

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 |

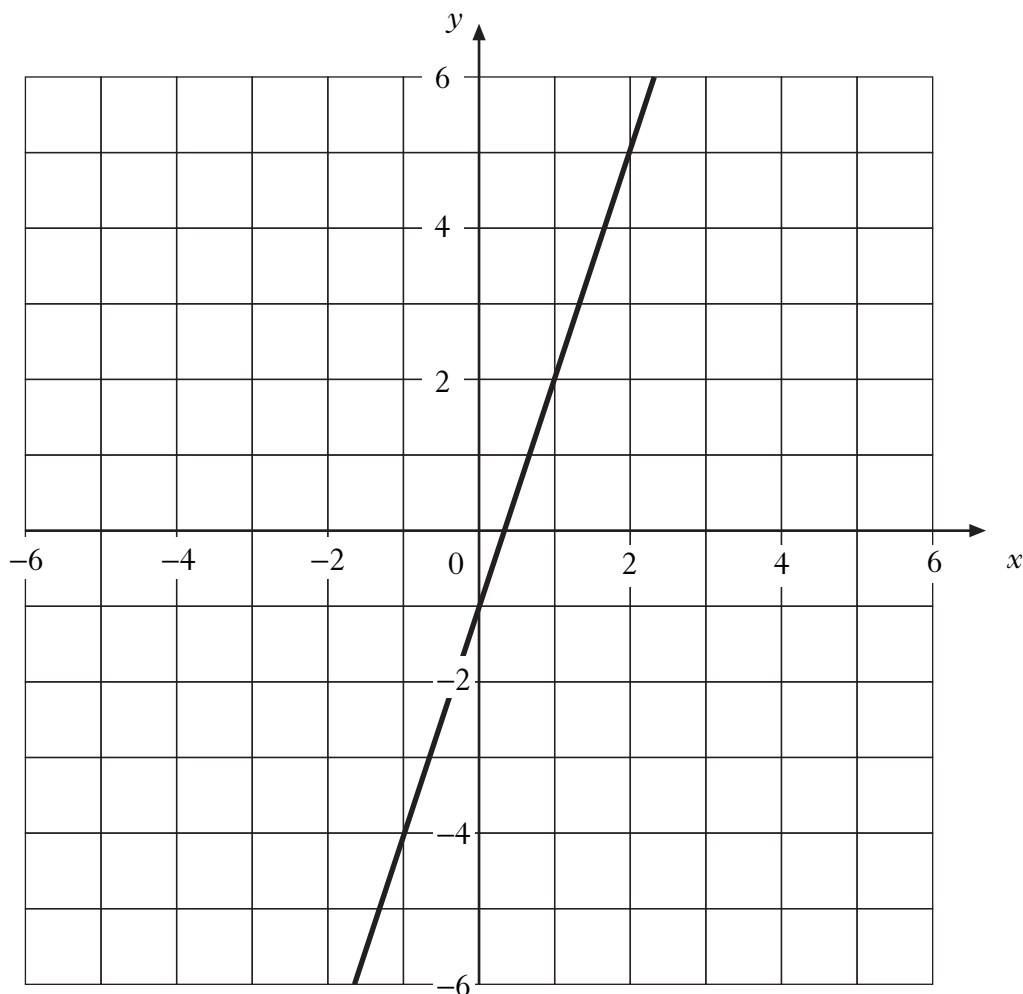
- (a) Construct a dotplot for the data. 2

- (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

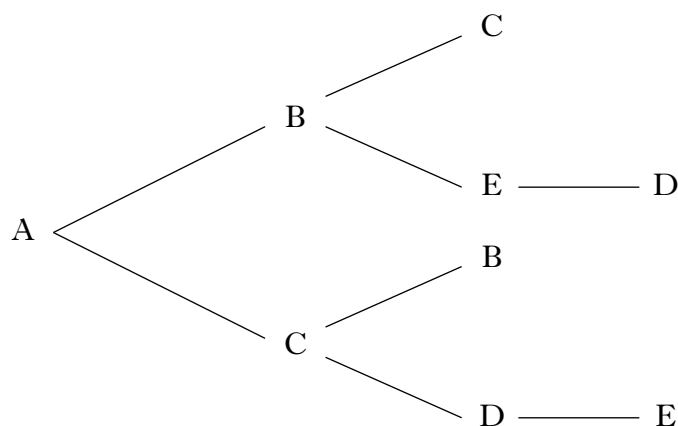
7. A straight line is represented by the equation $x + y = 5$.

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.

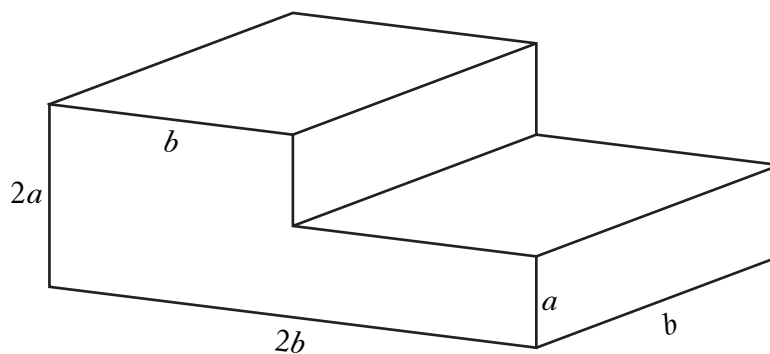
As a result, the values in column E are updated automatically.

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]

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