

2500/31/02

NATIONAL
QUALIFICATIONS
2013

FRIDAY, 3 MAY
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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 $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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

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

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

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

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

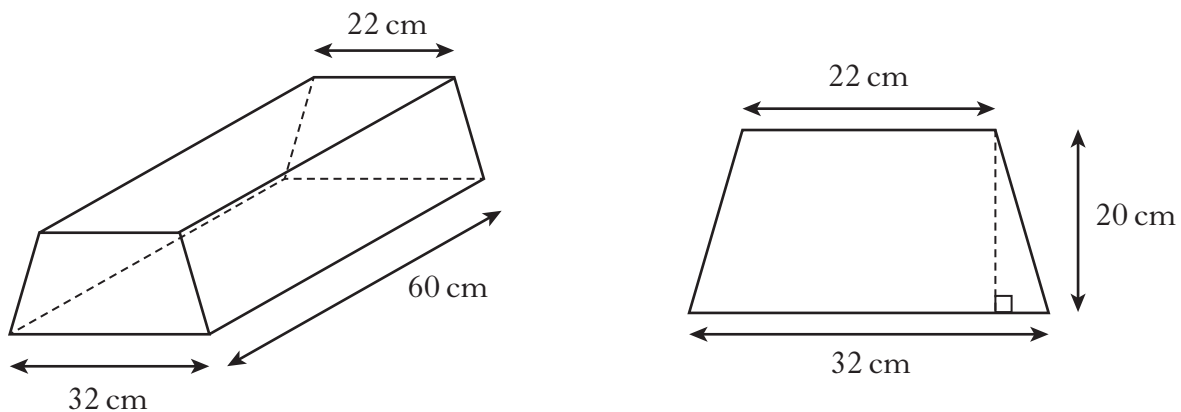
2. Solve the equation

$$2x^2 + 7x - 3 = 0.$$

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

3

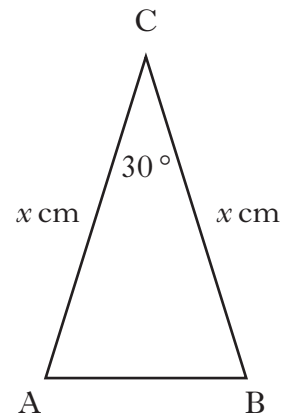
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4. Last year, 1296 learner drivers from “Topflight” school of motoring passed their driving test.
 This was 72% of those who sat their driving test from Topflight.
 How many **failed** their driving test?

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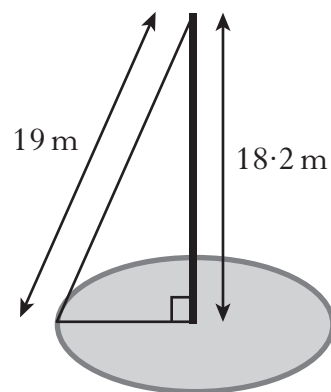
5. ABC is an isosceles triangle with angle $ACB = 30^\circ$.
 $AC = BC = x$ centimetres.



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.

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7. Jack weighs 94 kilograms.

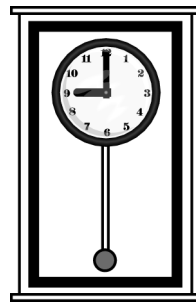
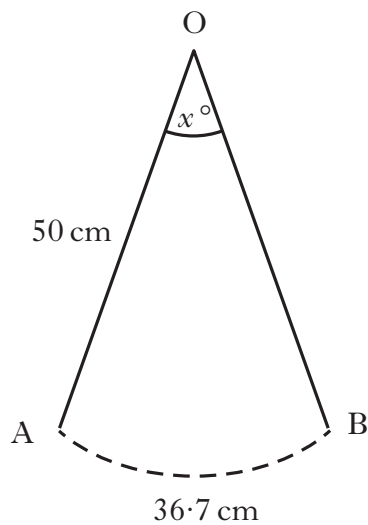
On the 1st of January, he starts a diet which is designed to reduce his weight by 7% per month.

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.

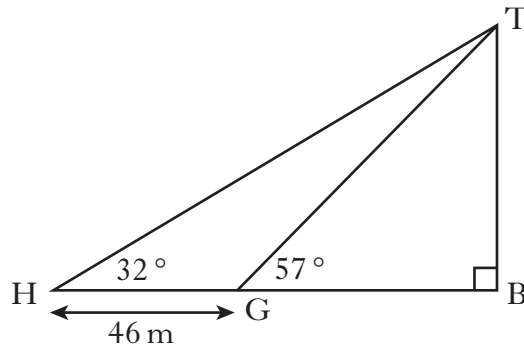
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9. In triangle THB:
- angle TBH = 90°
 - angle THB = 32° .

G is a point on HB.

- angle TGB = 57°
- GH = 46 metres.



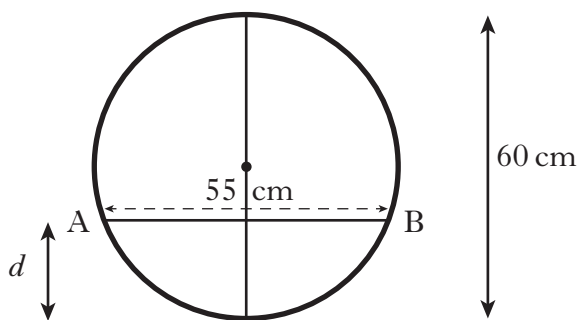
Calculate the length of TB.

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

(a) Evaluate $f(3)$.

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

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

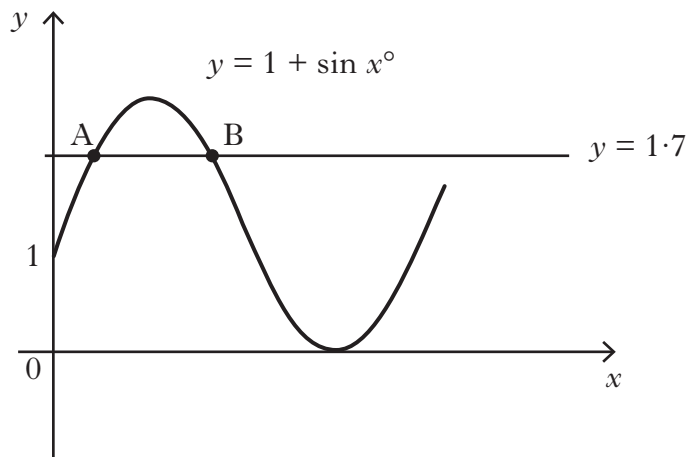


(a) Calculate the depth, d , of the water in the pipe.

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

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



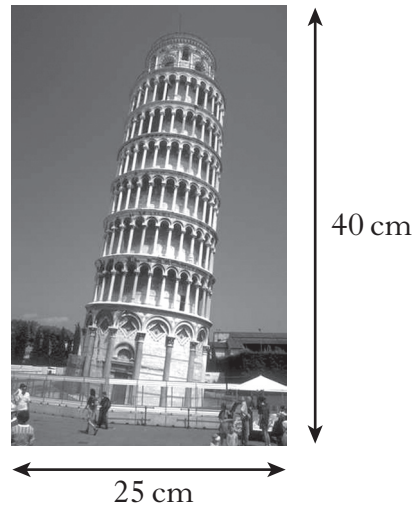
The line $y = 1.7$ is drawn. It cuts the graph of $y = 1 + \sin x^\circ$ at A and B as shown.

Calculate the x-coordinates of A and B.

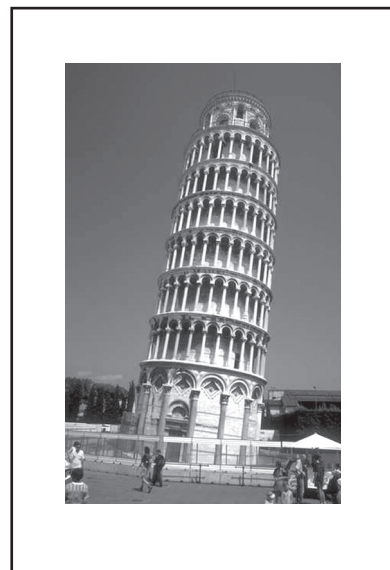
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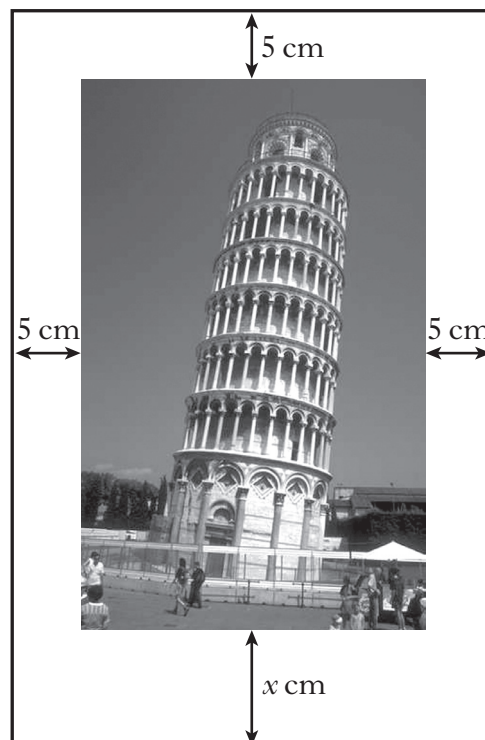
13. Asim has a poster which is 25 centimetres wide and 40 centimetres high.



He decides to place it on a white card.
The card and the poster are mathematically similar.



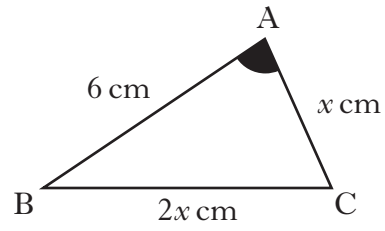
The border is 5 centimetres wide on three sides and x centimetres wide on the fourth side as shown.



Calculate the value of x .

14. In triangle ABC:

- $\cos A = 0.5$
- $AB = 6$ centimetres
- $BC = 2x$ centimetres
- $AC = x$ centimetres.



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

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