

[Turn over

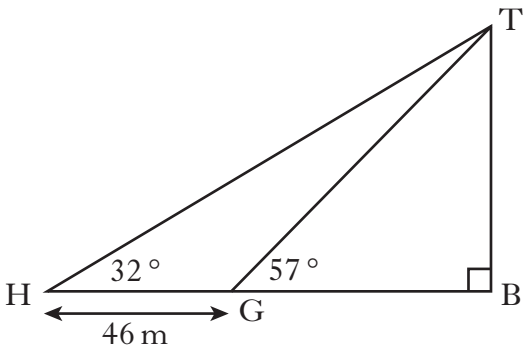
	KU	RE

9. In triangle THB:

- angle TBH = 90 °
- angle THB = 32 °.

G is a point on HB.

- angle TGB = 57 °
- GH = 46 metres.



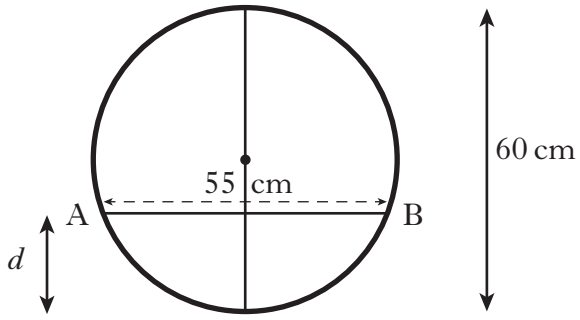
Calculate the length of TB. **4**

10. A function is given by the formula, $f(x) = 4 \times 2^x$.

(*a*) Evaluate $f(3)$. **2**

(*b*) Given that $f(m) = 4$, find the value of m. **2**

11. Water flows through a horizontal pipe of diameter 60 centimetres.
The surface width, AB, of the water is 55 centimetres.

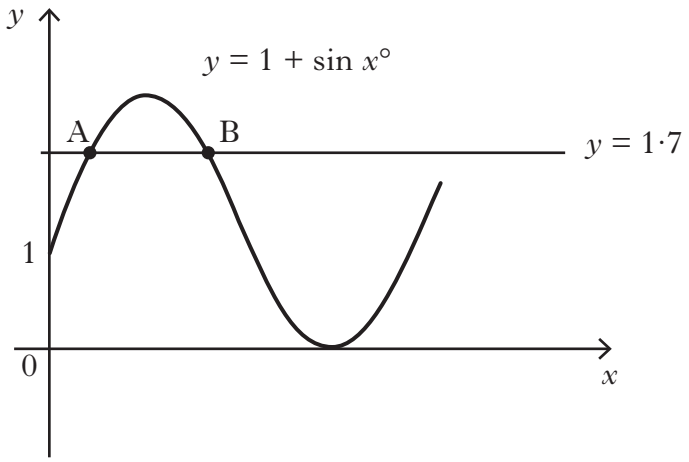


(*a*) Calculate the depth, d, of the water in the pipe. **4**

(*b*) What other depth of water would give the same surface width? **1**

KU	RE

12. Part of the graph of $y = 1 + \sin x°$ is shown in the diagram below.



The line $y = 1{\cdot}7$ is drawn. It cuts the graph of $y = 1 + \sin x°$ at A and B as shown.

Calculate the x-coordinates of A and B. **4**

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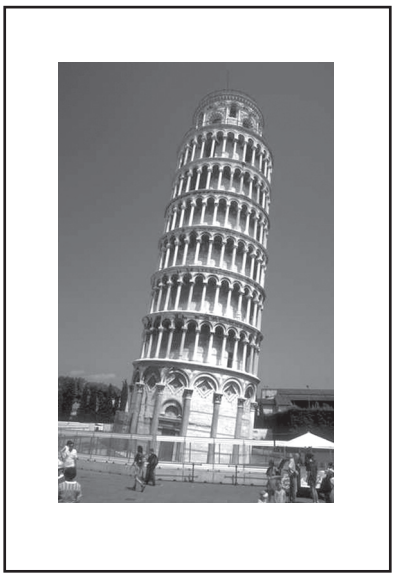
KU	RE

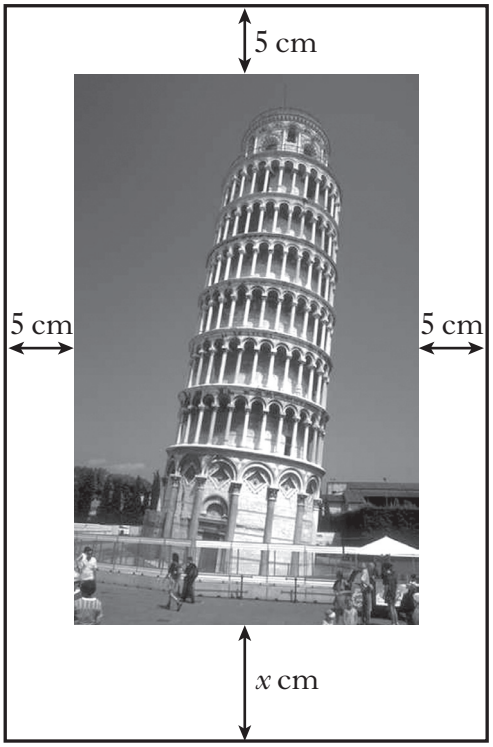
13. Asim has a poster which is 25 centimetres wide and 40 centimetres high.

He decides to place it on a white card.

The card and the poster are mathematically similar.



The border is 5 centimetres wide on three sides and x centimetres wide on the fourth side as shown.

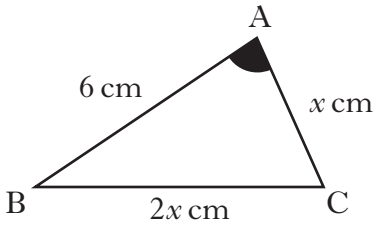


Calculate the value of x. **4**

KU	RE

14. In triangle ABC:

- cos A = 0·5
- AB = 6 centimetres
- BC = $2x$ centimetres
- AC = x centimetres.



Show that $x^2 + 2x - 12 = 0$. **3**

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