

# X101/11/01

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NATIONAL TUESDAY, 19 MAY  
QUALIFICATIONS 9.00 AM – 9.45 AM  
2015

MATHEMATICS  
INTERMEDIATE 2  
Units 1, 2 and  
Applications of Mathematics  
Paper 1  
(Non-calculator)

**Read carefully**

- 1 You may **NOT** use a calculator.
- 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.

**ALL questions should be attempted.**

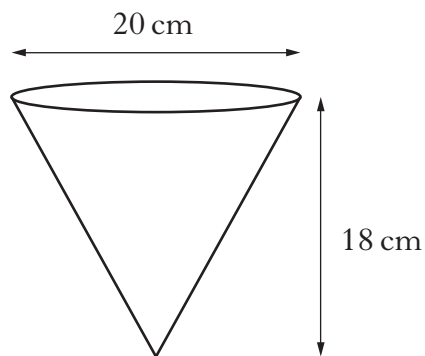
*Marks*

1. Multiply out the brackets and collect like terms.

$$(2x + 6)(5x - 3) + 9x$$

**3**

2. A hanging basket is in the shape of a cone.



The diameter is 20 centimetres and the height is 18 centimetres.  
Calculate the volume of the hanging basket.

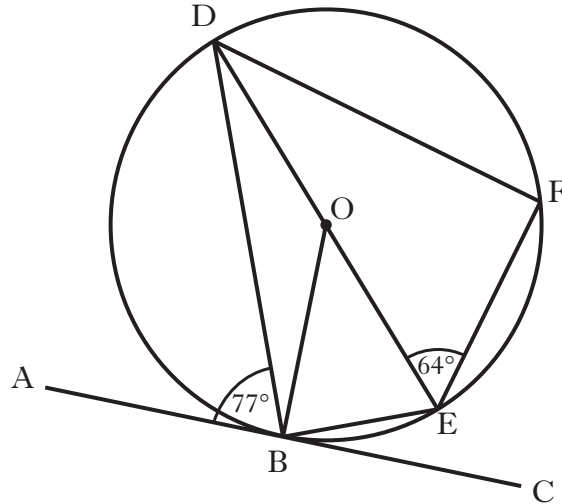
**Take  $\pi = 3.14$ .**

**2**

**[Turn over**

3.

Marks



AC is a tangent to the circle, centre O, with point of contact B.  
 DE is a diameter of the circle and F is a point on the circumference.  
 Angle ABD is  $77^\circ$  and angle DEF is  $64^\circ$ .  
 Calculate the size of angle BDF.

3

4. Michael Walker sells furniture. He earns a basic pay of £291.25 per week.  
 A copy of part of Michael's payslip is shown below for one week in February.

<b>Name</b>	<b>Employee No.</b>	<b>Tax Code</b>	<b>Week Ending</b>
M. Walker	153	640L	15/02/2015
<b>Basic Pay</b>	<b>Overtime Pay</b>	<b>Commission</b>	<b>Gross Pay</b>
£291.25	—		
<b>Nat. Insurance</b>	<b>Income Tax</b>	<b>Pension</b>	<b>Deductions</b>
£21.16	£47.58	£22.13	
			<b>Net Pay</b>

Michael earns commission of 2.5% on all his sales. If he sold furniture to the value of £1800 during that week, calculate his Net Pay.

3

5. The standard deviation of 1, 2, 2, 2, 8 is equal to  $\sqrt{a}$ .

Find the value of  $a$ .

3

6. A civil engineer uses the formula


$$A = \frac{1}{2}l(b+h)$$

to calculate a particular area,  $A$ .

Calculate  $A$  when  $l = 8$ ,  $b = 6$  and  $h = 12$ .

2

7. The diagram below shows part of Mrs Logan's marks spreadsheet.

	A	B	C	D	E
1		<b>Mathematics</b>	<b>English</b>	<b>Biology</b>	<b>Total</b>
2	Alex	87	56	74	
3	Ben	35	77	55	
4	Chiara	75		72	=SUM(B4:D4)
5	David	49	52	54	
6					
7		=AVERAGE(B2:B7)			
8					

- (a) When she types the formula shown into cell E4, it displays 225. What is the value in cell C4?

1

- (b) She wants to calculate the average Mathematics mark, but when she types the formula shown into cell B7 she gets an error message. What is the problem?

1

**[Turn over**

8. Using **graphical** means, solve the system of equations:

Marks

$$y = 2x + 5$$

$$y = 3x + 6.$$

**Use the squared paper provided.**

3

9. Write the following in order of size starting with the smallest.

$$\cos 90^\circ$$

$$\cos 100^\circ$$

$$\cos 360^\circ$$

Justify your answer.

2

10. A group of people were asked to record how much money (to the nearest pound) they each donated to charity in one year. The results are shown in the table below.

Money to charity ( $p$ pounds)	Frequency
$0 \leq p < 10$	52
$10 \leq p < 20$	56
$20 \leq p < 30$	44
$30 \leq p < 40$	20
$40 \leq p < 50$	8

(a) **Using the squared paper provided**, draw a histogram to illustrate this data.

2

(b) For the histogram you have drawn, estimate the modal amount to the nearest pound.

1

11. A straight line is represented by the equation  $y = mx + c$ .

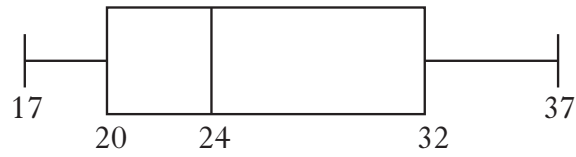
Sketch a possible straight line graph to illustrate this equation when  $m < 0$  and  $c > 0$ .

2

12. A book club has **seven** members.

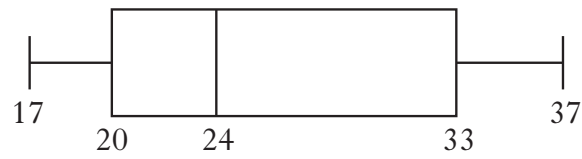
*Marks*

The ages of the members have been used to construct the following boxplot.



After an **eighth** member joins the club, a new boxplot is drawn.

This boxplot is shown below.



What age is the eighth member?

2

[END OF QUESTION PAPER]

## ACKNOWLEDGEMENT

Paper 1, Question 2 – [Lightraveler/shutterstock.com](https://www.shutterstock.com/user/lighttraveler)



# X101/11/02

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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.**
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## FORMULAE LIST

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

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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 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

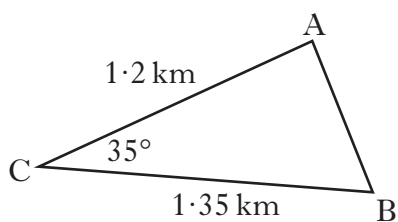
In the same three week period, the number of visitors to **Farrhill Castle** is recorded daily. For this data the semi-interquartile range is found to be 5.

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

2

[Turn over

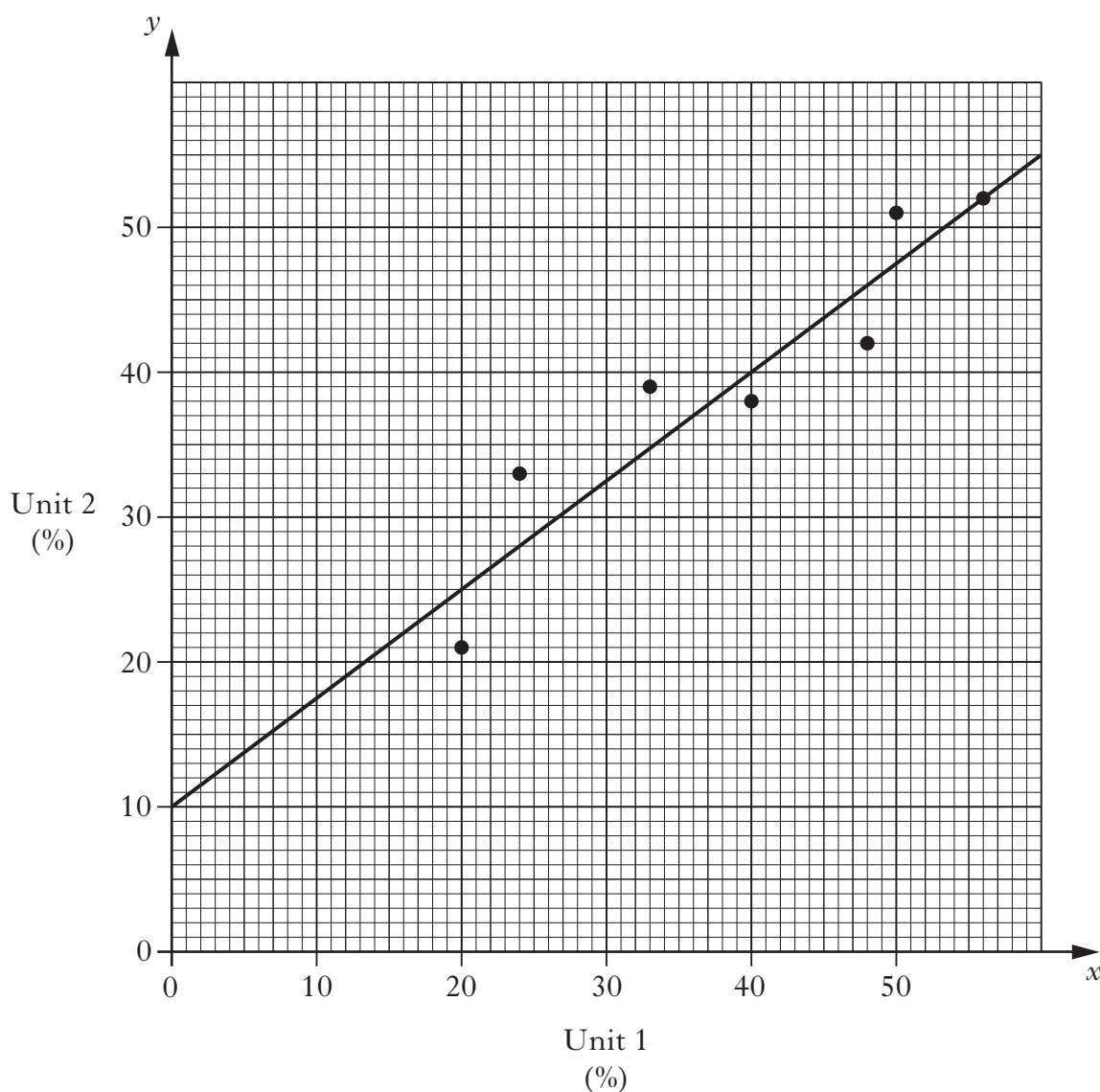
3. Triangle ABC is shown below.



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.

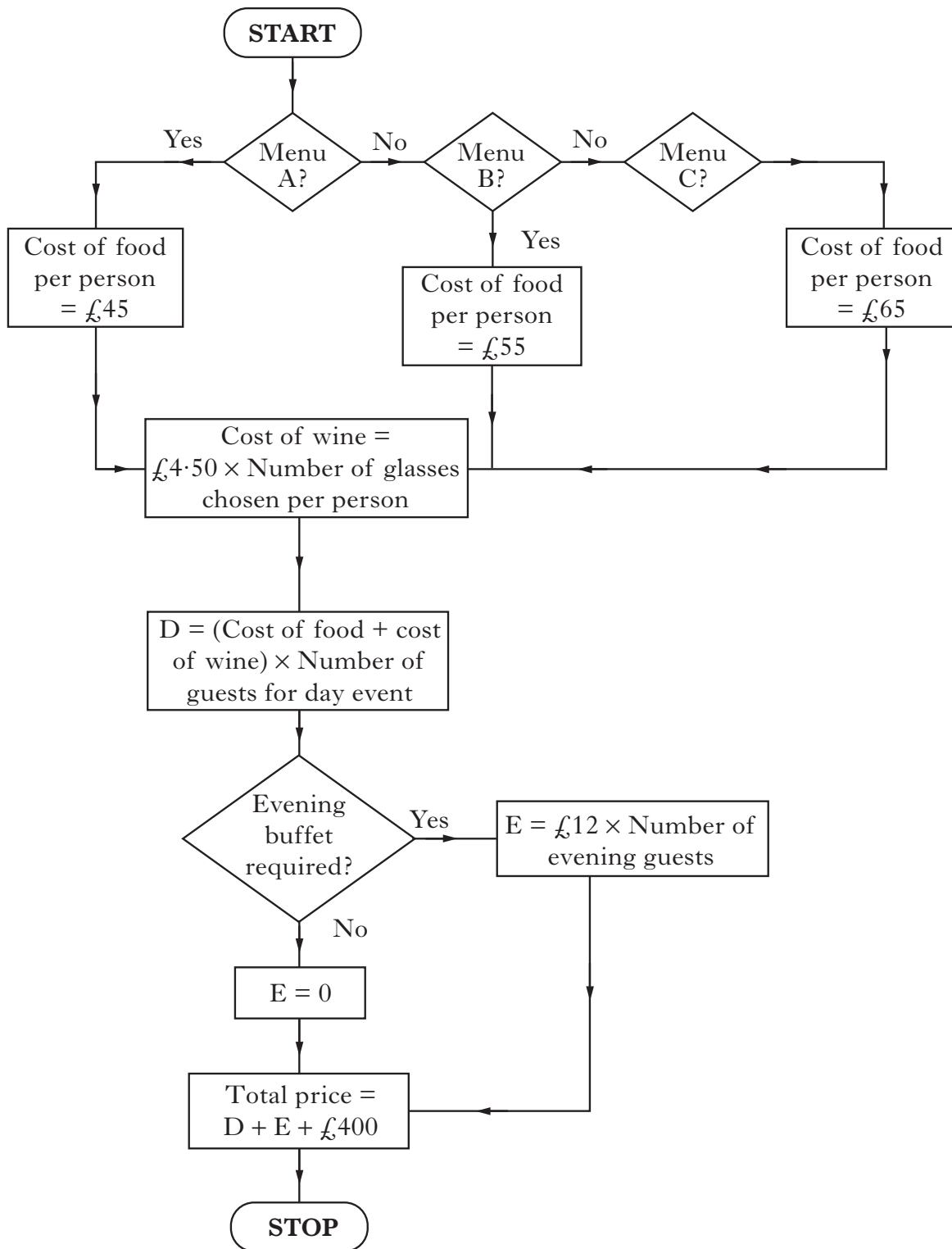
<i>Taxable income</i>	<i>Rate</i>
On the first £32 010	20%
On the next £117 990	40%
On any income over £150 000	45%

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.

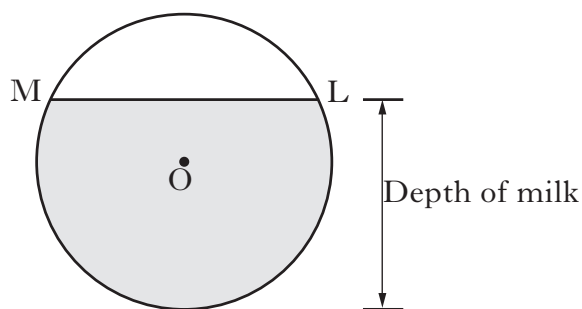
2

(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.

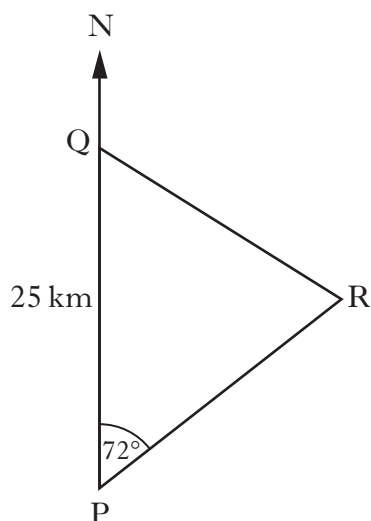
The width of the surface of the milk in the tank, represented by  $ML$  in the diagram, is 1.8 metres.

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  $072^\circ$ .

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

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.

	<b>Repayment over 1 year</b>	<b>Repayment over 2 years</b>
	<i>Monthly repayment</i>	<i>Monthly repayment</i>
<b>£100</b>	£8·88	£4·71
<b>£200</b>	£17·76	£9·42
<b>£300</b>	£26·64	£14·13
<b>£500</b>	£44·40	£23·55
<b>£1000</b>	£88·80	£47·10
<b>£2000</b>	£177·60	£94·20
<b>£3000</b>	£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.”

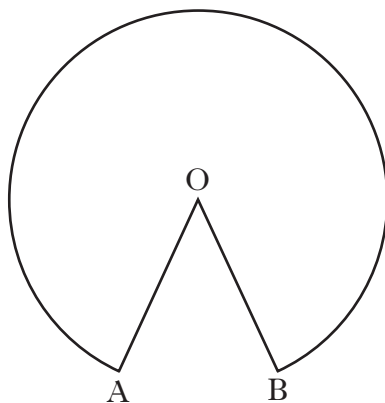
Vince chooses to repay the loan over one year.

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

[END OF QUESTION PAPER]

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