

X100/201

NATIONAL
QUALIFICATIONS
2010

FRIDAY, 21 MAY
1.00 PM – 1.45 PM

MATHEMATICS
INTERMEDIATE 2
Units 1, 2 and 3
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

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: $\text{Volume} = \frac{4}{3}\pi r^3$

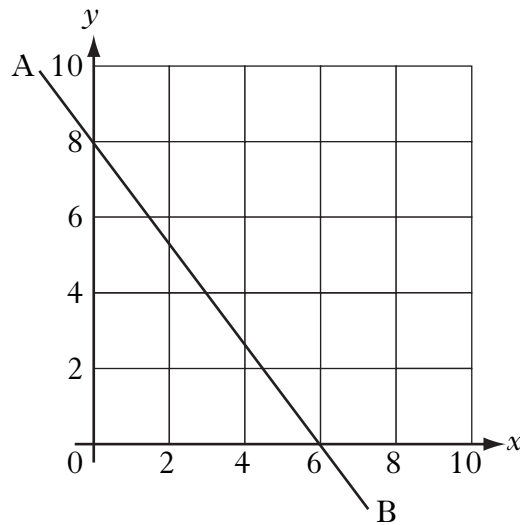
Volume of a cone: $\text{Volume} = \frac{1}{3}\pi r^2 h$

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.

1.



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

3

2. The pupils in a primary class record their shoe sizes as shown below.

8	7	6	5	6
5	7	11	7	7
7	8	7	9	6
8	6	5	9	7

(a) Construct a frequency table from the above data and add a cumulative frequency column.

2

(b) For this data, find:

(i) the median;

1

(ii) the lower quartile;

1

(iii) the upper quartile.

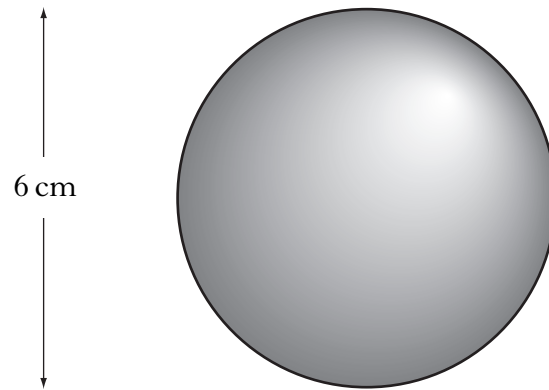
1

(c) Construct a boxplot for this data.

2

[Turn over

3. The diagram below represents a sphere.



The sphere has a diameter of 6 centimetres.

Calculate its volume.

Take $\pi = 3.14$.

2

4. (a) Factorise

$$x^2 + x - 6.$$

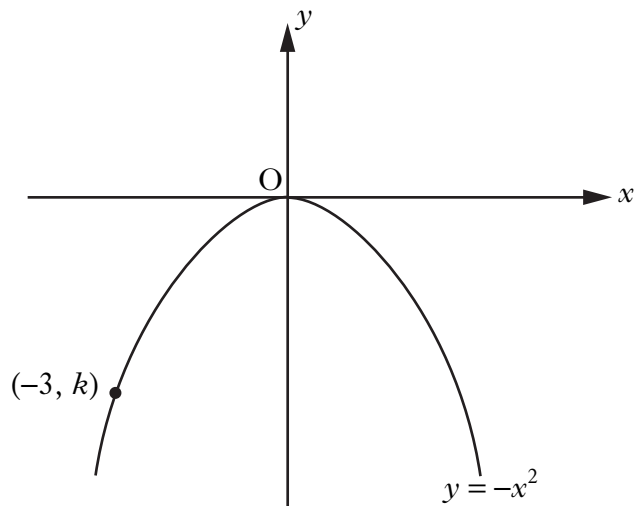
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- (b) Multiply out the brackets and collect like terms.

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

3

5. The diagram below shows the graph of $y = -x^2$.

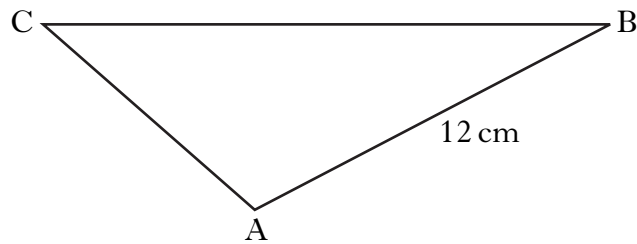


The point $(-3, k)$ lies on the graph.

Find the value of k .

1

6.



In triangle ABC, $AB = 12$ centimetres, $\sin C = \frac{1}{2}$ and $\sin B = \frac{1}{3}$.

Find the length of side AC.

3

[Turn over

7. Express

$$p^3(p^2 - p^{-3})$$

in its simplest form.

2

8. Maria has been asked to find the roots of the equation

$$x^2 + 3x + 5 = 0.$$

She decides to use the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

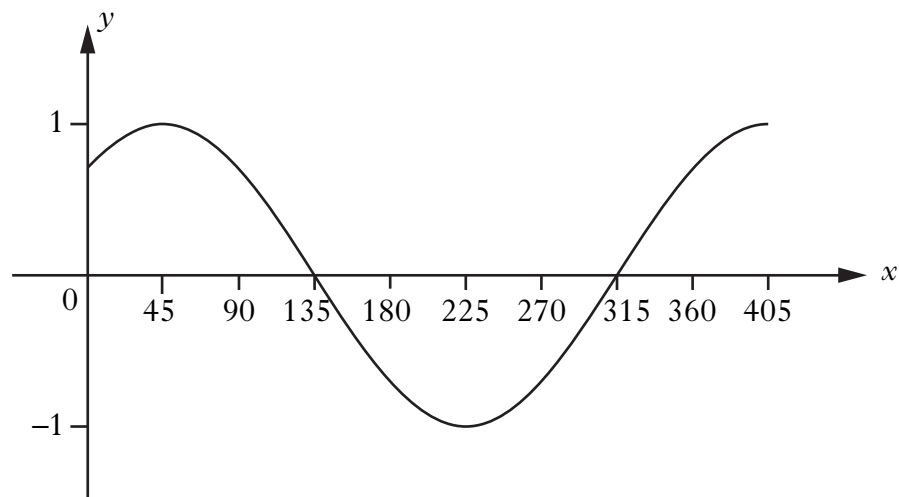
(a) Calculate the value of $b^2 - 4ac$.

1

(b) Now explain why Maria cannot find the roots.

1

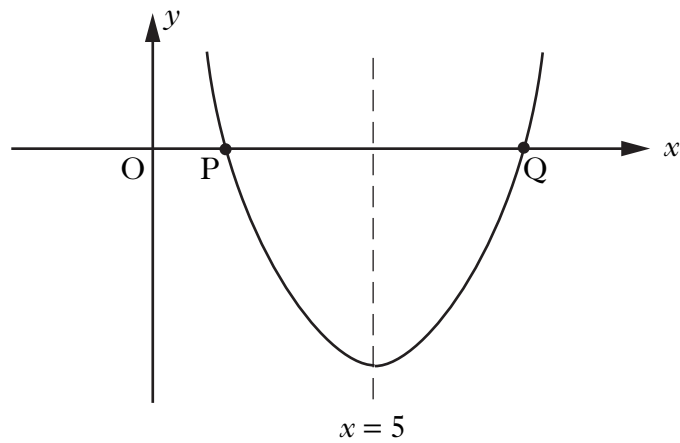
9. The graph shown below has an equation of the form $y = \cos(x - a)^\circ$.



Write down the value of a .

1

10. The graph below shows part of a parabola with equation of the form $y = (x + a)^2 + b$.



The equation of the axis of symmetry of the parabola is $x = 5$.

- | | |
|--|----------|
| (a) State the value of a . | 1 |
| (b) P is the point (2, 0). State the coordinates of Q. | 1 |
| (c) Calculate the value of b . | 2 |

[END OF QUESTION PAPER]