

# X100/11/02

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NATIONAL  
QUALIFICATIONS 2015

TUESDAY, 19 MAY  
10.05 AM – 11.35 AM

MATHEMATICS  
INTERMEDIATE 2  
Units 1, 2 and 3  
Paper 2

**Read carefully**

- 1 **Calculators may be used in this paper.**
- 2 Full credit will be given only where the solution contains appropriate working.
- 3 Square-ruled paper is provided. If you make use of this, you should write your name on it clearly and put it inside your answer booklet.



## 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:  $\text{Area} = \frac{1}{2}ab \sin C$

Volume of a sphere:  $\text{Volume} = \frac{4}{3}\pi r^3$

Volume of a cone:  $\text{Volume} = \frac{1}{3}\pi r^2 h$

Volume of a cylinder:  $\text{Volume} = \pi r^2 h$

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 house is valued at £240 000. Its value is predicted to rise by 2·8% per annum.

Calculate its predicted value after 2 years.

**3**

2. The number of visitors to **Farrhill Museum** is recorded daily over a three week period. The results are shown in the stem and leaf diagram below.

3		2		7				
4		3		6		6		7
5		0		4		5		8
							8	9
6		2		5		7		8
7		0		2		2		5
8		5						

$n = 21$       4|3 represents 43 visitors.

- (a) What is the probability that on any given day in this three week period there were more than 70 visitors to Farrhill Museum?

**1**

- (b) For the given data, calculate:

(i) the median;

**1**

(ii) the lower quartile;

**1**

(iii) the upper quartile.

**1**

In the same three week period, the number of visitors to **Farrhill Castle** is recorded daily. For this data the semi-interquartile range is found to be 5.

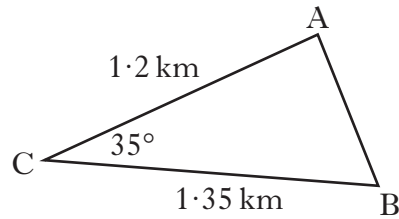
- (c) Make an appropriate comment comparing the distribution of visitors to the museum and the castle.

**2**

**[Turn over**

3. Triangle ABC is shown below.

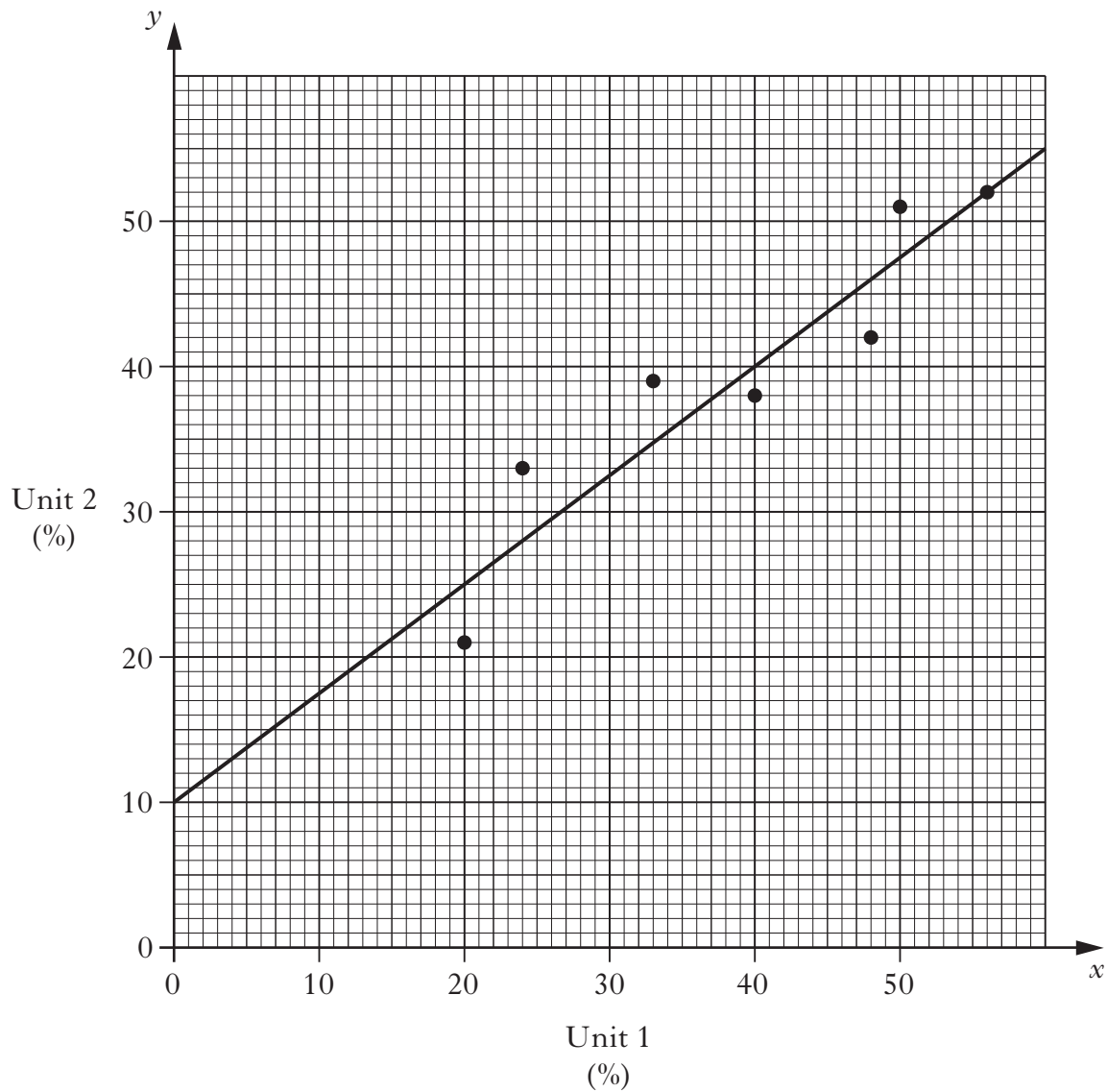
Marks



Calculate the length of AB.

3

4. The marks of a group of students in the Unit 1 and Unit 2 tests of their Intermediate 2 Mathematics course are shown in the scattergraph below. A line of best fit has been drawn.



- (a) Find the equation of this line of best fit.

3

- (b) Another student scored 80% in the Unit 1 test.

**Use your answer to part (a) to predict her mark in the Unit 2 test.**

1

5. Express

$$\frac{5t}{s} \div \frac{t}{2s^2}$$

in its simplest form.

3

6. Change the subject of the formula

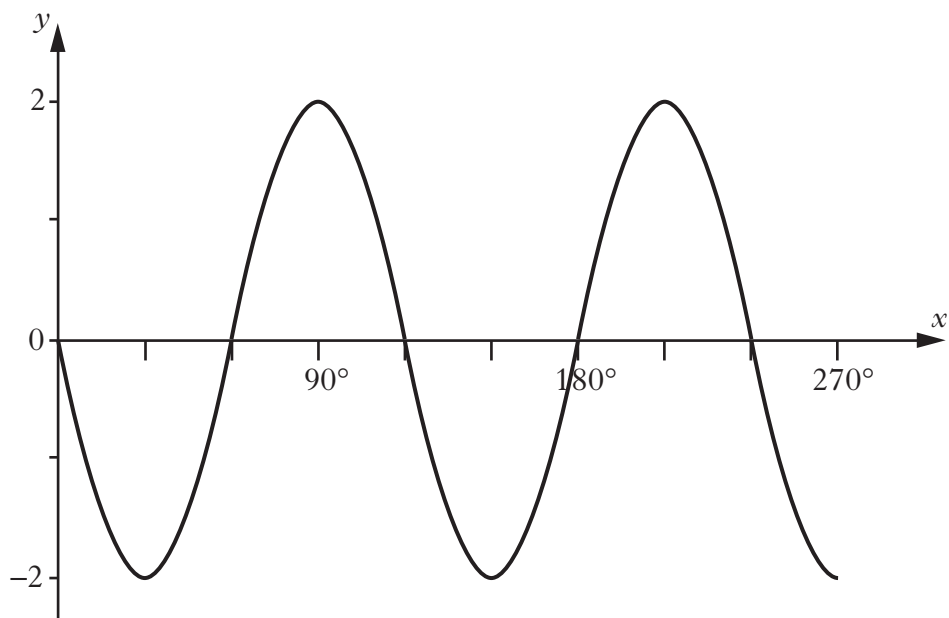
$$A = \frac{1}{2}(b+c)d \quad \text{to } b.$$

3

7. Simplify  $\frac{5p^7 \times 4p^{-2}}{2p}$ .

3

8. Part of the graph of a trigonometric function is shown below.



State the period, in degrees, of this function.

1

**[Turn over**

9. Solve the equation

$$3 \tan x^\circ - 2 = 4, \quad 0 \leq x < 360.$$

3

10. A mug in the shape of a cylinder has a volume of 400 cubic centimetres.



Its diameter is 7.6 centimetres.

Calculate the height of the mug, giving your answer correct to one decimal place.

3

11. A straight line has equation  $2y + 3x = 12$ .

(a) Find the gradient of this line.

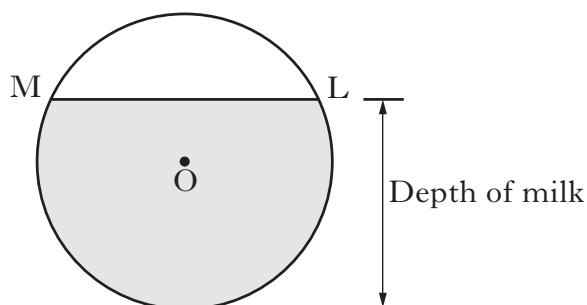
2

(b) The line crosses the  $y$ -axis at  $(0, c)$ .

Find the value of  $c$ .

1

12. The diagram below shows the circular cross-section of a milk tank.



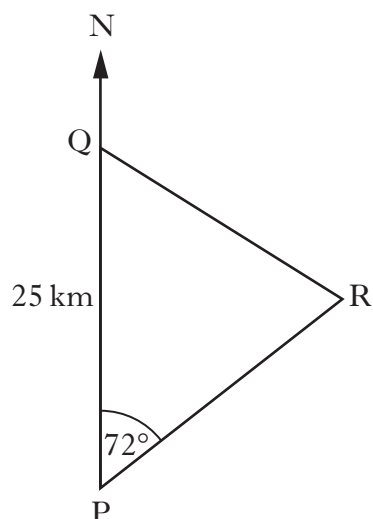
The radius of the circle, centre O, is 1.2 metres.

The width of the surface of the milk in the tank, represented by ML in the diagram, is 1.8 metres.

Calculate the depth of the milk in the tank.

4

13. In the diagram below P, Q and R represent the positions of Portlee, Queenstown and Rushton respectively.



Portlee is 25 kilometres due South of Queenstown.

From Portlee, the bearing of Rushton is  $072^\circ$ .

From Queenstown, the bearing of Rushton is  $128^\circ$ .

Calculate the distance between Portlee and Rushton.

**Do not use a scale drawing.**

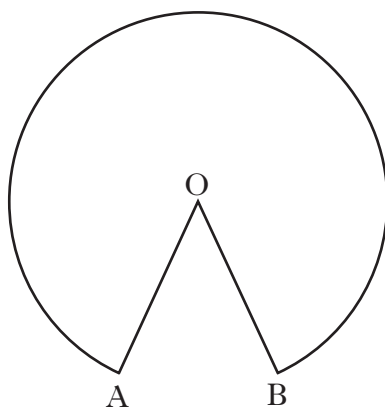
4

14. Find the roots of the equation

$$2x^2 + 9x - 5 = 0.$$

3

15. The diagram below shows part of a circle, centre O.



The radius of the circle is 6.4 centimetres.

Major arc AB has length 34.6 centimetres.

Calculate the size of reflex angle AOB.

4

[END OF QUESTION PAPER]