

X101/11/02

NATIONAL TUESDAY, 19 MAY
QUALIFICATIONS 10.05 AM – 11.35 AM
2015

MATHEMATICS
INTERMEDIATE 2
Units 1, 2 and
Applications of Mathematics
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

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

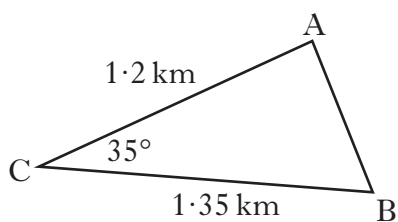
In the same three week period, the number of visitors to **Farrhill Castle** is recorded daily. For this data the semi-interquartile range is found to be 5.

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

2

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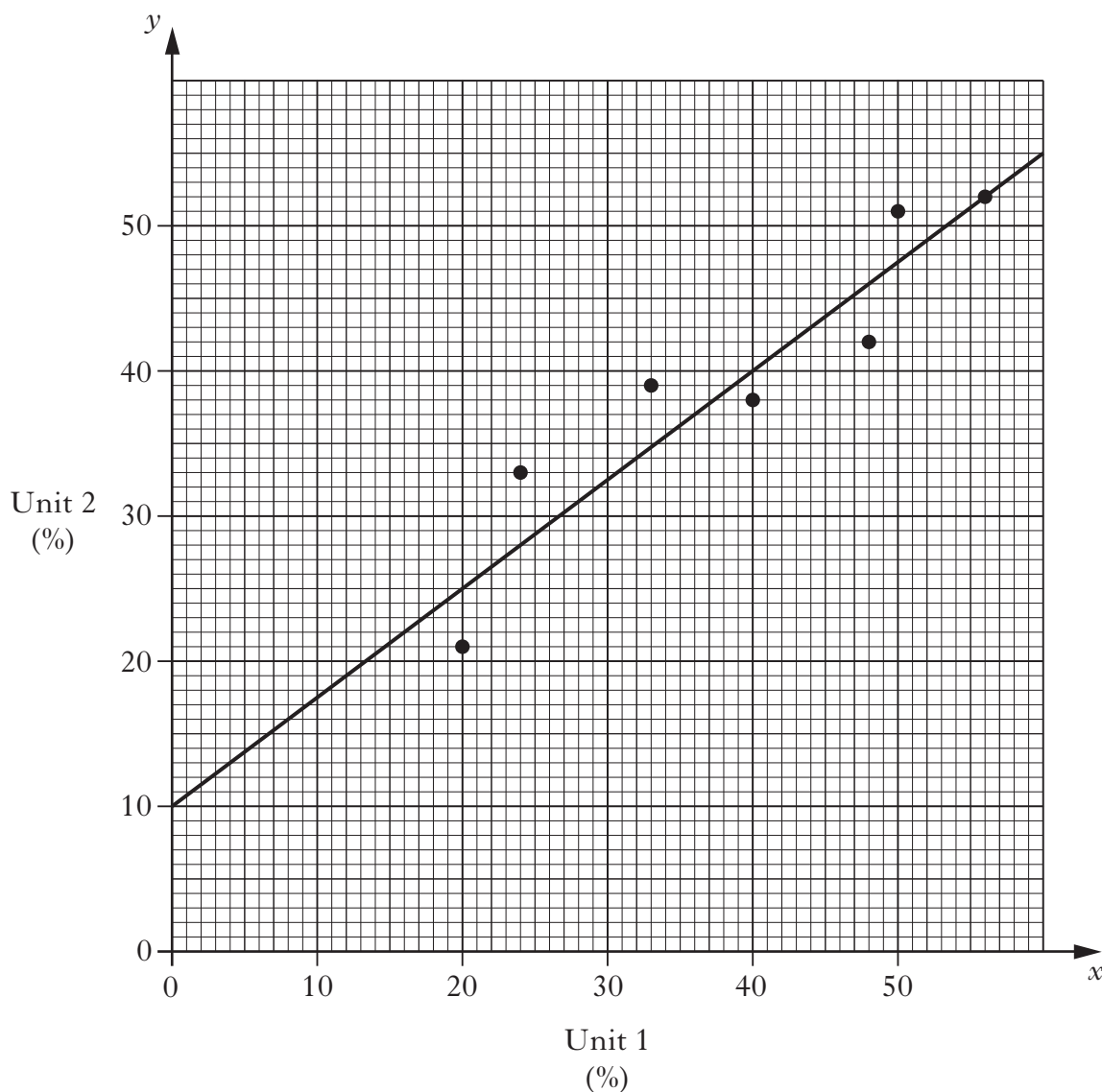
3. Triangle ABC is shown below.



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. Alice Larsson is a nurse.
She earns a gross salary of £27 080 per year.
She has tax allowances totalling £9940.

The rates of tax applicable are as follows.

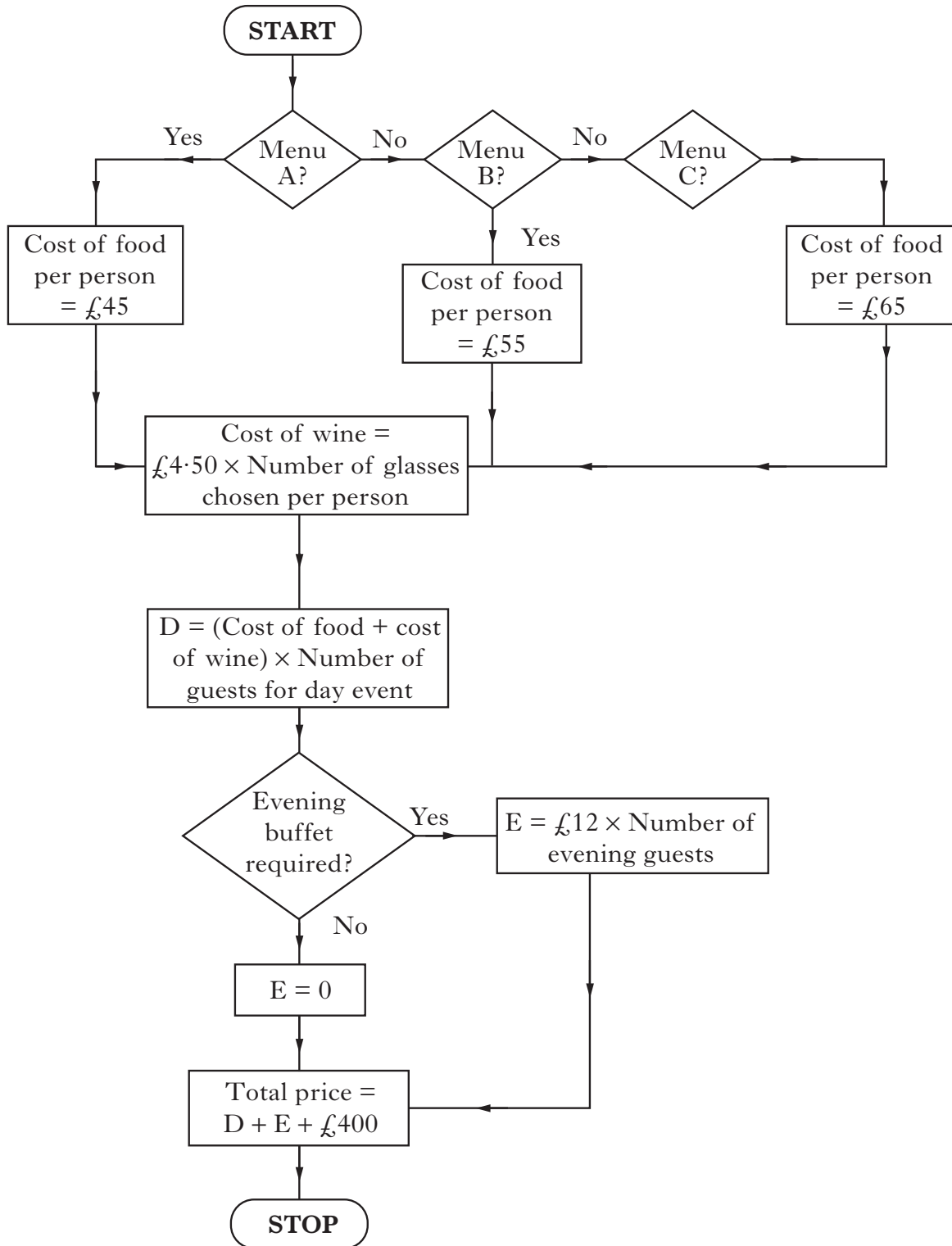
<i>Taxable income</i>	<i>Rate</i>
On the first £32 010	20%
On the next £117 990	40%
On any income over £150 000	45%

Calculate Alice's annual tax bill for last year.

3

[Turn over

6. The flowchart below shows how to calculate the cost of hiring a wedding venue.



Maureen and Austin are hiring this venue for their wedding. They will have 50 guests for the day event. They have chosen Menu C and 3 glasses of wine are being provided per guest. They will provide a buffet for 70 evening guests. Calculate the total cost Maureen and Austin will have to pay.

7. 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

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

(a) Find the gradient of this line.

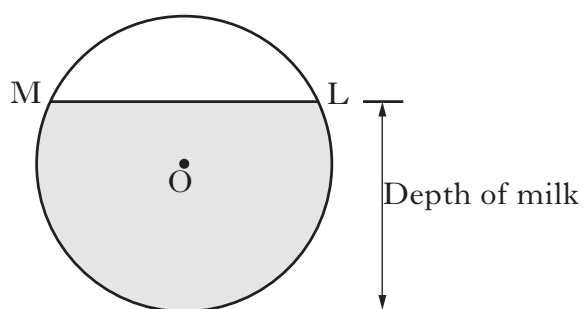
2

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

Find the value of c .

1

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



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

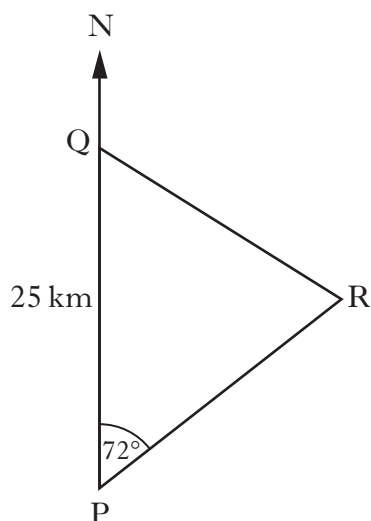
The width of the surface of the milk in the tank, represented by ML in the diagram, is 1.8 metres.

Calculate the depth of the milk in the tank.

4

[Turn over

10. 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° .

From Queenstown, the bearing of Rushton is 128° .

Calculate the distance between Portlee and Rushton.

Do not use a scale drawing.

4

11. A salesman uses the table below to prepare quotes for loans.

	Repayment over 1 year	Repayment over 2 years
	<i>Monthly repayment</i>	<i>Monthly repayment</i>
£100	£8.88	£4.71
£200	£17.76	£9.42
£300	£26.64	£14.13
£500	£44.40	£23.55
£1000	£88.80	£47.10
£2000	£177.60	£94.20
£3000	£266.40	£141.30

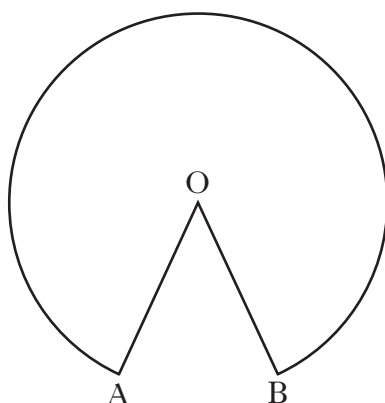
He tells Vince: “The payments will be £195.36 per month if you want to repay the loan over one year and £103.62 per month if you want to repay the loan over 2 years.”

Vince chooses to repay the loan over one year.

Calculate the cost of his loan.

4

12. 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

13. On a given day a company records the number of minutes that each employee is late. The results are shown in the frequency table below.

<i>Number of minutes late</i>	<i>Frequency</i>
0–4	42
5–9	18
10–14	23
15–19	16
20–24	8
25–29	5
30–34	3
35–39	1

Calculate the mean number of minutes that an employee is late.

5

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