# X056/201

NATIONAL QUALIFICATIONS 2001

THURSDAY, 17 MAY
9.00 AM – 9.45 AM

# 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.

SCOTTISH QUALIFICATIONS AUTHORITY


LIB X056/201 6/22870

**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.

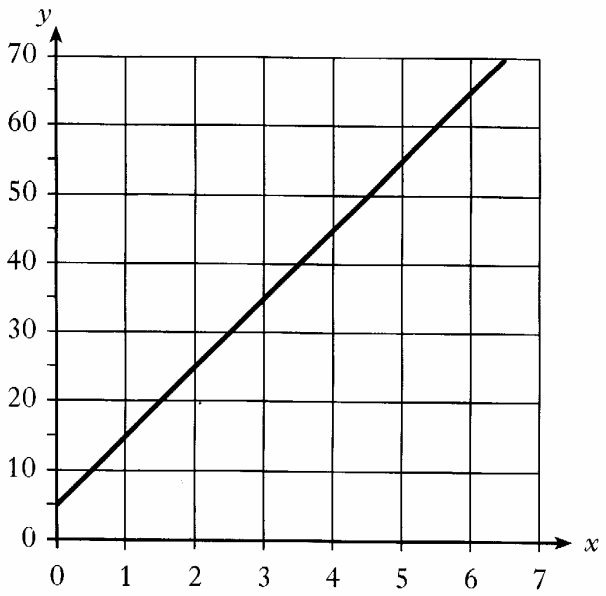
**ALL questions should be attempted.**

*Marks*

**1.** Factorise

$x^2 + 2x - 15$. **2**

**2.**




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

**3.** Find the point of intersection of the straight lines with equations $2x + y = 5$ and $x - 3y = 6$. **4**

**4.** $P = R^2b - 5$

Change the subject of the formula to $R$. **3**

**[Turn over**

*Marks*

**5.** The stem and leaf diagram shows the amounts of money spent by customers in a shop.

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

$n = 33$ 2|1 represents 21 pence

(*a*) Using the above information, find

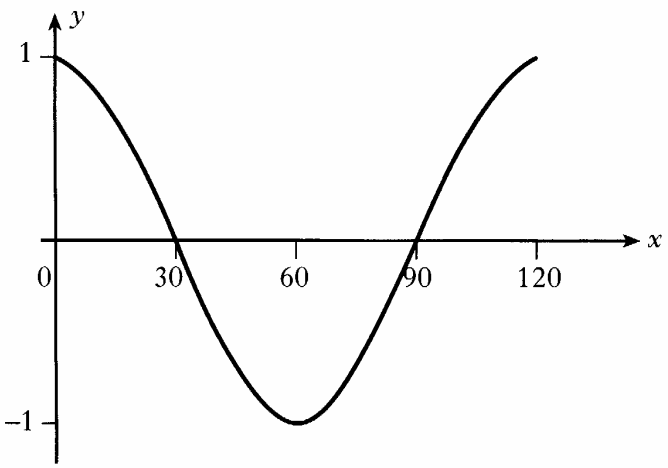
(i) the median **1**

(ii) the lower quartile and the upper quartile **2**

(iii) the semi-interquartile range. **2**

(*b*) What is the probability that a customer chosen at random spent more than 80 pence? **1**

**6.**

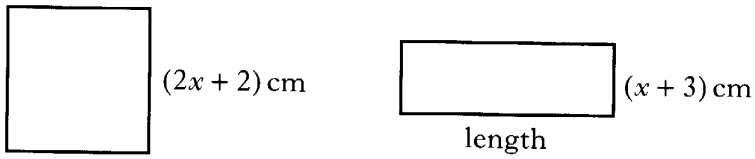



Part of the graph of $y = \cos bx°$ is shown in the diagram.

State the value of $b$. **1**

*Marks*

**7.** The square and rectangle shown below have the same **perimeter**.




Show that the length of the rectangle is $(3x + 1)$ centimetres. **2**

**8.** (*a*) Express $\frac{3}{x} - \frac{5}{x+2}$, $x \neq 0$, $x \neq -2$, as a single fraction in its simplest form. **3**

(*b*) Express $\sqrt{18} - \sqrt{2} + \sqrt{72}$ as a surd in its simplest form. **3**

*[END OF QUESTION PAPER]*

# X056/203

NATIONAL QUALIFICATIONS 2001

THURSDAY, 17 MAY
10.05 AM – 11.35 AM

# MATHEMATICS
## INTERMEDIATE 2
Units 1, 2 and 3
Paper 2

**Read carefully**

1 **Calculators may be used in this paper.**

2 Full credit will be given only where the solution contains appropriate working.

3 Square-ruled paper is provided.

SCOTTISH QUALIFICATIONS AUTHORITY



LIB X056/203 6/22870

**FORMULAE LIST**

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

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

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

**ALL questions should be attempted.**

*Marks*

**1.** The population of a city is increasing at a steady rate of 2·4% per annum. The present population is 528 000.

What is the expected population in 4 years time?

Give your answer to the nearest thousand. **3**

**2.** Two groups of six students are given the same test.

(*a*) The marks of Group A are

73 47 59 71 48 62.

Use an appropriate formula to calculate the mean and the standard deviation.

**Show clearly all your working.** **4**

(*b*) In Group B, the mean is 60 and the standard deviation is 29·8.

Compare the results of the two groups. **2**

**3.** The contents of twenty matchboxes were counted.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 44 | 44 | 46 | 45 | 47 | 48 | 47 | 41 | 48 | 45 |
| 45 | ~~44~~ | 42 | 43 | 44 | 46 | 46 | 43 | 49 | 45 |

(*a*) Construct a dot plot for the data. **2**

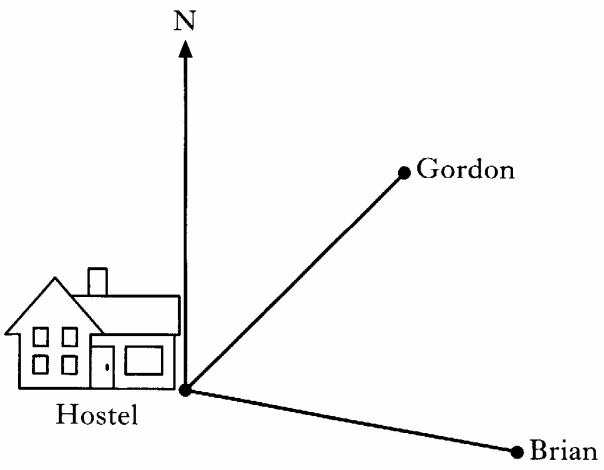
(*b*) Describe the shape of the distribution. **1**

(*c*) What would you expect the "average contents per matchbox" to be ? **1**

**[Turn over**

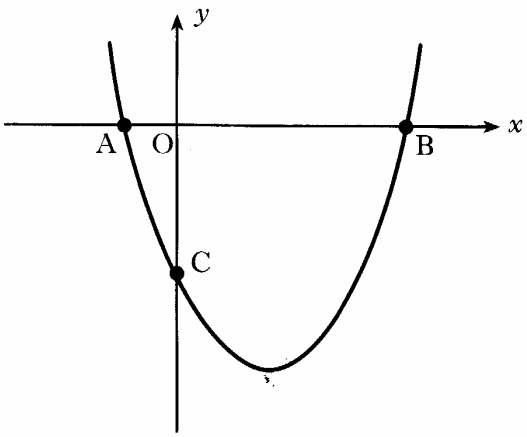
*Marks*

**4.** Gordon and Brian leave a hostel at the same time.
Gordon walks on a bearing of 045° at a speed of 4·4 kilometres per hour.
Brian walks on a bearing of 100° at a speed of 4·8 kilometres per hour.




If they both walk at steady speeds, how far apart will they be after 2 hours? **5**

**5.**




The equation of the parabola in the above diagram is

$$y = (x-2)^2 - 9.$$

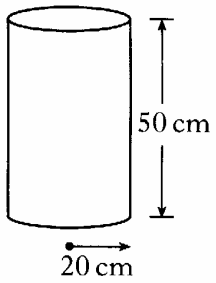
(*a*) State the coordinates of the minimum turning point of the parabola. **2**

(*b*) Find the coordinates of C. **2**

(*c*) A is the point (–1, 0). State the coordinates of B. **1**

*Mark*

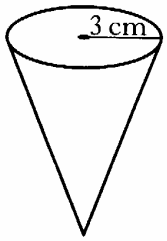
**6.** A drinks container is in the shape of a cylinder with radius 20 centimetres and height 50 centimetres.




(*a*) Calculate the volume of the drinks container.

Give your answer in cubic centimetres, correct to two significant figures. **3**

(*b*) Liquid from the full container can fill 800 cups, in the shape of cones, each of radius 3 centimetres.




What will be the height of liquid in each cup? **4**

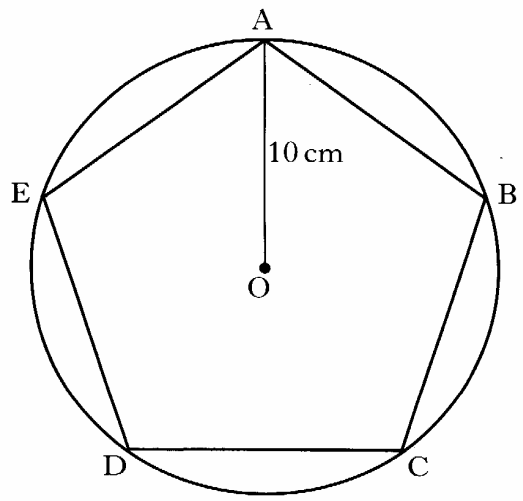
**7.** Multiply out the brackets and collect like terms.

$(x + 4)(2x^2 + 3x - 1)$ **3**

**[Turn over**

*Marks*

**8.**




A regular pentagon ABCDE is drawn in a circle, centre O, with radius 10 centimetres.
Calculate the area of the regular pentagon. **5**

**9.** (*a*) Express $a^2(2a^{-\frac{1}{2}} + a)$ in its simplest form. **2**

(*b*) Solve the quadratic equation

$$3x^2 + 3x - 7 = 0$$

using an appropriate formula.
Give your answers correct to 1 decimal place. **4**

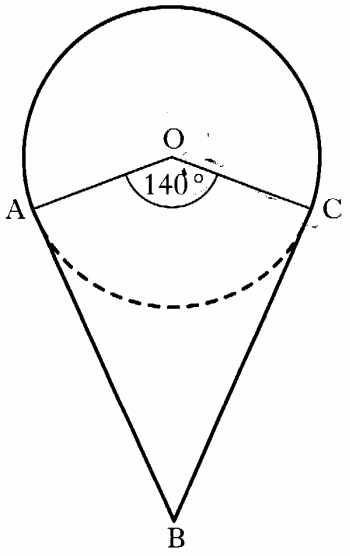
*Marks*

**10.** **The diagram** shows a mirror which **has been** designed for a new hotel.

**The shape** consists of a sector of a **circle and** a kite AOCB.

- **The** circle, centre O, has a radius **of 50** centimetres.
- **Angle** AOC = 140°.
- **AB** and CB are tangents to the **circle** at A and C respectively.

**Find the** perimeter of the mirror. **5**




**11.** (*a*) Solve the equation

$$4\tan x^\circ + 5 = 0, \qquad 0 \leq x \leq 360.$$ **3**

(*b*) Show that

$$\tan x^\circ \cos x^\circ = \sin x^\circ.$$ **2**

*[END OF QUESTION PAPER]*