X100/201

NATIONAL QUALIFICATIONS 2004

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.

LIB X100/201 6/22420

SCOTTISH QUALIFICATIONS AUTHORITY

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{\left(b^2 - 4ac\right)}}{2a}$

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

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

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

Marks

ALL questions should be attempted.

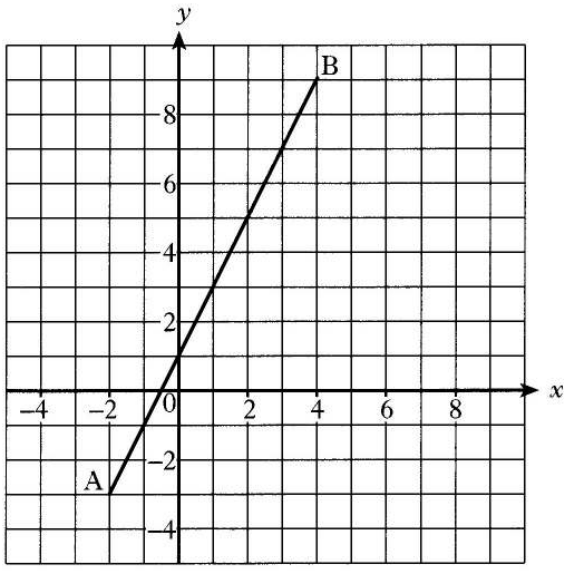
1. In a class test, the following marks were recorded.

5	9	10	4	5	5	6	10	5	8
5	7	4	9	7	5	4	6	5	7

(*a*) Construct a frequency table for the above data and add a cumulative frequency column. **2**

(*b*) What is the probability that a student, chosen at random from this class, obtained a mark higher than 7? **1**

2.

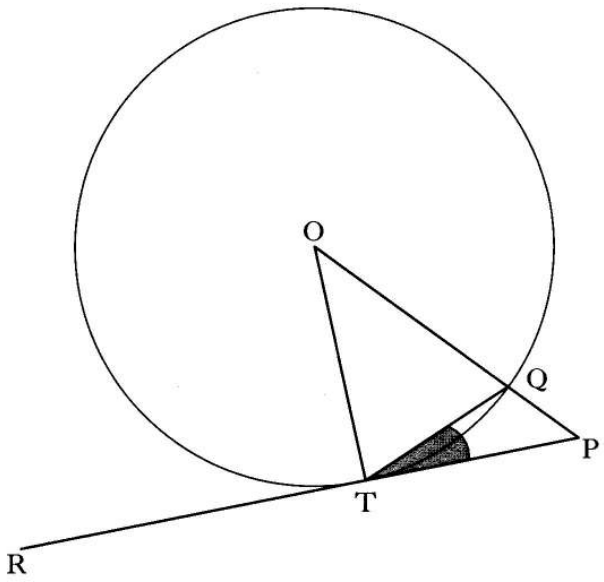


Find the equation of the straight line AB. **3**

[Turn over

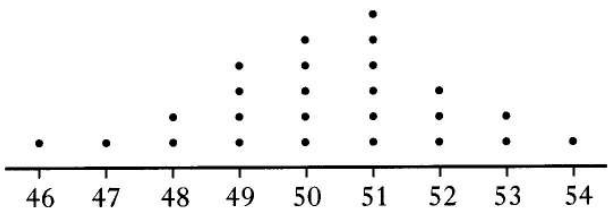
Marks

3.



RP is a tangent to the circle, centre O, with a point of contact T.
The shaded angle PTQ = 24°.
Calculate the size of angle OPT. **3**

4. The number of chocolates in each box from a sample of 25 boxes was counted.
The results are displayed in the dotplot below.



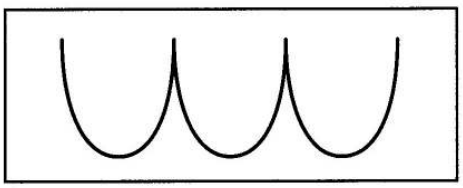
(*a*) For this sample find:
(i) the median; **1**
(ii) the lower quartile; **1**
(iii) the upper quartile. **1**

(*b*) Use the data from this sample to construct a boxplot. **2**

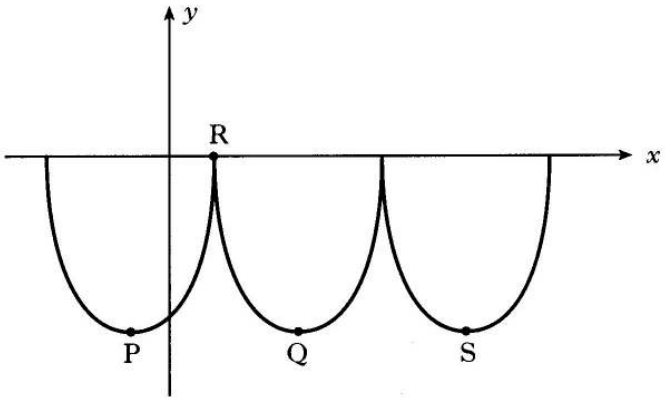
(*c*) In a second sample of boxes, the semi-interquartile range was 1·5.
Make an appropriate comment about the distribution of data in the two samples. **2**

Marks

5. William Watson's Fast Foods use a logo based on parts of three identical parabolas.



This logo is represented on the diagram below.



The first parabola has turning point P and equation $y = (x + 2)^2 - 16$.

(*a*) State the coordinates of P. **2**

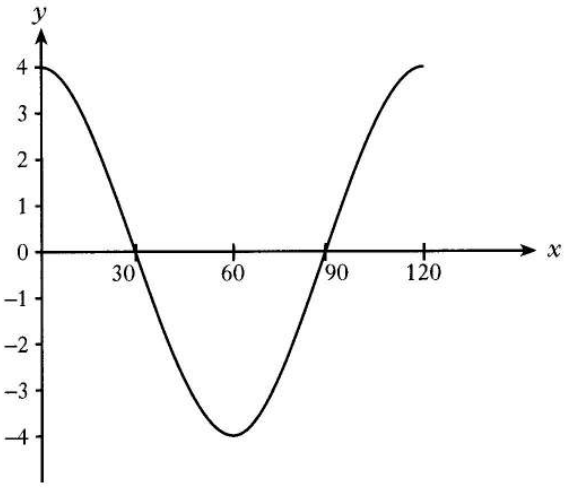
(*b*) If R is the point (2, 0), find the coordinates of Q, the minimum turning point of the second parabola. **1**

(*c*) Find the equation of the parabola with turning point S. **2**

[Turn over for Question 6 on *Page six*

Marks

6. (*a*) Part of the graph of $y = b\cos ax°$ is shown in the diagram.



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

(*b*) Express $\sqrt{12}+5\sqrt{3}-\sqrt{27}$ as a surd in its simplest form. **3**

[END OF QUESTION PAPER]

X100/203

NATIONAL QUALIFICATIONS 2004

FRIDAY, 21 MAY
2.05 PM – 3.35 PM

MATHEMATICS
INTERMEDIATE 2
Units 1, 2 and 3
Paper 2

Read carefully

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LIB X100/203 6/22420

SCOTTISH QUALIFICATIONS AUTHORITY

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ALL questions should be attempted.

Marks

1. The average Scottish house price is £77 900.
The average price is expected to rise by 2·5% per month. What will the average Scottish house price be in 3 months?
Give your answer correct to three significant figures. **3**

2. The heights, in millimetres, of six seedlings are given below.

15 18 14 17 16 19

(*a*) Calculate:
(i) the mean; **1**
(ii) the standard deviation; **3**
of these heights.
Show clearly all your working.

(*b*) Later the same six seedlings are measured again.
Each has grown by 4 millimetres.
State:
(i) the mean; **1**
(ii) the standard deviation; **1**
of the new heights.

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

$$5x + (x - 4)(3x + 1)$$ **3**

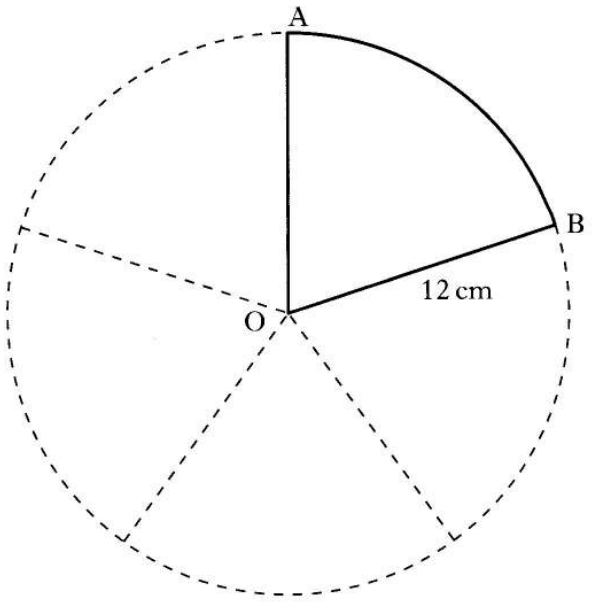
(*b*) Factorise

$$3x^2 - 7x + 2.$$ **2**

[Turn over

Marks

4.



A circle, with centre O and radius 12 centimetres, is cut into 5 equal sectors.
Calculate the perimeter of sector OAB. **3**

5. A sports centre charges different entrance fees for adults and children.

(*a*) One evening 14 adults and 4 children visited the sports centre. The total collected in entrance fees was £55·00.

Let £x be the adult's entrance fee and £y be the child's entrance fee.

Write down an equation in x and y which represents the above condition. **1**

(*b*) The following evening 13 adults and 6 children visited the sports centre. The total collected in entrance fees was £54·50.

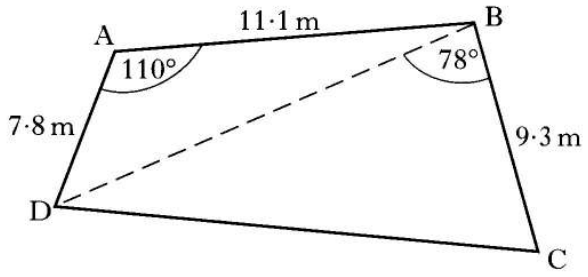
Write down a second equation in x and y which represents the above condition. **1**

(*c*) Calculate the entrance fee for an adult and the entrance fee for a child. **4**

Marks

6. Solve the equation $2x^2 + 7x - 3 = 0$, giving the roots correct to one decimal place. **4**

7. A garden, in the shape of a quadrilateral, is represented in the diagram below.



Calculate:

(*a*) the length of the diagonal BD;

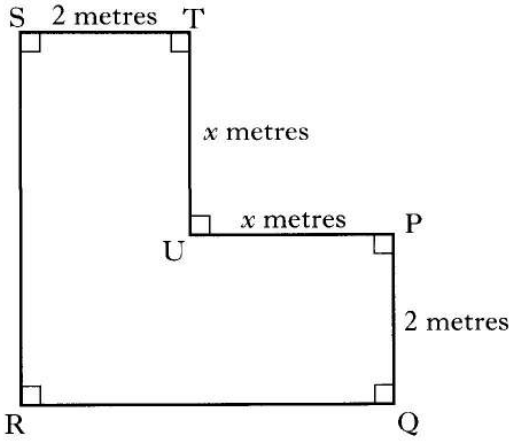
Do not use a scale drawing **3**

(*b*) the area of the garden. **4**

[Turn over

Marks

8. The diagram shows an L-shaped metal plate.



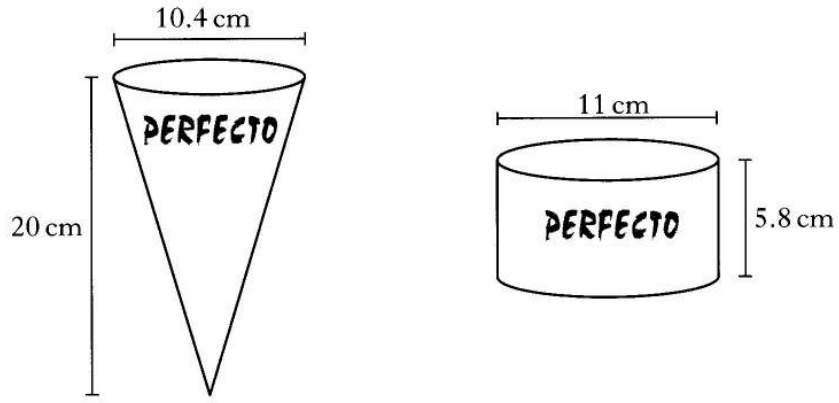
PQ = ST = 2 metres
TU = UP = x metres

(*a*) Show that the area, A square metres, of the metal plate is given by

$$A = 4x + 4.$$ **2**

(*b*) The area of the metal plate is 18 square metres.
Find x. **1**

9. Perfecto Ice Cream is sold in cones and cylindrical tubs with measurements as shown below.



Both the cone and the tub of ice cream cost the same.
Which container of ice cream is better value for money?
Give a reason for your answer. **5**

Marks

10. Solve the following equation for $0 \leq x \leq 360$.

$$7 \sin x^\circ - 3 = 0$$ **3**

11. (*a*) Express $\frac{4}{x+3} + \frac{3}{x}$, $x \neq -3$, $x \neq 0$,

as a single fraction in its simplest form. **3**

(*b*) Change the subject of the formula $m = \frac{3x+2y}{p}$ to x. **3**

(*c*) Simplify $\frac{3a^5 \times 2a}{a^2}$ **3**

[END OF QUESTION PAPER]