

For OCR

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
MATHEMATICS**

Higher Paper 3A

H

Time: 2 hours

Candidates answer on the question paper.
Additional materials: Geometrical instruments
Tracing paper (optional)

Name

INSTRUCTIONS TO CANDIDATES

- Write your name in the box above.
- Answer **all** the questions.
- Read each question carefully.
- Show all your working. Marks may be given for working even if you get the answer wrong.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED.**

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 100.



WARNING You are not allowed to use a calculator in this paper.

*Churchill
Maths*

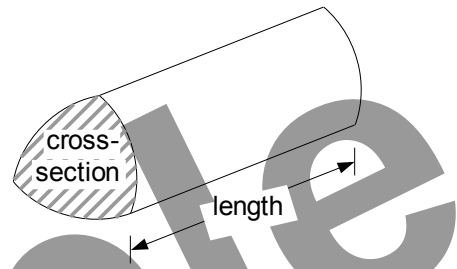


Written by Shaun Armstrong

Only to be copied for use in the purchaser's school or college

FORMULAE SHEET

Volume of prism = (area of cross-section) \times length

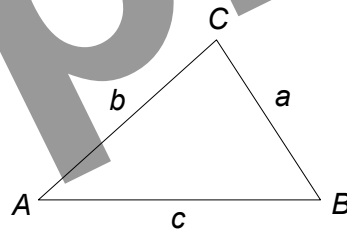


In any triangle ABC

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

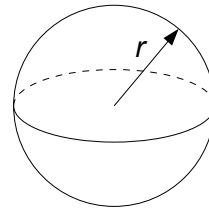
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



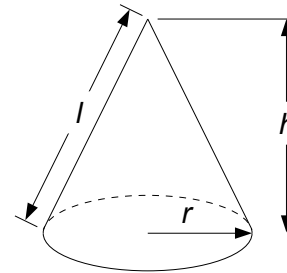
Volume of sphere = $\frac{4}{3} \pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area of cone = $\pi r l$

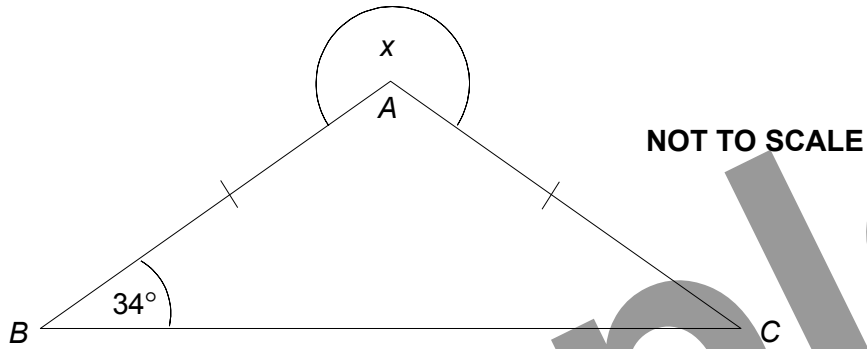


The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1



In the diagram, $AB = AC$ and angle $ABC = 34^\circ$.

Find the size of the angle marked x .

.....° [3]

2 (a) Express 56 as the product of its prime factors.

(a) [2]

(b) Find the Highest Common Factor (HCF) of 56 and 84.

(b) [2]

[Turn over

Mathematical Instruments



Instrument Set
£2.80 + VAT

A set of mathematical instruments costs £2.80 plus $17\frac{1}{2}\%$ VAT.

- (a) Calculate the total cost of the set of instruments.

(a) £ [3]

A school wants to buy 470 sets of mathematical instruments.
They buy them in boxes of 40

- (b) Work out the number of boxes the school should buy.

(b) [2]

[Turn over

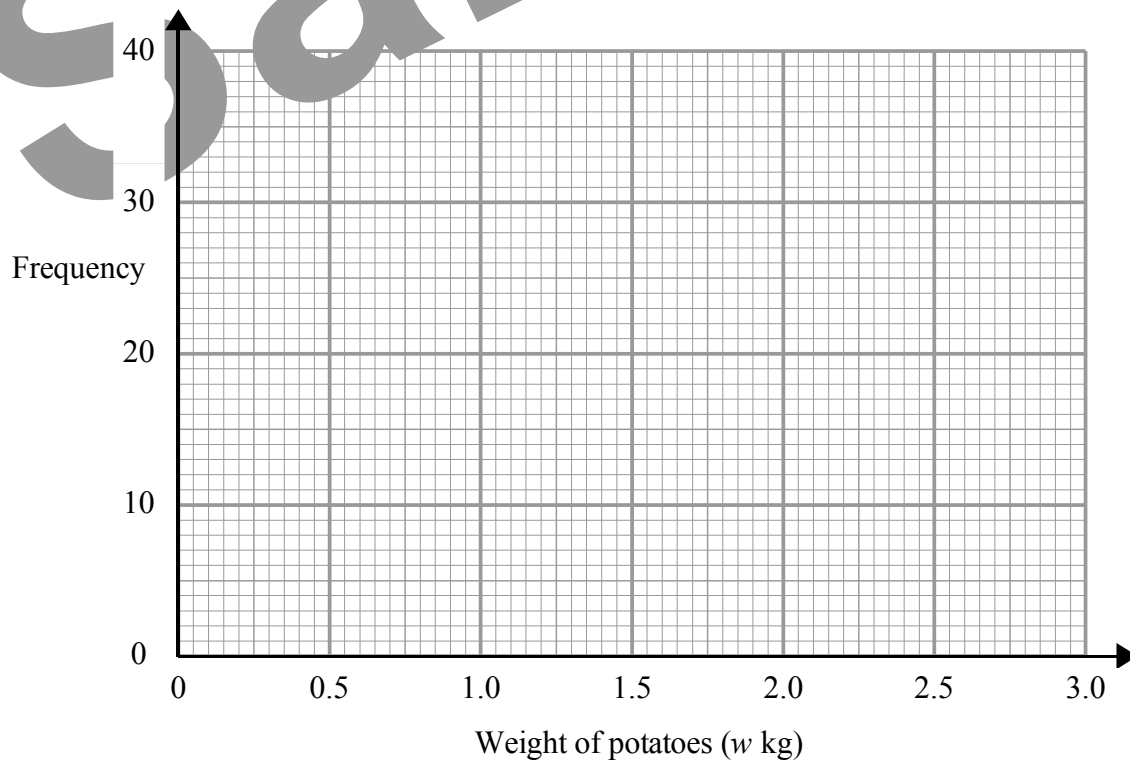
- 9 A supermarket records the weight (w kg) of loose potatoes bought by 100 customers. The results are shown in the table.

Weight of potatoes (w kg)	Frequency
$0.5 < w \leq 1.0$	6
$1.0 < w \leq 1.5$	21
$1.5 < w \leq 2.0$	34
$2.0 < w \leq 2.5$	23
$2.5 < w \leq 3.0$	16

- (a) What percentage of these customers bought more than 2.5 kg of potatoes?

(a) % [1]

- (b) On the grid, draw a frequency diagram to represent the data in the table.



[2]

[Turn over

12 (a) Simplify $(2a)^2$

(a) [1]

(b) Simplify $\frac{x^5 \times x^2}{x^3}$

(b) [1]

(c) Expand $y^2(3y - 2)$

(c) [1]

(d) Solve $5p + 9 = p - 3$

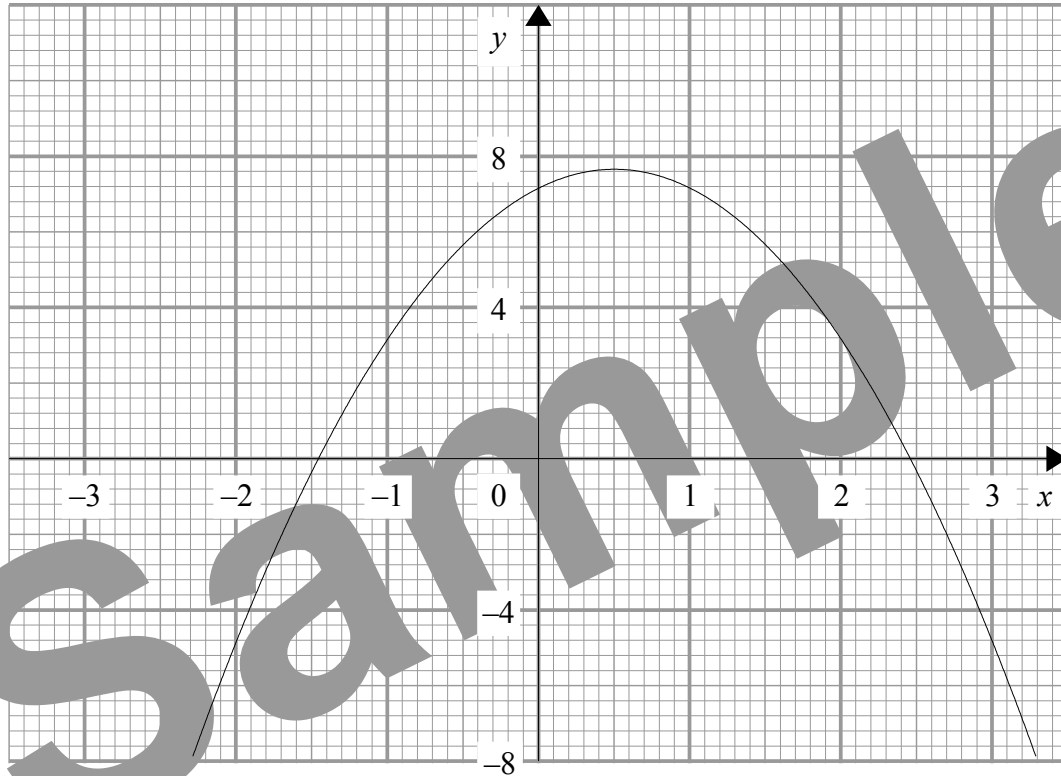
(d) [3]

(e) Show that $x^2 - 8x + 19$ can be written in the form $(x + a)^2 + b$ for all values of x .
State the value of a and the value of b .

(e) $a = \dots\dots\dots$, $b = \dots\dots\dots$ [3]

[Turn over

18



The diagram shows the graph of $y = 7 + 2x - 2x^2$

(a) Use the graph to estimate the solutions to the equation

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

(a) [1]

(b) Explain how, using the graph, you can tell that there are no solutions to the equation

$$2x - 2x^2 = 1$$

.....
.....
..... [2]

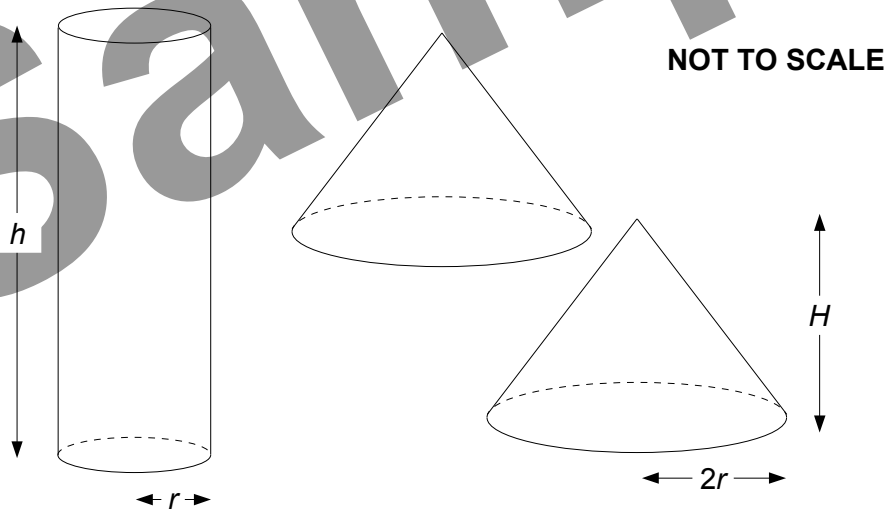
[Turn over

One evening, Jenny marks 180 papers.

- (c) Work out an estimate for the number of papers on which she marks at least one part correct.

(c) [4]

20



Some plasticine is used to make a solid cylinder of base radius r cm and height h cm. The plasticine is then split in half and used to make two identical cones. Each cone has base radius $2r$ cm and height H cm.

Express H in terms of h .
Give your answer in its simplest form.

..... [4]

[Turn over

