X100/201

NATIONAL QUALIFICATIONS 2008

TUESDAY, 20 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. A straight line has equation $y = 4x + 5$.
State the gradient of this line. **1**

2. Multiply out the brackets and collect like terms.

$$(3x + 2)(x - 5) + 8x$$ **3**

3. The stem and leaf diagram shows the number of points gained by the football teams in the Premiership League in a season.

3	3 3 3 9
4	1 4 5 5 7 8
5	0 2 3 3 6 6
6	0
7	5 9
8	
9	0

n = 20 4 | 1 represents 41 points

(*a*) Arsenal finished 1st in the Premiership with 90 points.
In what position did Southampton finish if they gained 47 points? **1**

(*b*) What is the probability that a team chosen at random scored less than 44 points? **1**

4. (*a*) Factorise

$$x^2 - y^2.$$ **1**

(*b*) Hence, or otherwise, find the value of

$$9{\cdot}3^2 - 0{\cdot}7^2.$$ **2**

[Turn over

Marks

5. In a survey, the number of books carried by each girl in a group of students was recorded.

The results are shown in the frequency table below.

Number of books	*Frequency*
0	1
1	2
2	3
3	5
4	5
5	6
6	2
7	1

(*a*) Copy this frequency table and add a cumulative frequency column. **1**

(*b*) For this data, find:

(i) the median; **1**

(ii) the lower quartile; **1**

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

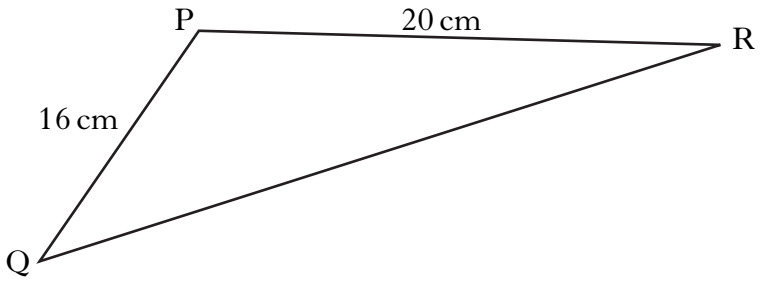
(*c*) Calculate the semi-interquartile range. **1**

(*d*) In the same survey, the number of books carried by each boy was also recorded.

The semi-interquartile range was 0·75.

Make an appropriate comment comparing the distribution of data for the girls and the boys. **1**

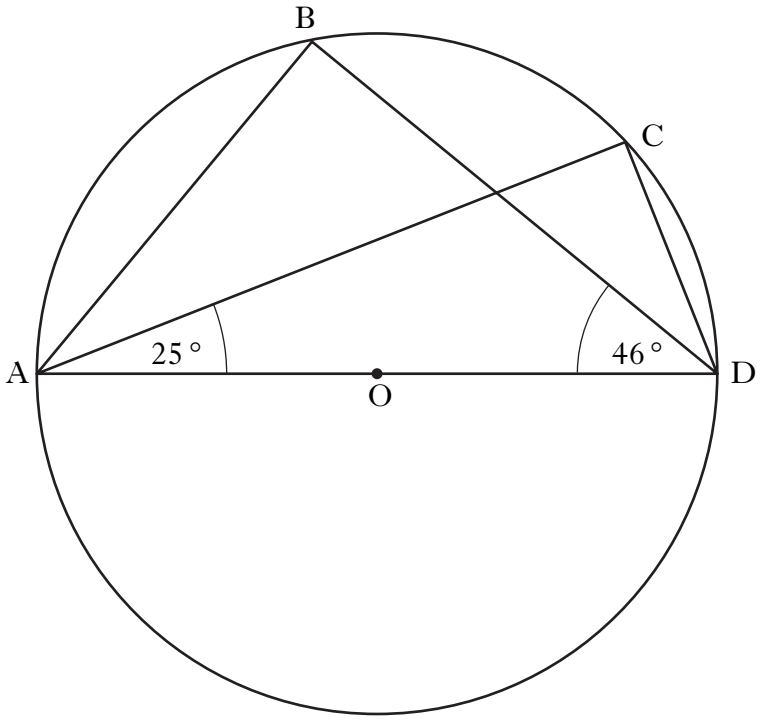
6. Triangle PQR is shown below.



If $\sin P = \frac{1}{4}$, calculate the area of triangle PQR. **2**

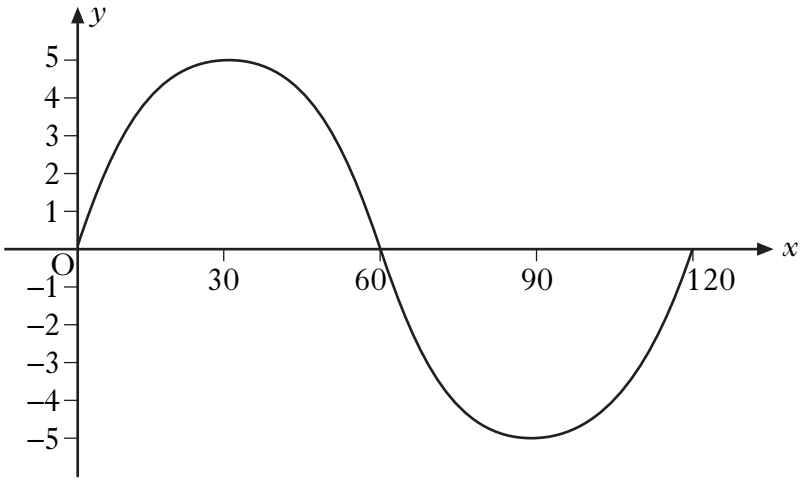
Marks

7.



AD is a diameter of a circle, centre O.
B and C are points on the circumference of the circle.
Angle CAD = 25 °.
Angle BDA = 46 °.
Calculate the size of angle BAC. **3**

8. Part of the graph of $y = a \sin bx°$ is shown in the diagram.



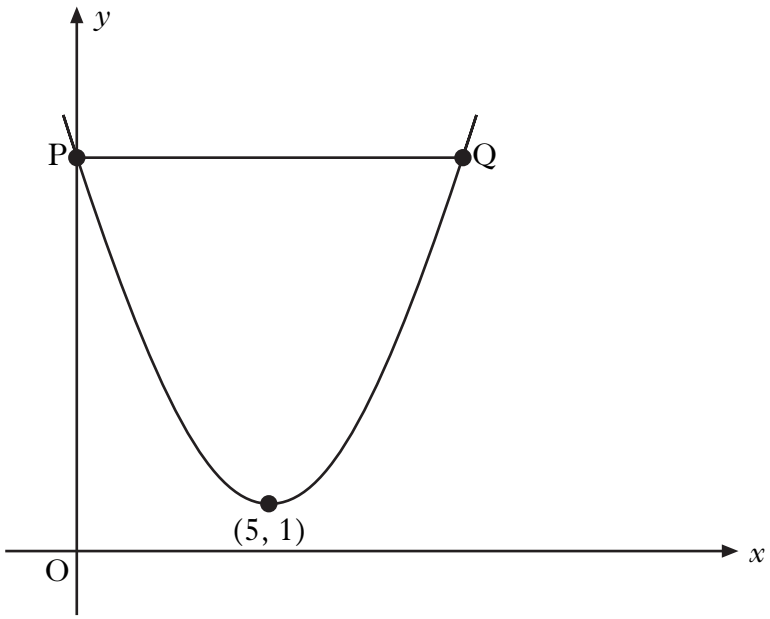
State the values of a and b. **2**

[Turn over for Questions 9 and 10 on *Page six*

Marks

9. The graph below shows part of a parabola with equation of the form

$$y = (x + a)^2 + b.$$



(*a*) State the values of *a* and *b*. **2**

(*b*) State the equation of the axis of symmetry of the parabola. **1**

(*c*) The line PQ is parallel to the *x*-axis.
Find the coordinates of points P and Q. **3**

10. If $\sin x° = \frac{4}{5}$ and $\cos x° = \frac{3}{5}$, calculate the value of $\tan x°$. **2**

[*END OF QUESTION PAPER*]

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