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 $x = \dfrac{-b \pm \sqrt{\left(b^2 - 4ac\right)}}{2a}$

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

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos \mathrm{A}$ or $\cos \mathrm{A} = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: Area $= \frac{1}{2}ab \sin \mathrm{C}$

Volume of a sphere: Volume $= \frac{4}{3}\pi r^3$

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

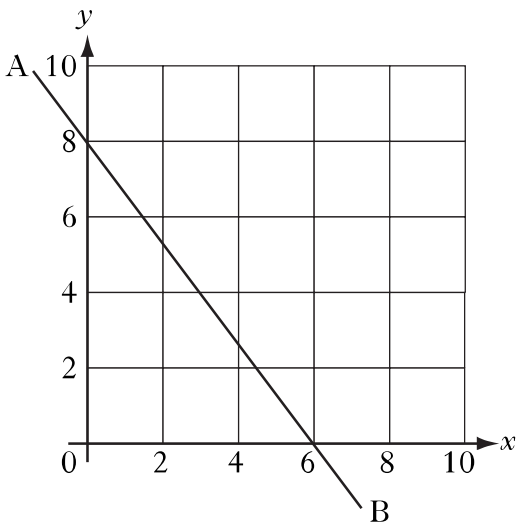
Volume of a cylinder: Volume $= \pi r^2 h$

Standard deviation: $s = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, where n is the sample size.

Marks

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**

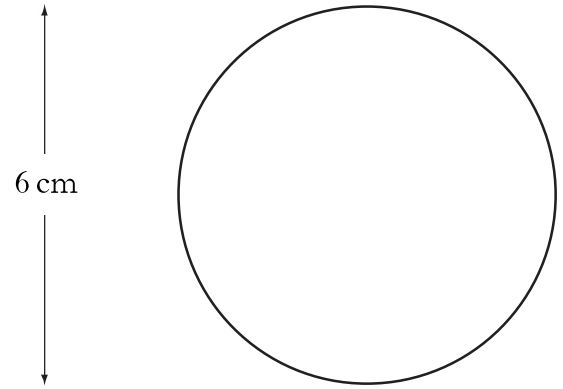
(iii) the upper quartile. **1**

(*c*) Construct a boxplot for this data. **2**

[Turn over

Marks

3. The diagram below represents a sphere.



The sphere has a diameter of 6 centimetres.

Calculate its volume.

Take $\pi = 3{\cdot}14$. **2**

4. (*a*) Factorise

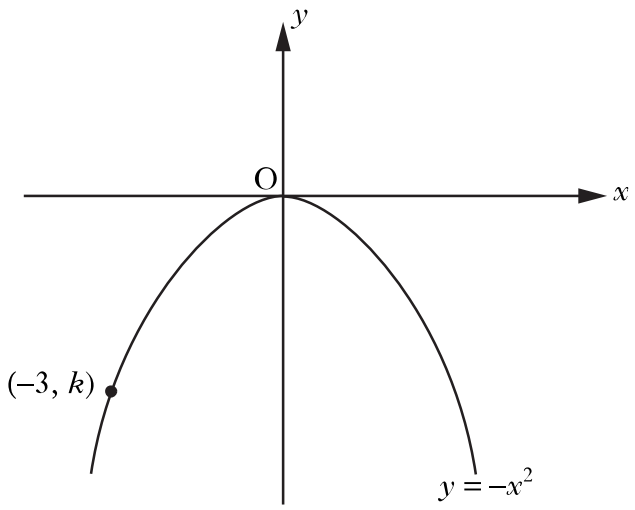
$$x^2 + x - 6.$$ **2**

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

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

Marks

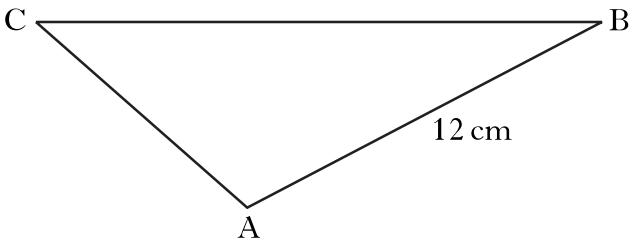
5. The diagram below shows the graph of $y = -x^2$.



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

Marks

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

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

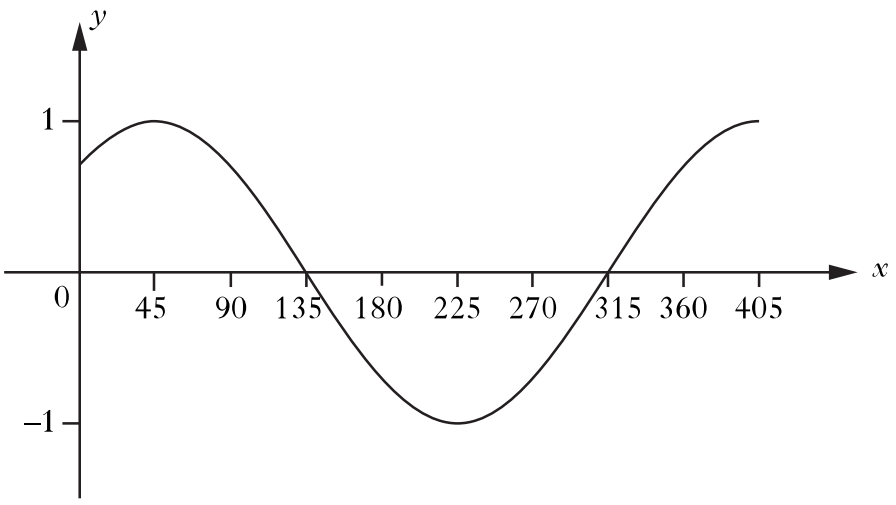
She decides to use the quadratic formula

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

(*a*) Calculate the value of $b^2 - 4ac$. **1**

(*b*) Now explain why Maria cannot find the roots. **1**

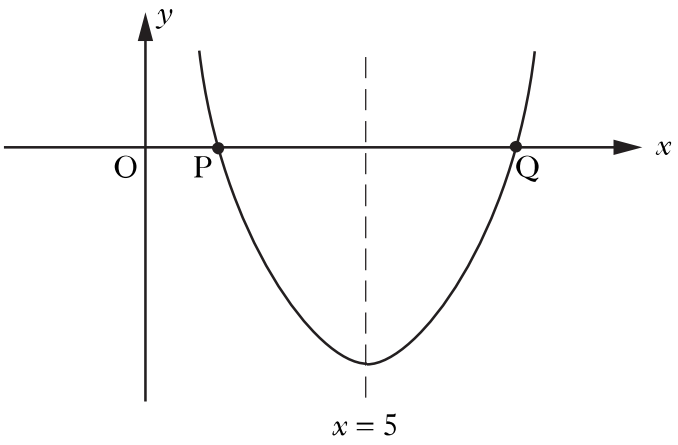
9. The graph shown below has an equation of the form $y = \cos(x - a)°$.



Write down the value of a. **1**

Marks

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*]

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