

X100/201

NATIONAL
QUALIFICATIONS
2011

WEDNESDAY, 18 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. If you make use of this, you should write your name on it clearly and put it inside your answer booklet.



FORMULAE LIST

The roots of $ax^2 + bx + c^2 = 0$ 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. Sandi takes the bus to work each day.

Over a two week period, she records the number of minutes the bus is late each day. The results are shown below.

5 6 15 0 6 11 2 9 8 7

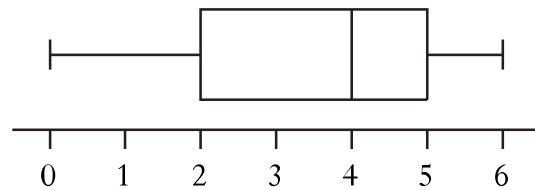
- (a) From the above data, find:

- (i) the median; 1
 (ii) the lower quartile; 1
 (iii) the upper quartile. 1

- (b) Construct a boxplot for the data. 2

Sandi decides to take the train over the next two week period and records the number of minutes the train is late each day.

The boxplot, drawn below, was constructed for the new data.



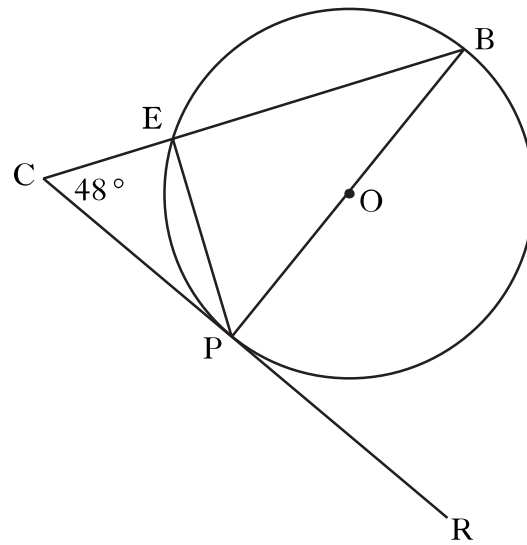
- (c) Compare the two boxplots and comment. 1

2. Multiply out the brackets and collect like terms.

$$5x + (3x + 2)(2x - 7) \quad \text{3}$$

[Turn over

3. A circle, centre O, is shown below.



In the circle

- PB is a diameter
- CR is a tangent to the circle at point P
- Angle BCP is 48° .

Calculate the size of angle EPR.

3

4. Three of the following have the same value.

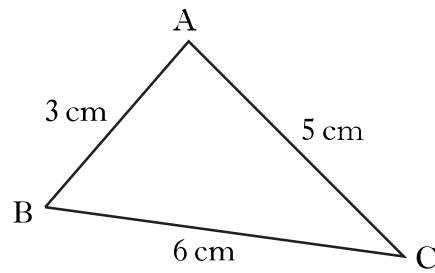
$$2\sqrt{6}, \quad \sqrt{2} \times \sqrt{12}, \quad 3\sqrt{8}, \quad \sqrt{24}.$$

Which one has a different value?

You must give a reason for your answer.

2

5.



In triangle ABC, show that $\cos B = \frac{5}{9}$.

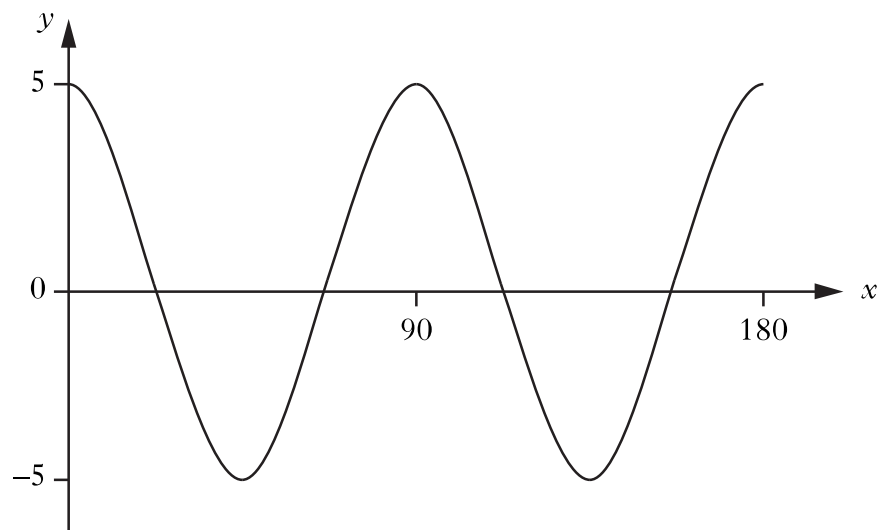
3

6. Evaluate

$$9^{\frac{3}{2}}$$

2

7. Part of the graph of $y = a \cos bx^\circ$ is shown in the diagram.



State the values of a and b .

2

[Turn over

8. A straight line is represented by the equation $y = mx + c$.

Sketch a possible straight line graph to illustrate this equation when $m > 0$ and $c < 0$.

2

9. (a) Factorise $x^2 - 4x - 21$.

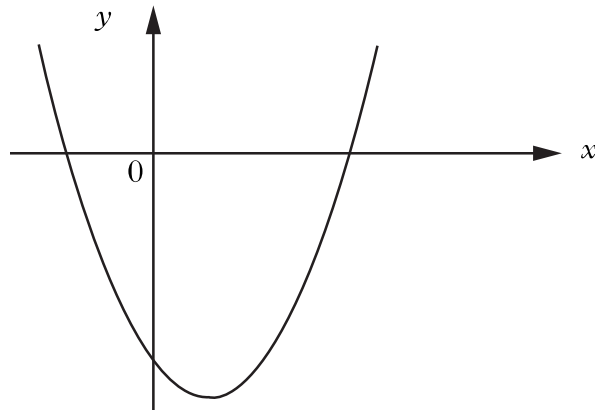
2

(b) Hence write down the roots of the equation

$$x^2 - 4x - 21 = 0.$$

1

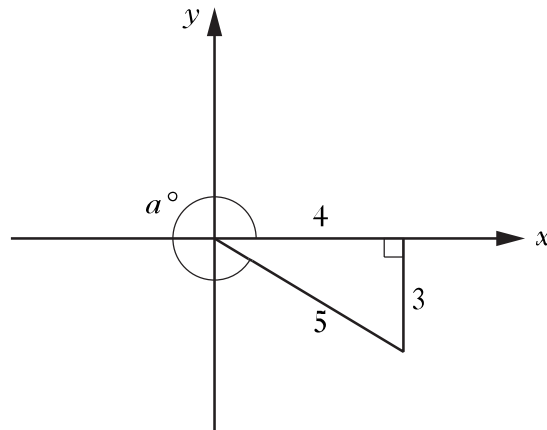
(c) The graph of $y = x^2 - 4x - 21$ is shown in the diagram.



Find the coordinates of the turning point.

3

10.



Write down the value of $\cos a^\circ$.

1

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