X101/202

NATIONAL QUALIFICATIONS 2008

TUESDAY, 20 MAY
1.00 PM – 1.45 PM

MATHEMATICS
INTERMEDIATE 2
Units 1, 2 and
Applications of Mathematics
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

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: Area $= \frac{1}{2}ab \sin C$

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

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**

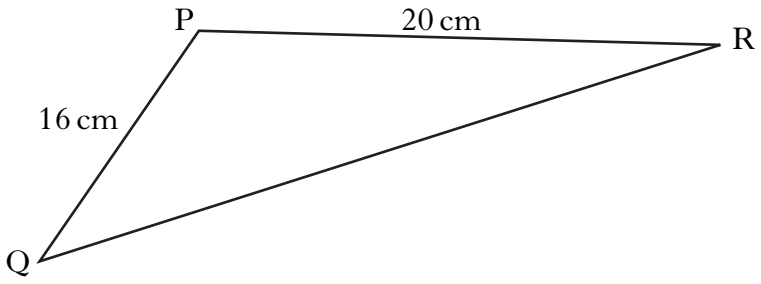
(*c*) Calculate the semi-interquartile range. **1**

(*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**

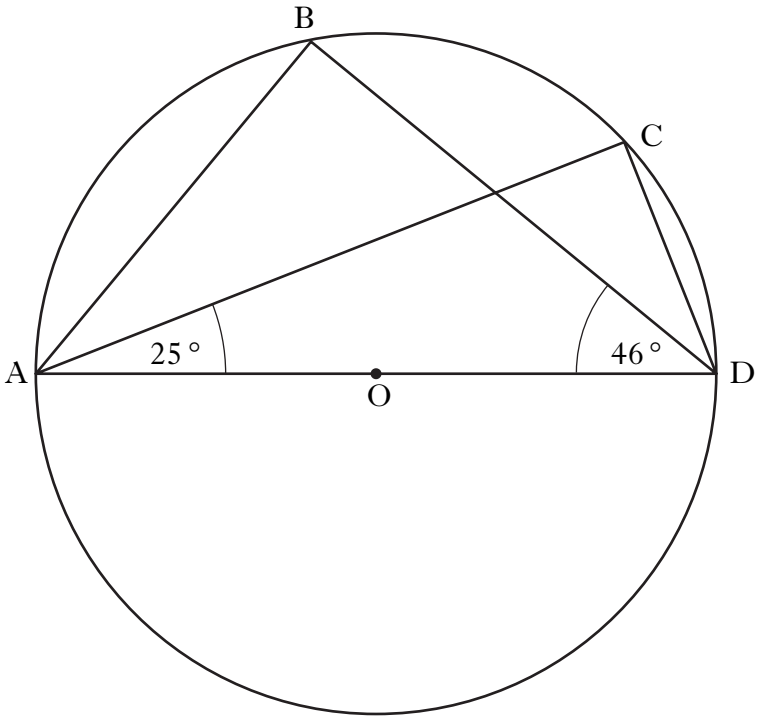
6. Triangle PQR is shown below.



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

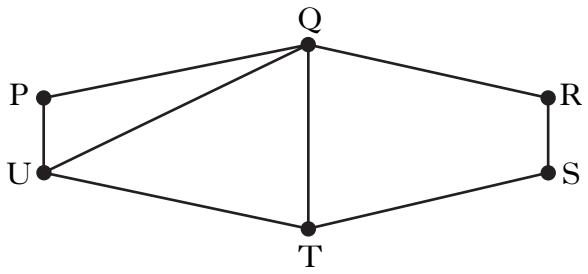
Marks

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. A network diagram is shown below.



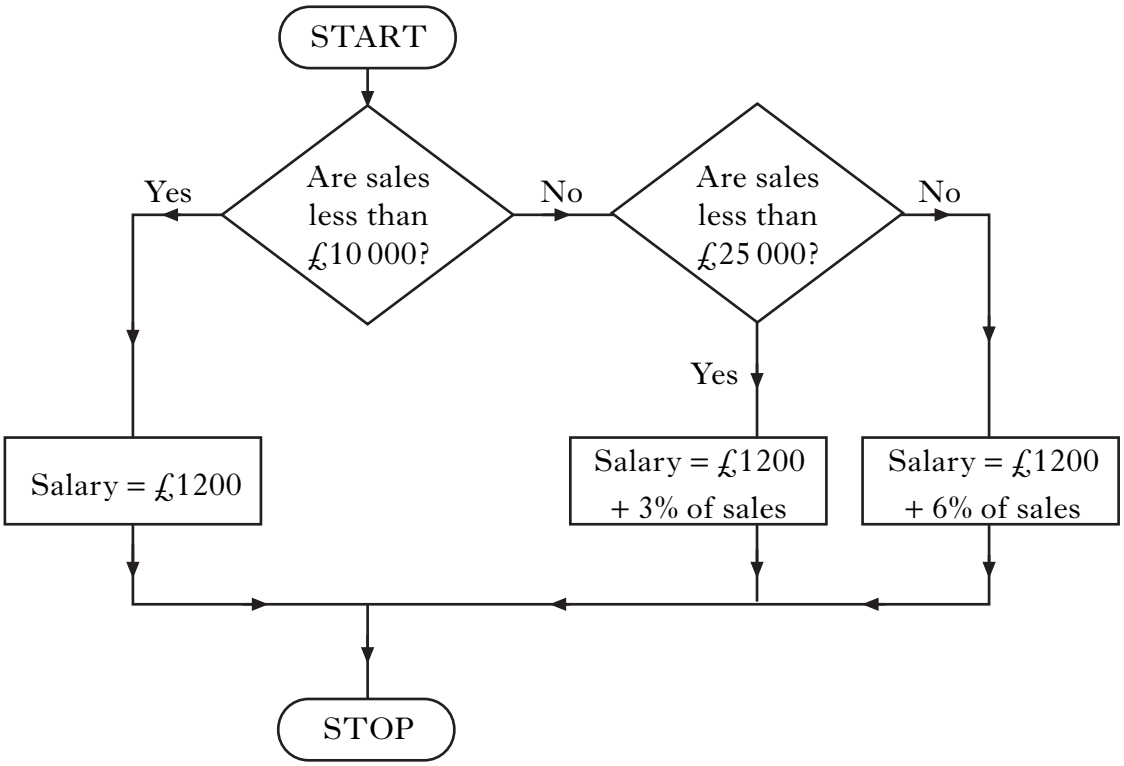
Write down the letters which represent the **odd** nodes. **1**

[Turn over

Marks

9. Jamie works for a firm which pays its employees a basic salary of £1200 per month plus commission on sales.

The flowchart below shows how the salaries are calculated.

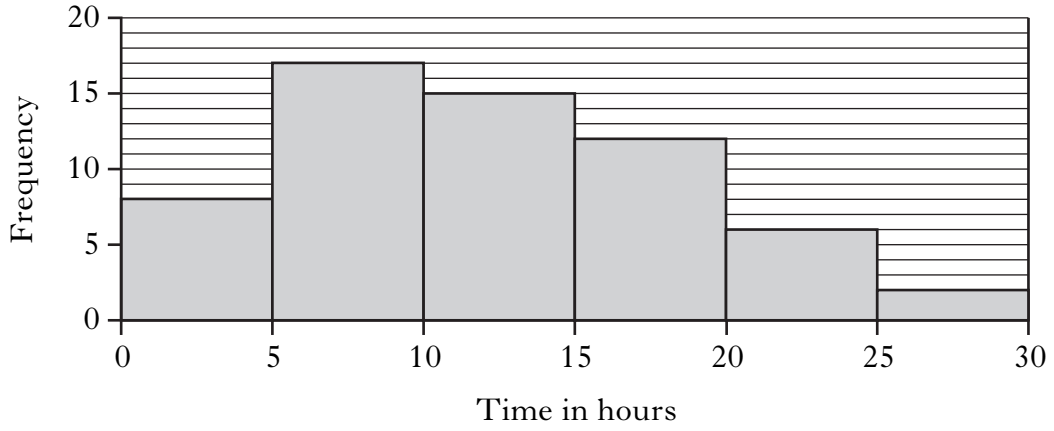


One month Jamie's sales are £40 000.

Calculate his salary for that month. **2**

Marks

10. A group of students was asked how many hours they spend studying each week. The histogram below shows the results of the survey.



The **same** group of students was asked how many hours of television they watch each week.

The results of the survey are shown in the table below.

Time (h hours)	Frequency
$0 \leq h < 5$	1
$5 \leq h < 10$	4
$10 \leq h < 15$	9
$15 \leq h < 20$	20
$20 \leq h < 25$	14
$25 \leq h < 30$	12

(*a*) Using squared paper, draw a histogram to illustrate the results of this survey. **2**

(*b*) For the histogram you have drawn, estimate the mode to the nearest hour. **1**

(*c*) Compare the two histograms and comment. **1**

11. The sum of the terms of a sequence of numbers is given by the formula

$$S = \frac{a(r^n - 1)}{r - 1}.$$

Calculate S when $a = 3$, $r = 2$ and $n = 4$. **3**

[*END OF QUESTION PAPER*]

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