

X100/203

NATIONAL
QUALIFICATIONS
2007

TUESDAY, 15 MAY
2.05 PM – 3.35 PM

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.



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.

ALL questions should be attempted.

Marks

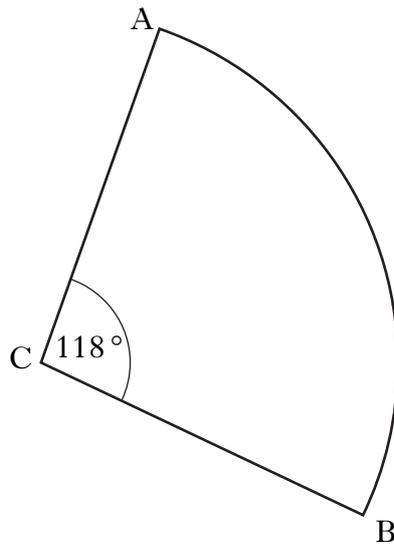
1. Ian's annual salary is £28 400. His boss tells him that his salary will increase by 2.3% per annum.

What will Ian's annual salary be after 3 years?

Give your answer to the nearest pound.

3

2. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 10.5 centimetres and angle ACB is 118° .

Calculate the length of arc AB.

3

[Turn over

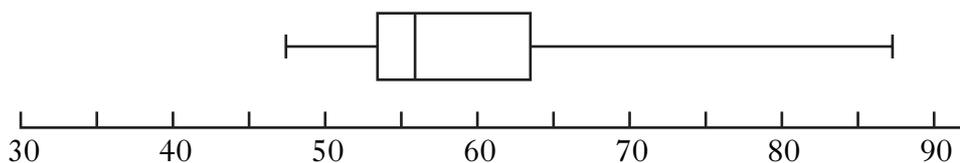
3. This back-to-back stem and leaf diagram shows the results for a class in a recent mathematics examination.

Girls		Boys
	1	3
	9	4 7 9
8 7 4 3 2	2	5 2 3 4 4 6 6 7 9
	9	6 3
9 6 3	7	4 8
8 1	8	7

$n = 15$
 $n = 14$

Key		
3	7	represents 73%
8	7	represents 87%

- (a) A boxplot is drawn to represent one set of data.



Does the boxplot above represent the girls' data or the boys' data?

Give a reason for your answer.

1

- (b) For the **other** set of data, find:

(i) the median;

1

(ii) the lower quartile;

1

(iii) the upper quartile.

1

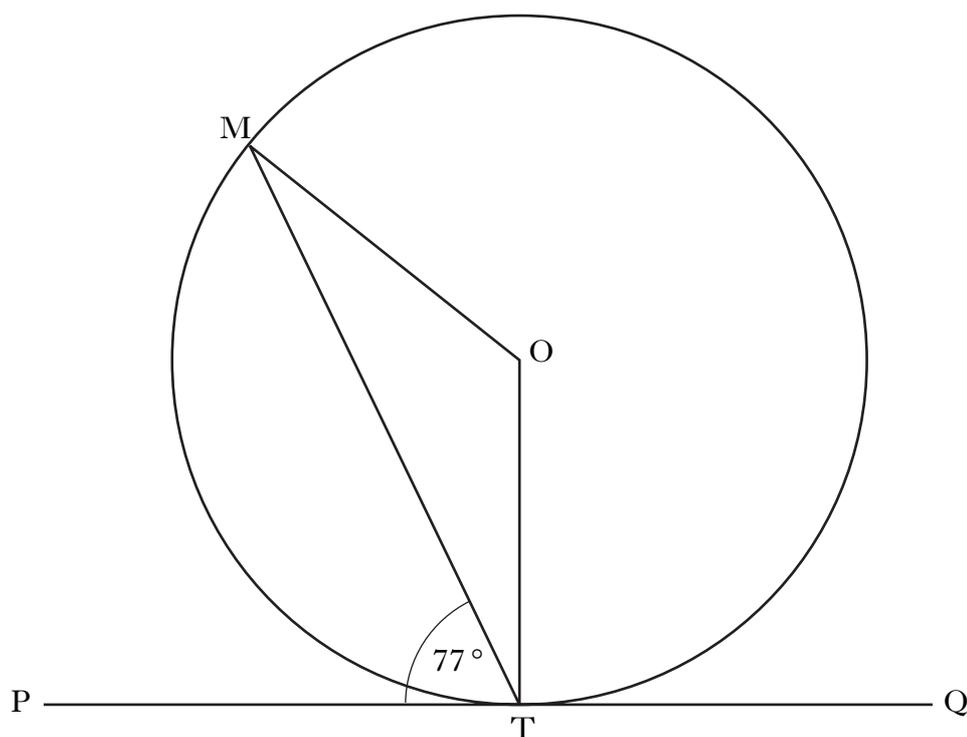
- (c) Use the answers found in part (b) to construct a second boxplot.

2

- (d) Make an appropriate comment about the distribution of data in the two sets.

1

4.



The tangent PQ touches the circle, centre O, at T.

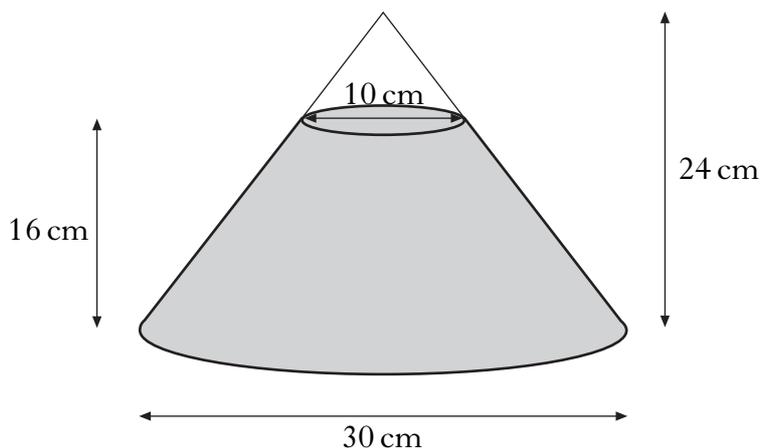
Angle MTP is 77° .

(a) Calculate the size of angle MOT. 2

(b) The radius of the circle is 8 centimetres.
Calculate the length of chord MT. 3

[Turn over

5. A glass ornament in the shape of a cone is partly filled with coloured water.



The cone is 24 centimetres high and has a base of diameter 30 centimetres. The water is 16 centimetres deep and measures 10 centimetres across the top.

What is the volume of the water?

Give your answer correct to 2 significant figures.

5

6. Tasnim rolls a standard dice with faces numbered 1 to 6.

The probability that she gets a number less than 7 is

- A 0
- B $\frac{1}{7}$
- C $\frac{1}{6}$
- D 1.

Write down the letter that corresponds to the correct probability.

1

7. (a) Factorise **fully**

$$2x^2 - 18.$$

2

- (b) Simplify

$$\frac{(2x+5)^2}{(2x-1)(2x+5)}$$

1

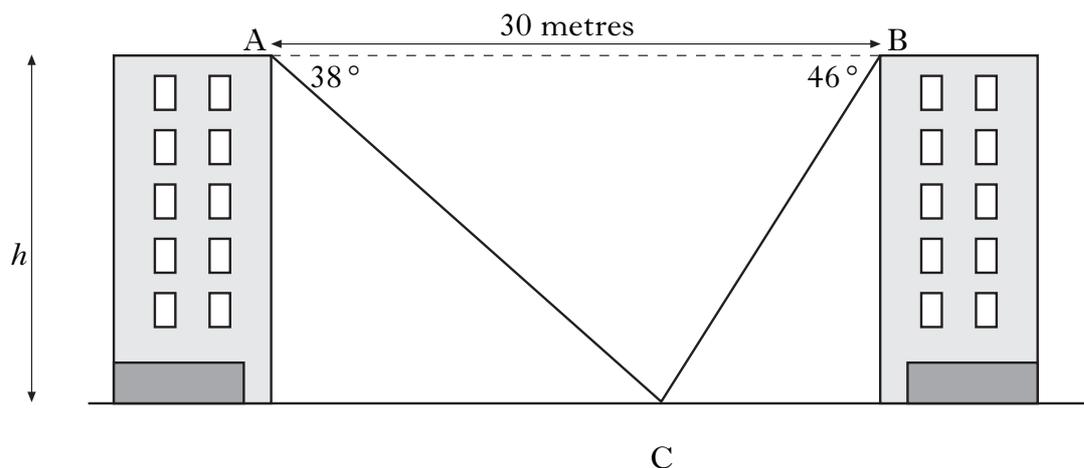
8. Solve the equation

$$2x^2 - 6x - 5 = 0,$$

giving the roots correct to one decimal place.

4

9. The diagram shows two blocks of flats of equal height.



A and B represent points on the top of the flats and C represents a point on the ground between them.

To calculate the height, h , of each block of flats, a surveyor measures the angles of depression from A and B to C.

From A, the angle of depression is 38° .

From B, the angle of depression is 46° .

The distance AB is 30 metres.

Calculate the height, h , in metres.

5

10. Express $\frac{5p^2}{8} \div \frac{p}{2}$ as a fraction in its simplest form.

3

11. Change the subject of the formula

$$K = \frac{m^2 n}{p}$$

to m .

3

[Turn over for Questions 12, 13 and 14 on Page eight

12. Simplify the expression below, giving your answer with a positive power.

$$m^5 \times m^{-8}$$

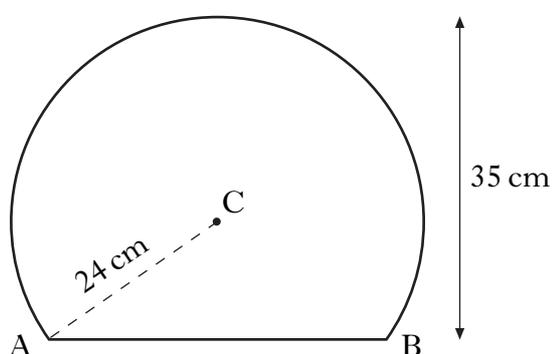
2

13. Solve the equation

$$5 \tan x^\circ - 6 = 2, \quad 0 \leq x < 360.$$

3

14. A mirror is shaped like part of a circle.



The radius of the circle, centre C, is 24 centimetres.
The height of the mirror is 35 centimetres.

Calculate the length of the base of the mirror, represented in the diagram by AB.

3

[END OF QUESTION PAPER]