

2500/31/01

NATIONAL
QUALIFICATIONS
2013

FRIDAY, 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 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. Evaluate

$$86.5 - 3.651 \times 20.$$

KU RE

2

2. Evaluate

$$\frac{1}{2} \div 2\frac{2}{3}.$$

2

3. A group of people attended a course to help them stop smoking.

The following table shows the statistics before and after the course.

	<i>Mean number of cigarettes smoked per person per day</i>	<i>Standard deviation</i>
Before	20.8	8.5
After	9.6	12.0

2

Make **two** valid comments about these results.

4. Change the subject of the formula to r .

$$A = 4\pi r^2.$$

2

[Turn over

5. 150 patients have been given a flu vaccine.
The data is shown in the table below.

<i>AGE</i>	<i>GENDER</i>	
	<i>male</i>	<i>female</i>
5 or under	4	3
6 – 15	7	8
16 – 59	37	47
60 or over	12	32

What is the probability that

- (a) a patient given the flu vaccine was male **and** aged 60 or over? **1**
- (b) a patient given the flu vaccine was aged 5 or under? **1**
6. Joan buys gold and silver charms to make bracelets.
2 gold charms and 5 silver charms cost £125.
- (a) Let g pounds be the cost of one gold charm and s pounds be the cost of one silver charm.
Write down an equation in terms of g and s to illustrate the above information. **1**
- 4 gold charms and 3 silver charms cost £145.
- (b) Write down another equation in terms of g and s to illustrate this information. **1**
- (c) Hence calculate the cost of each type of charm. **3**

7. (a) Expand and simplify

$$(2x - 5)(x^2 + 3x - 7).$$

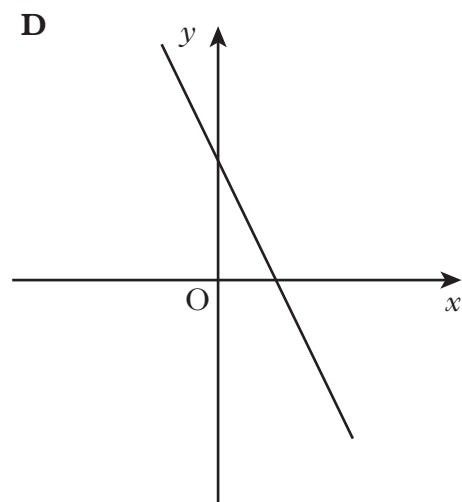
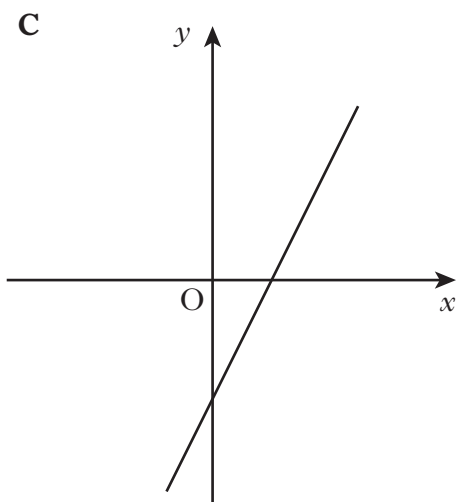
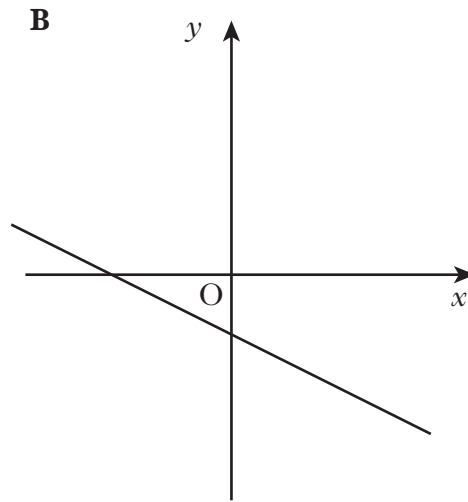
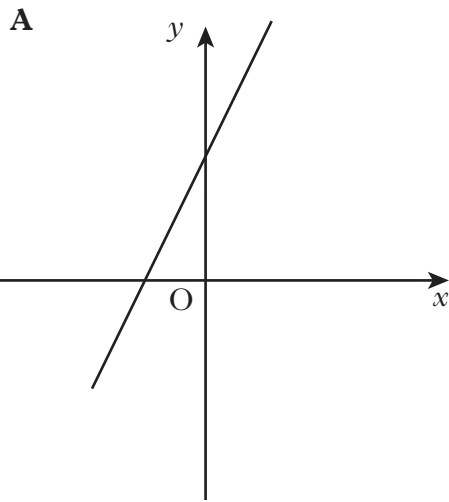
(b) Solve the inequality

$$4x - 5 \leq 7x - 20.$$

3

3

8. Four straight line graphs are shown below.



Which one of these above could represent the line with equation $2x + y = 3$?

Give two reasons to justify your answer.

3

9. Quick-Smile photographers charge the following rates:

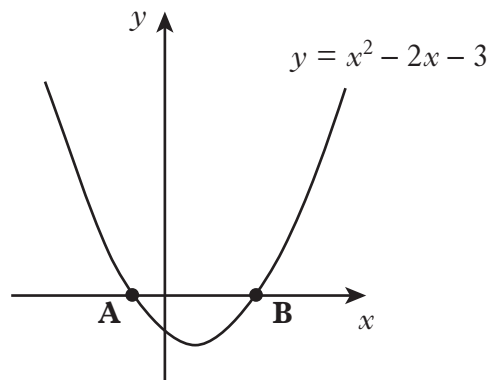
- 50p per photograph for the first 12 photographs printed
- 35p per photograph for any further photographs printed
- £4.25 for a CD of the photographs.

- (a) How much will it cost to have 16 photographs printed plus a CD?
- (b) Find a formula for C, the cost in pounds, of having x photographs printed (where x is greater than 12) plus a CD.

2

3

10. The parabola with equation $y = x^2 - 2x - 3$ cuts the x -axis at the points A and B as shown in the diagram.



- (a) Find the coordinates of A and B.
- (b) Write down the equation of the axis of symmetry of $y = x^2 - 2x - 3$.

4

1

KU	RE
1	3

11. Jenny is doing calculations using consecutive numbers.

She notices a pattern which always gives an answer of 1.

Using 2, 3, 4 gives $3^2 - 2 \times 4 = 1$.

3, 4, 5 gives $4^2 - 3 \times 5 = 1$.

4, 5, 6 gives $5^2 - 4 \times 6 = 1$.

(a) Using 8, 9, 10, write down a similar pattern.

(b) Using n , $(n+1)$, $(n+2)$, show that the answer is 1 for any three consecutive numbers.

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2500/31/02

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FRIDAY, 3 MAY
2.45 PM – 4.05 PM

MATHEMATICS
STANDARD GRADE
Credit Level
Paper 2

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FORMULAE LIST

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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

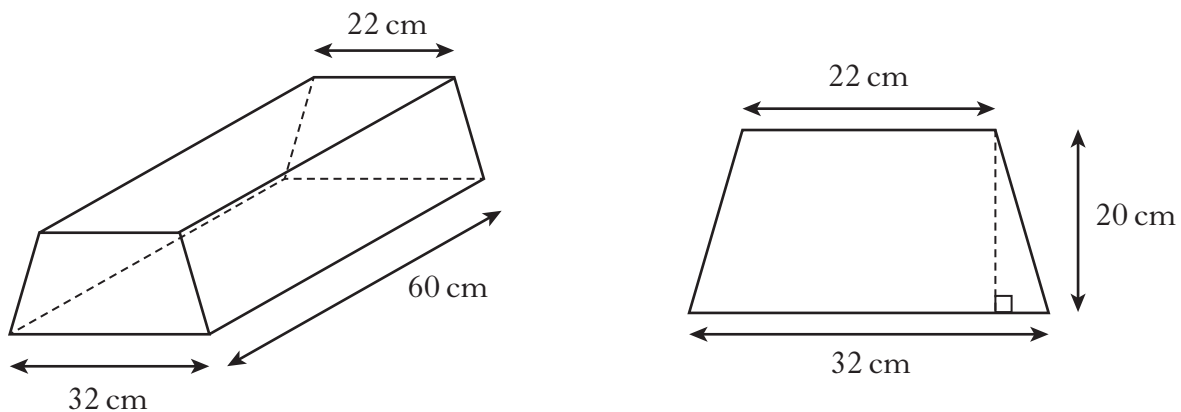
2. Solve the equation

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

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

1

[Turn over

4. Last year, 1296 learner drivers from “Topflight” school of motoring passed their driving test.

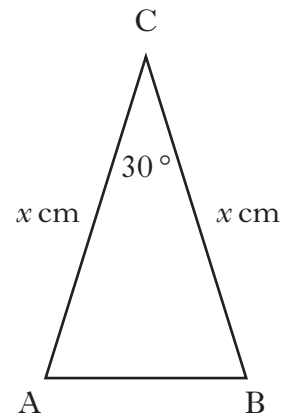
This was 72% of those who sat their driving test from Topflight.

How many **failed** their driving test?

3

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

$AC = BC = x$ centimetres.



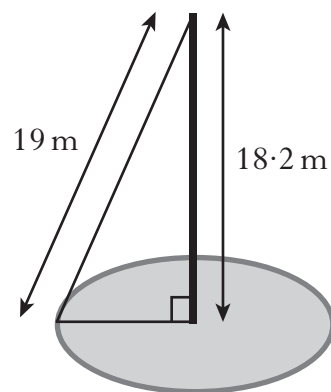
The area of triangle ABC is 9 square centimetres.

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.

3

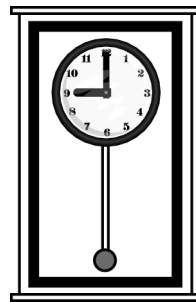
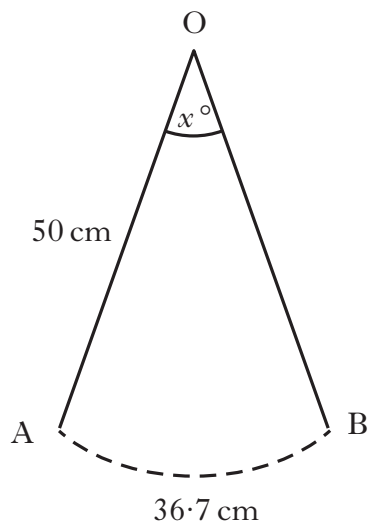
7. Jack weighs 94 kilograms.

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.

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.

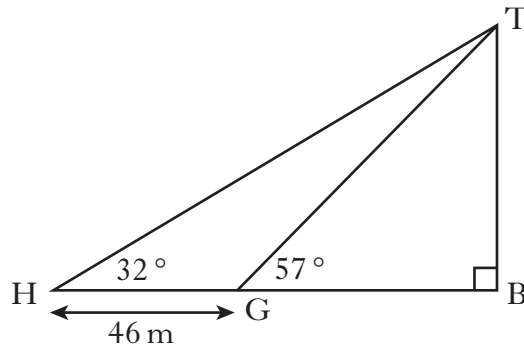
Calculate x° , the angle through which the pendulum swings.

[Turn over

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

G is a point on HB.

- angle TGB = 57°
- GH = 46 metres.



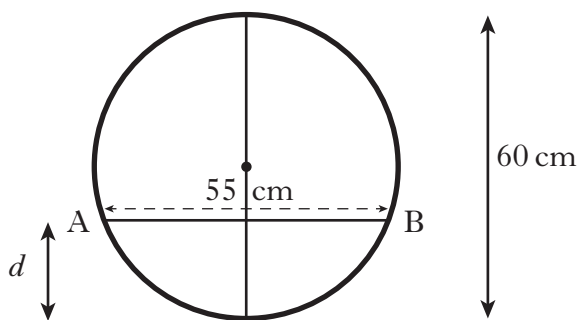
Calculate the length of TB.

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.

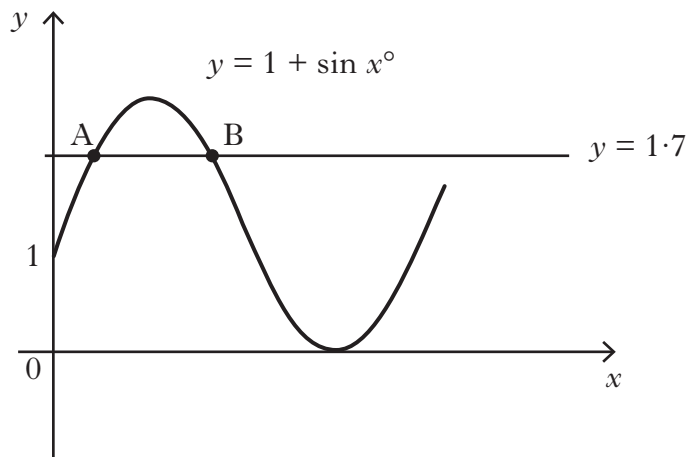


(a) Calculate the depth, d , of the water in the pipe.

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

KU	RE
4	
2	
	2
4	
	1

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



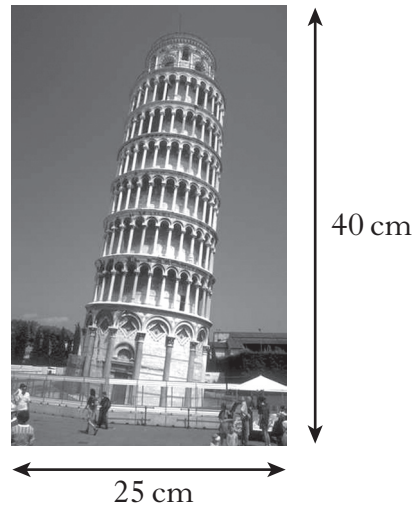
The line $y = 1.7$ is drawn. It cuts the graph of $y = 1 + \sin x^\circ$ at A and B as shown.

Calculate the x-coordinates of A and B.

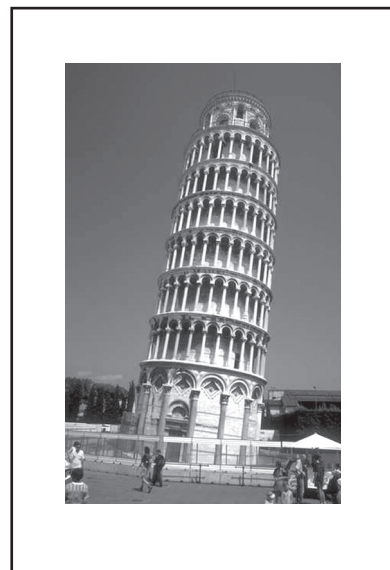
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[Turn over

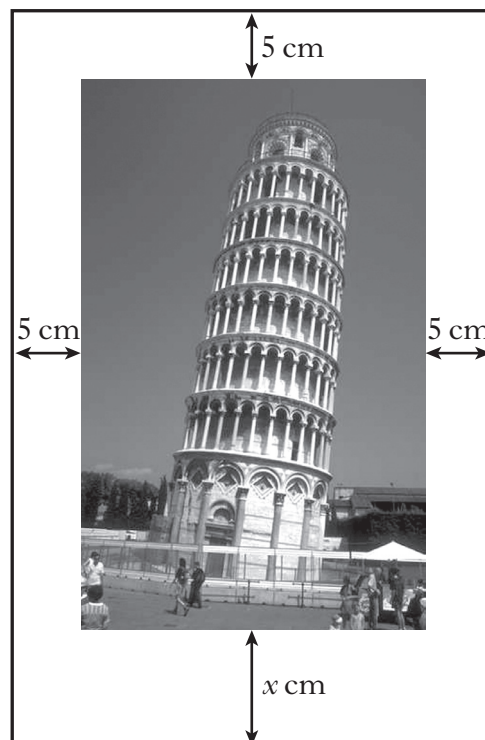
13. Asim has a poster which is 25 centimetres wide and 40 centimetres high.



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



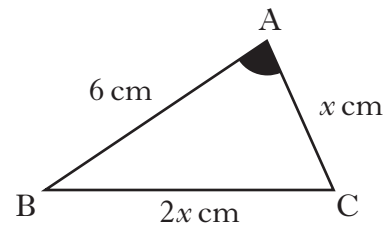
The border is 5 centimetres wide on three sides and x centimetres wide on the fourth side as shown.



Calculate the value of x .

14. In triangle ABC:

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



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

[END OF QUESTION PAPER]

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