

X101/202

NATIONAL
QUALIFICATIONS
2009

THURSDAY, 21 MAY
1.00 PM – 1.45 PM

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.



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.

1. The number of goals scored one weekend by each team in the Football League is shown below.

0	1	1	2	1	0	0	5	0	1	3
0	2	2	1	1	3	0	0	2	4	1

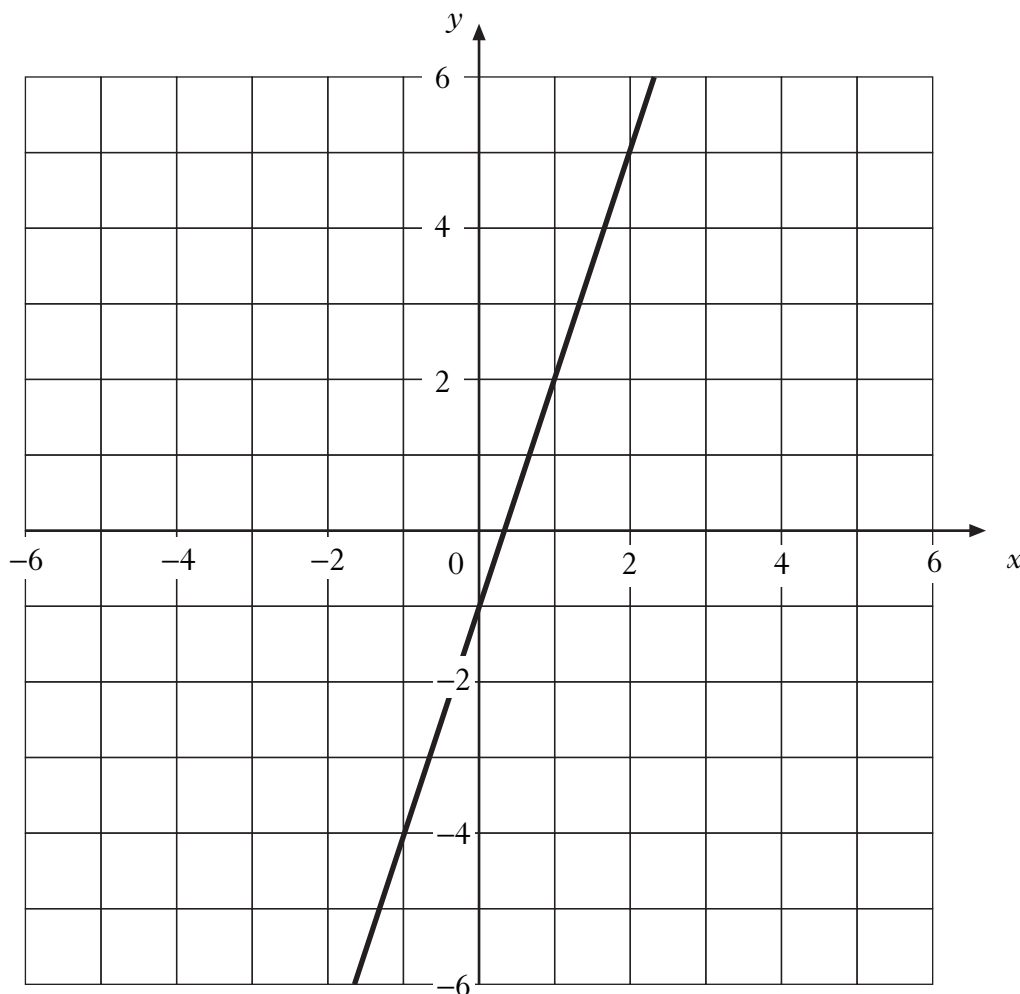
- (a) Construct a dotplot for the data. 2

- (b) The shape of the distribution is

- A skewed to the right
- B symmetric
- C skewed to the left
- D uniform.

Write down the letter that corresponds to the correct shape. 1

2.



Find the equation of the straight line shown in the diagram. 3

3. Factorise

$$x^2 - 5x - 24.$$

2

4. Multiply out the brackets and collect like terms.

$$(x + 5)(2x^2 - 3x - 1)$$

3

5. (a) The marks of a group of students in their October test are listed below.

41 56 68 59 43 37 70 58 61 47 75 66

Calculate:

(i) the median;

1

(ii) the semi-interquartile range.

3

(b) The teacher arranges extra homework classes for the students before the next test in December.

In this test, the median is 67 and the semi-interquartile range is 7.

Make **two** appropriate comments comparing the marks in the October and December tests.

2

6. An angle, a° , can be described by the following statements.

- a is greater than 0 and less than 360
- $\sin a^\circ$ is negative
- $\cos a^\circ$ is positive
- $\tan a^\circ$ is negative

Write down a possible value for a .

1

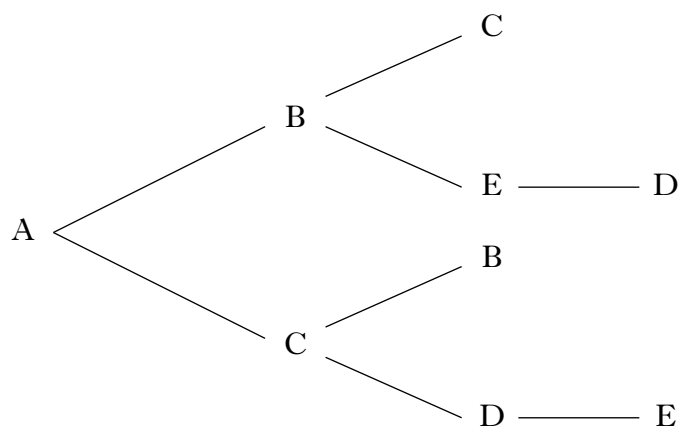
7. A straight line is represented by the equation $x + y = 5$.

Find the gradient of this line.

2

8. Five towns are represented by letters A, B, C, D and E in the tree diagram shown below.

The tree diagram represents routes between these five towns.



Draw a network diagram to represent the routes shown in the tree diagram.

2

9. A company of window fitters uses a spreadsheet to show examples of how their prices are calculated.

	A	B	C	D	E
1	Wendy's Window Fitters		Quotation for fitting windows		
2	VAT rate (%)	17.5			
3					
4	Window Size	Cost per window	Quantity of windows	Cost	Cost including VAT
5					
6	30 cm by 30 cm	£50	3	£150	£176.25
7	50 cm by 70 cm	£75	4	£300	£352.50
8	120 cm by 100 cm	£120	2	£240	£282.00
9	90 cm by 150 cm	£125	1	£125	£146.88
10					
11					£957.63
12					

(a) Write down the formula used in cell E11.

1

(b) The VAT rate in cell B2 is changed.

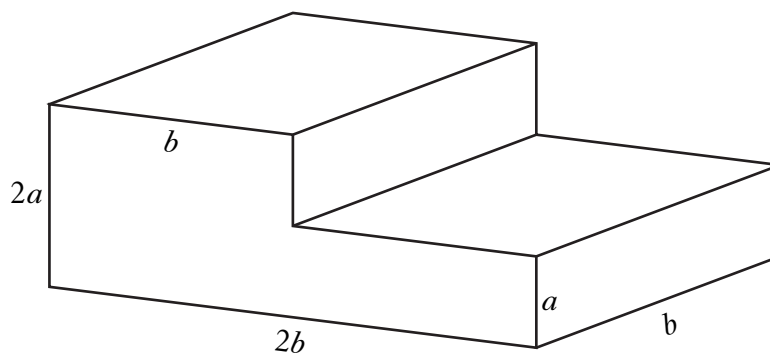
As a result, the values in column E are updated automatically.

Write down the formula used in cell E6.

2

[Turn over for Question 10 on Page six

10. A three-dimensional solid is shown in the diagram below.
All dimensions are in centimetres.



The surface area, S square centimetres, of this solid is given by the formula

$$S = 10ab + 4b^2.$$

- (a) Calculate S when $a = 12$ and $b = 5$. 2
- (b) Calculate a when $S = 424$ and $b = 4$. 3

[END OF QUESTION PAPER]

[BLANK PAGE]

[BLANK PAGE]

X101/204

NATIONAL
QUALIFICATIONS
2009

THURSDAY, 21 MAY
2.05 PM – 3.35 PM

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.



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. A new book “Intermediate 2 Maths is Fun” was published in 2006.
There were 3000 sales of the book during that year.
Sales rose by 11% in 2007 then fell by 10% in 2008.

Were the sales in 2008 more or less than the sales in 2006?

You must give a reason for your answer.

3

2. The heights, in centimetres, of seven netball players are given below.

173 176 168 166 170 180 171

For this sample, calculate:

(a) the mean;

1

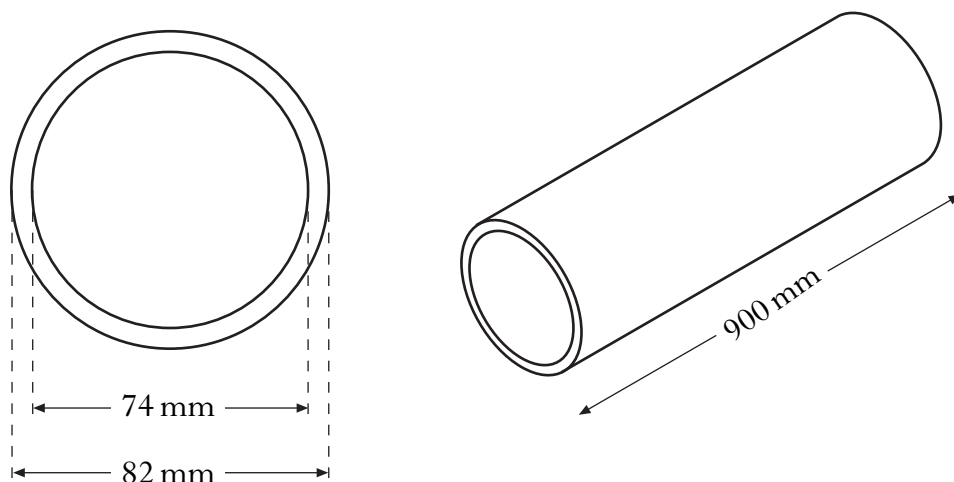
(b) the standard deviation.

3

Show clearly all your working.

[Turn over

3. A company manufactures aluminium tubes.
The cross-section of one of the tubes is shown in the diagram below.



The inner diameter is 74 millimetres.

The outer diameter is 82 millimetres.

The tube is 900 millimetres long.

Calculate the volume of aluminium used to make the tube.

Give your answer correct to three significant figures.

5

4. There are 14 cars and 60 passengers on the morning crossing of the ferry from Wemyss Bay to Rothesay. The total takings are £344.30.

(a) Let x pounds be the cost for a car and y pounds be the cost for a passenger.

Write down an equation in x and y which satisfies the above condition.

1

(b) There are 21 cars and 40 passengers on the evening crossing of the ferry. The total takings are £368.95.

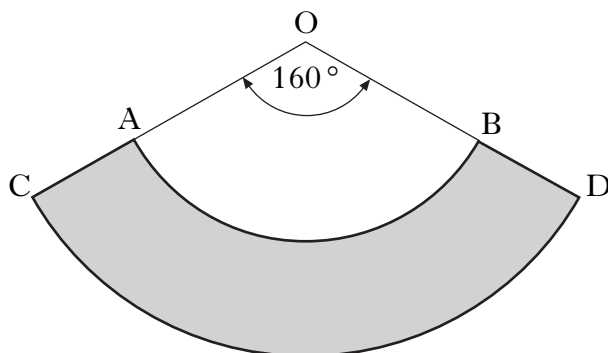
Write down a second equation in x and y which satisfies this condition.

1

(c) Find the cost for a car and the cost for a passenger on the ferry.

4

5. A pet shop manufactures protective dog collars. In the diagram below the shaded area represents one of these collars.

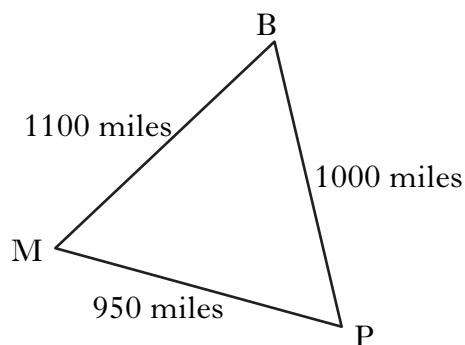
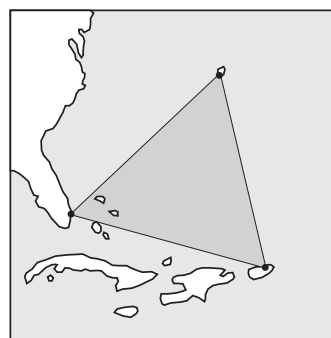


AB and CD are arcs of the circles with centres at O.
 The radius, OA, is 10 inches and the radius, OC, is 18 inches.
 Angle AOB is 160° .

Calculate the area of a collar.

4

6. The Bermuda triangle is an area in the Atlantic Ocean where many planes and ships have mysteriously disappeared. Its vertices are at Bermuda (B), Miami (M) and Puerto Rico (P).



Calculate the size of angle BPM.

3

[Turn over

7. The table shown below is used to calculate loan repayments.

		60 months	48 months	24 months
		Monthly repayment (£)	Monthly repayment (£)	Monthly repayment (£)
With payment protection	£20 000	463.85	551.43	994.23
	£15 000	347.89	413.57	745.67
	£7500	173.94	206.79	372.84
Without payment protection	£20 000	384.65	467.72	884.47
	£15 000	288.49	350.79	663.35
	£7500	144.24	175.40	331.68

Samir wishes to borrow £15 000.

How much will the loan cost him if he repays it over 48 months, with payment protection?

3

8. Jamie works as a potter for a company which makes china ornaments. He earns a basic salary of £218 per week plus 80 pence for every ornament he makes.

Jamie saves $\frac{2}{5}$ of his gross pay every week.

One week he makes 40 ornaments.

Calculate how much Jamie saves that week.

3

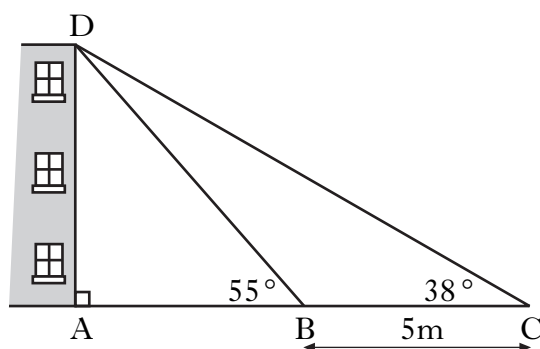
9. Anna earns £42 000 per year. She has tax allowances of £5425. The rates of tax applicable for the year are given in the table below.

Taxable income (£)	Rate
On the first £34 600	20%
On any income over £34 600	40%

How much is Anna's **monthly** tax bill?

5

10. For reasons of safety, a building is supported by two wooden struts, represented by DB and DC in the diagram below.



Angle ABD = 55° .

Angle BCD = 38° .

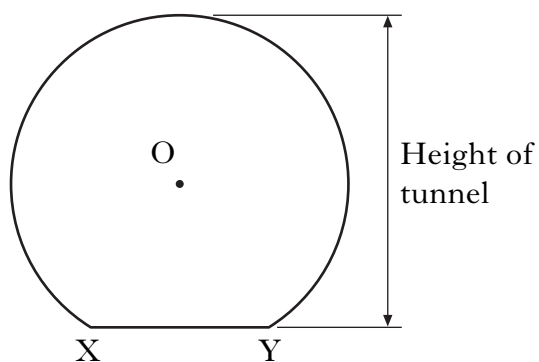
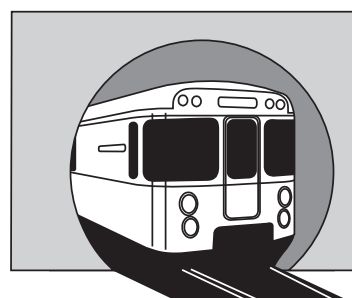
BC is 5 metres.

Calculate the height of the building represented by AD.

5

11. A railway goes through an underground tunnel.

The diagram below shows the cross-section of the tunnel. It consists of part of a circle with a horizontal base.



- The centre of the circle is O.
- XY is a chord of the circle.
- XY is 1.8 metres.
- The radius of the circle is 1.7 metres.

Find the height of the tunnel.

4

[Turn over for Question 12 on *Page eight*]

12. The amount of money spent by each pupil in a school tuck shop is recorded.

The data collected is shown in the table below.

Amount spent (pence)	Frequency
1– 50	42
51–100	64
101–150	35
151–200	18
201–250	12
251–300	10

Calculate the mean amount of money spent by pupils in the tuck shop.

5

[END OF QUESTION PAPER]