

For Edexcel

Name

GCSE Mathematics

Paper 3A (Non-Calculator)

Higher Tier

Time: 1 hour and 45 minutes



Materials required

Ruler, protractor, compasses,
pen, pencil, eraser.
Tracing paper may be used.

Instructions and Information for Candidates

Write your name in the box at the top of the page.

Answer all the questions in the spaces provided in this question paper.

The marks for each question and for each part of a question are shown in brackets.

The total number of marks for this paper is 100. There are 24 questions in this paper.

Calculators must not be used.

Advice to Candidates

Show all stages in any calculation.

Work steadily through the paper. Do not spend too long on one question.

If you cannot answer a question, leave it and attempt the next one.

Return at the end to those you have left out.



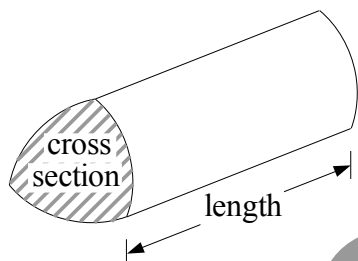
Written by Shaun Armstrong

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GCSE Mathematics

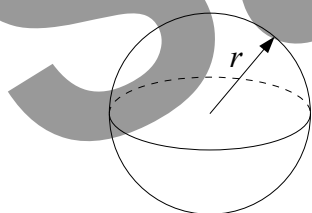
Formulae: Higher Tier

Volume of a prism = area of cross section \times length



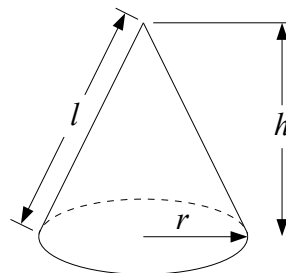
Volume of sphere = $\frac{4}{3}\pi r^3$

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

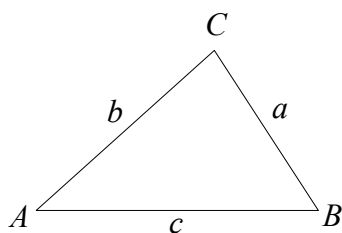


Volume of cone = $\frac{1}{3}\pi r^2 h$

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



In any triangle ABC



The Quadratic Equation

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

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

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

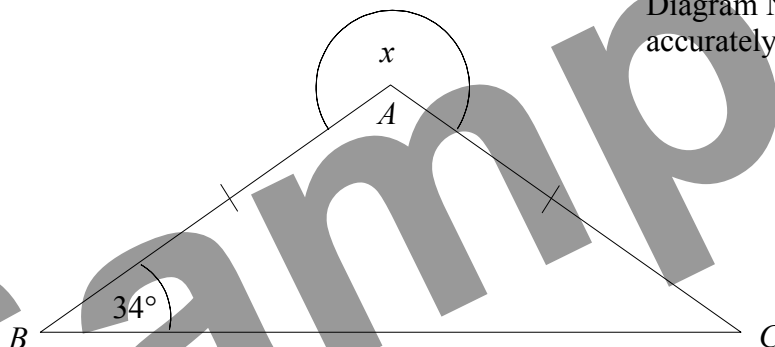
Answer ALL TWENTY FOUR questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

You must NOT use a calculator.

1.



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

Find the size of the angle marked x .

.....^o

Q1

(Total 3 marks)

2. Solve $5p + 9 = p - 3$

$p =$

Q2

(Total 3 marks)

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

(2)

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

(2)

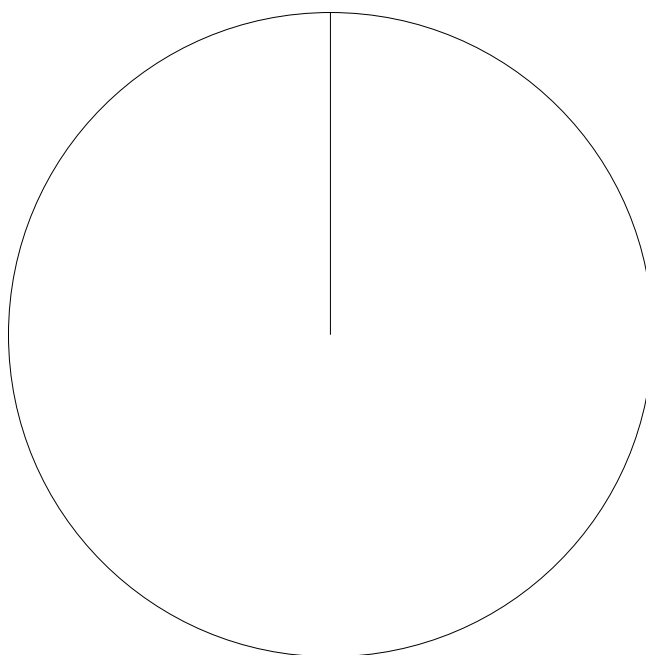
(Total 4 marks)

Q3

4. The table gives information about the number of bedrooms in 720 houses.

Number of Bedrooms	Frequency
1	100
2	320
3	240
4	60

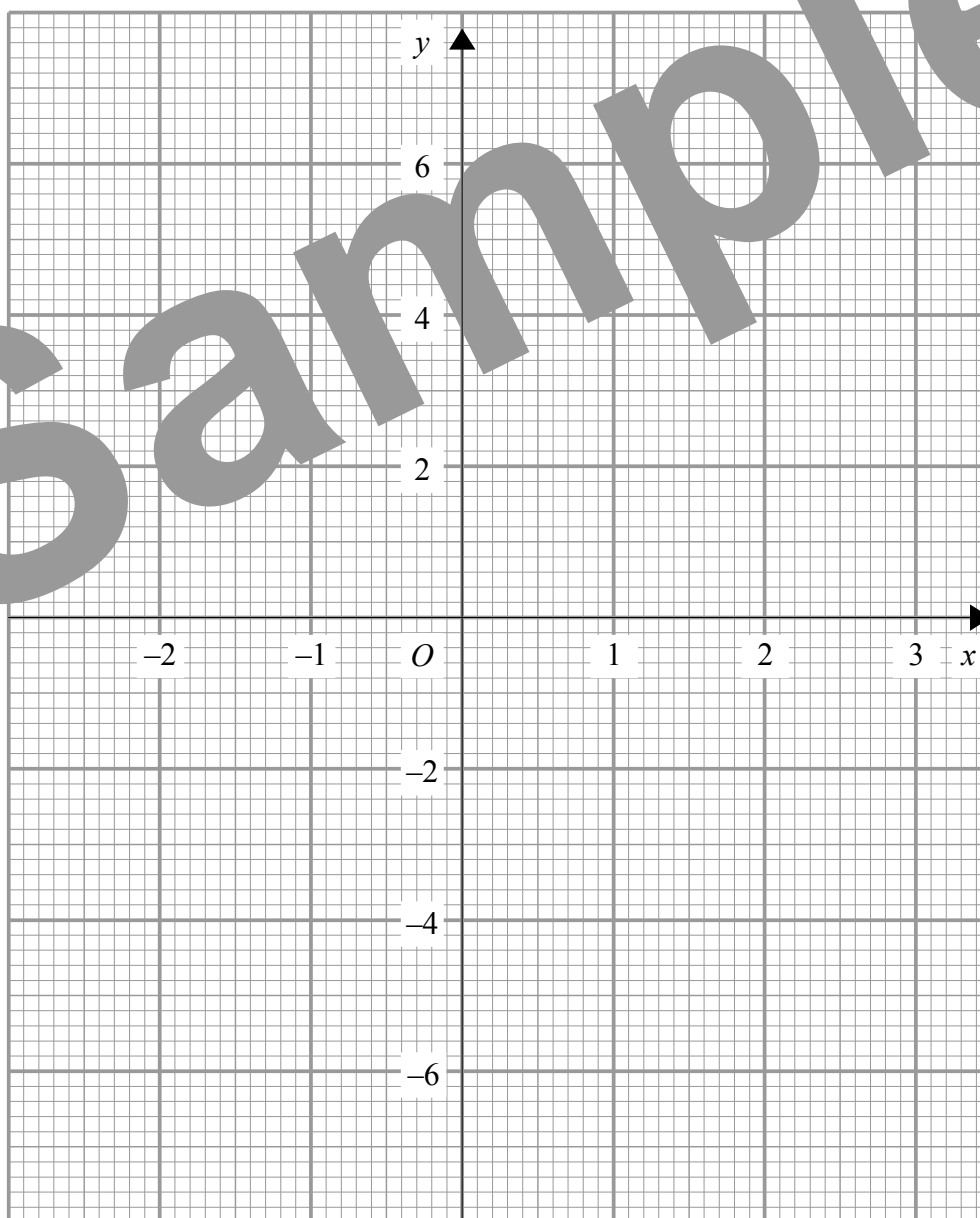
Draw an accurate pie chart to show this information.



(Total 4 marks)

Q4

5. (a) On the grid, draw the graph of $y = 2x - 3$



(3)

(b) Use your graph to solve the equation $2x - 3 = 1.4$

$x = \dots\dots\dots$
(1)

(Total 4 marks)

Q5

6. Tariq's bicycle has three gears.

The numbers of teeth on the gears are in the ratio $5 : 6 : 7$

In total there are 36 teeth on the gears.

(a) Work out how many teeth are on the middle gear.

.....
(3)

Tariq cycles 5 kilometres in 20 minutes.

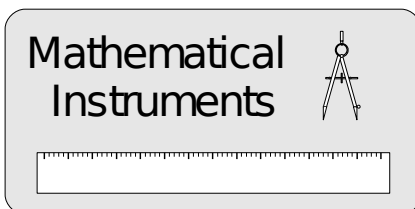
(b) Work out his average speed in kilometres per hour.

..... km/h
(2)

(Total 5 marks)

Q6

7.



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.

£
(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.

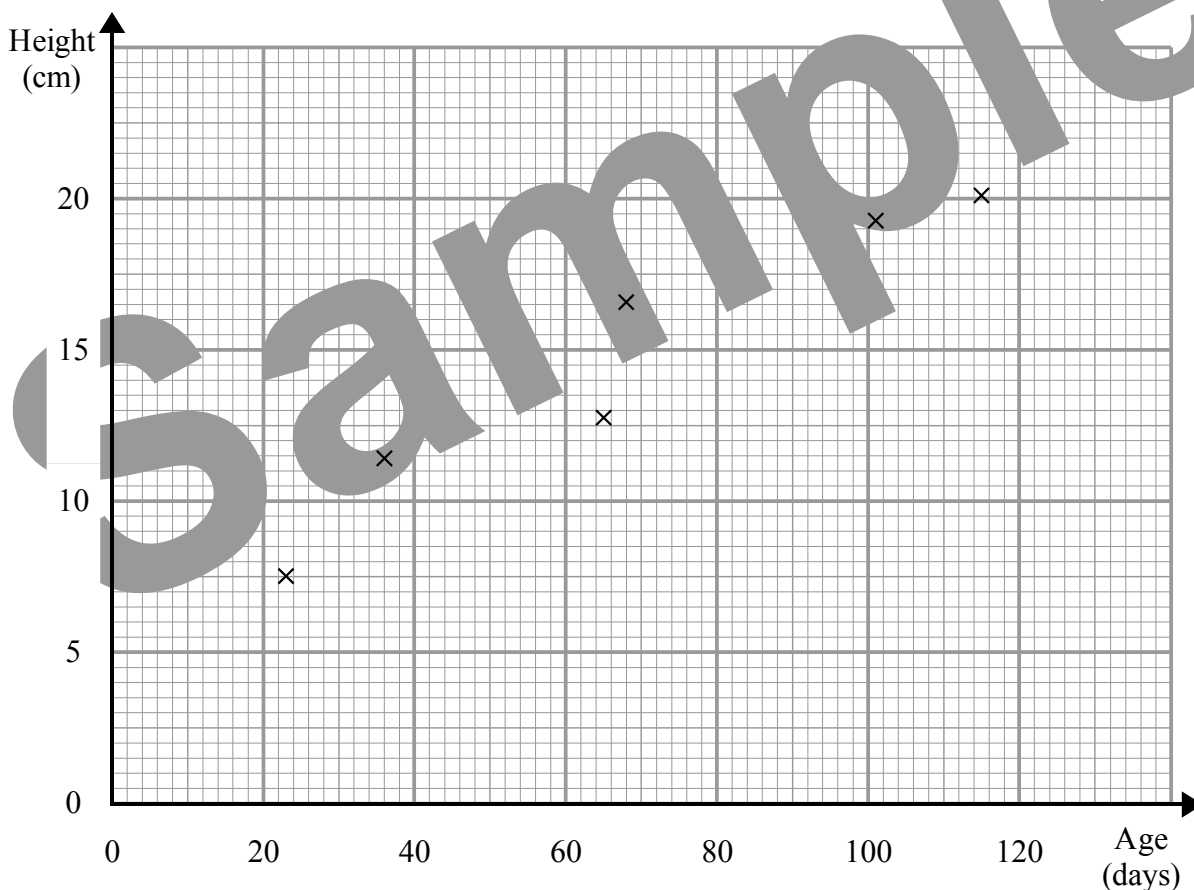
.....
(2)
(Total 5 marks)

Q7

8. The table shows the age in days and the heights in centimetres of eight plants.

Age (days)	36	115	68	23	101	65	38	91
Height (cm)	11.5	20.2	16.7	7.6	19.3	12.8	10.5	16.3

The first six pairs of values have been plotted on the scatter graph below.



(a) Plot the last two pairs of values on the scatter graph. (1)

(b) Describe the **correlation** between the age and height of the plants.
.....
(1)

(c) (i) Use your graph to estimate the age of another plant of the same type when it reached a height of 15 cm.

.....days

(ii) Explain why it might not be sensible to use your graph to estimate the age of a plant of the same type that is 24 cm tall.

.....
.....

(3)

(Total 5 marks)

Q8

9.

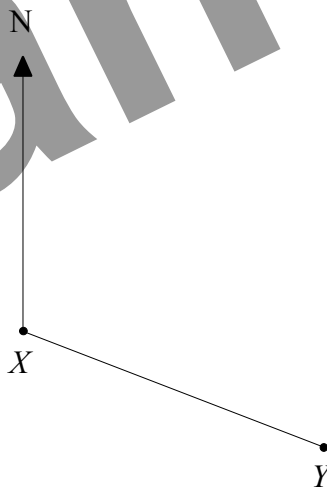


Diagram NOT
accurately drawn

The bearing of Y from X is 115° .

Work out the bearing of X from Y .

.....
.....

(Total 2 marks)

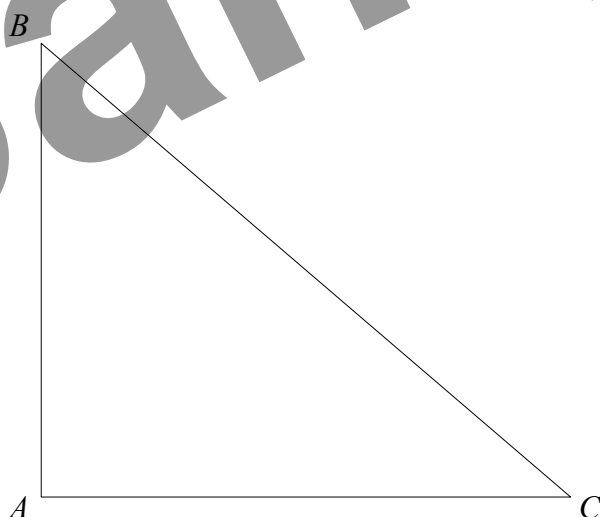
Q9

10. Work out an estimate for the value of $\frac{916 \times 28.45}{(2.96)^2}$

(Total 3 marks)

Q10

11.



ABC is a triangle.

Shade the region inside the triangle which is nearer to point A than point C and less than 5 cm from the point C .

(Total 4 marks)

Q11

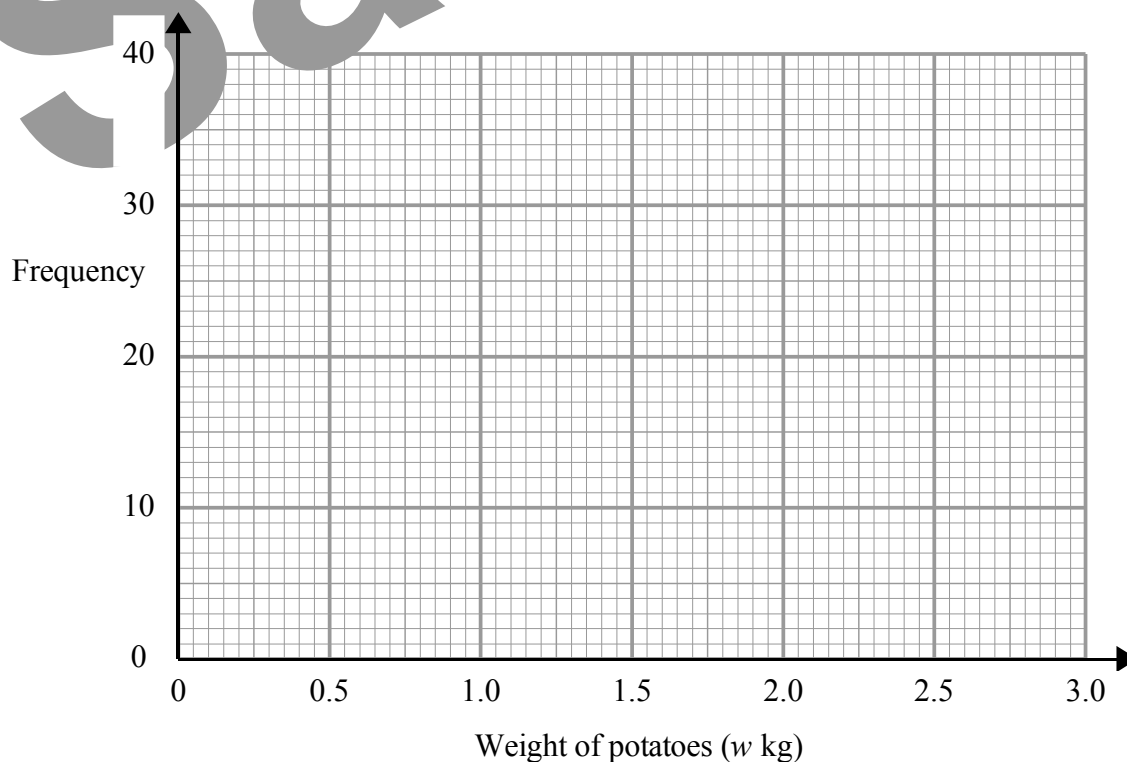
12. A supermarket records the weight (w kg) of loose potatoes bought by 100 customers. The results are shown in the table.

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?

..... %
(1)

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



(2)

(Total 3 marks)

Q12

13. (a) Simplify $(2a)^2$

.....
(1)

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

.....
(1)

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

.....
(1)

(d) 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 .

$a =$

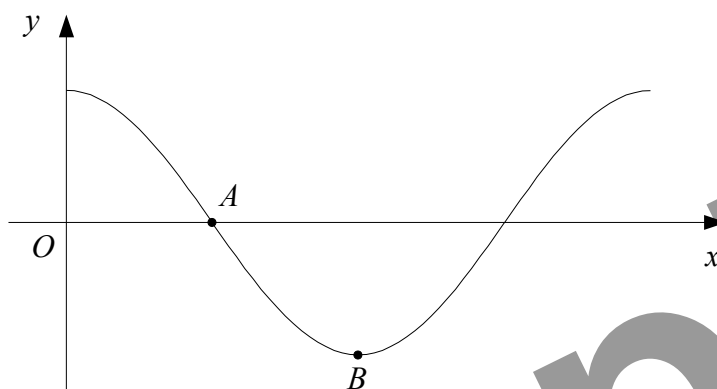
$b =$

(3)

(Total 6 marks)

Q13

14.



The diagram shows a sketch of part of the graph of $y = \cos x^\circ$.

(a) Write down the coordinates of

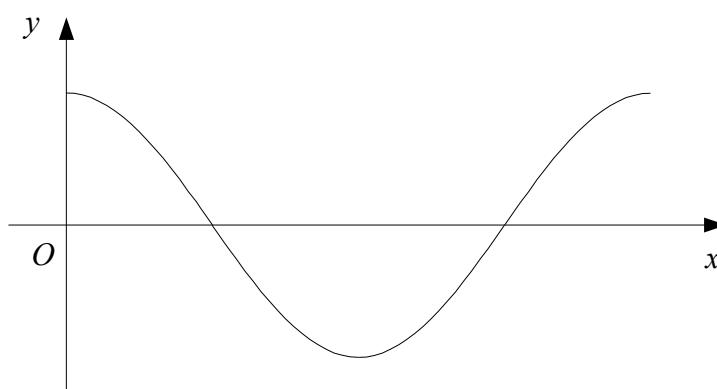
(i) A ,

(.....,) (2)

(ii) B .

(.....,) (2)

(b) On this copy of the diagram above, sketch the graph of $y = \cos 2x^\circ$.



(2)

(Total 4 marks)

Q14

15. The table shows some expressions.
 a , b , c and d represent lengths.
 π and 2 are numbers which have no dimensions.

πab	$\frac{a^2 c^2}{d}$	$2\pi b^3$	$abc + d$	$\frac{2d}{b^4}$	$b(c^2 + d^2)$	$c^3 + 2ab$

Tick (✓) the boxes underneath the **three** expressions which could represent volumes.

Q15

(Total 3 marks)

16. $P = 2\pi r + 5r - l$

Rearrange the formula to make r the subject.

$r = \dots\dots\dots$

Q16

(Total 3 marks)

17. The ages of three sisters are x years, x^2 years and $(3x - 2)$ years.

The total of the ages of the three sisters is 30 years.

(a) Show that $x^2 + 4x - 32 = 0$

(2)

(b) Find the age of the oldest of the three sisters.

..... years

(3)

(Total 5 marks)

Q17

18. (a) Write down the value of $9^{-\frac{1}{2}}$

.....
(1)

(b) Rationalise the denominator of $\frac{18}{\sqrt{3}}$ and simplify your answer.

.....
(2)

(Total 3 marks)

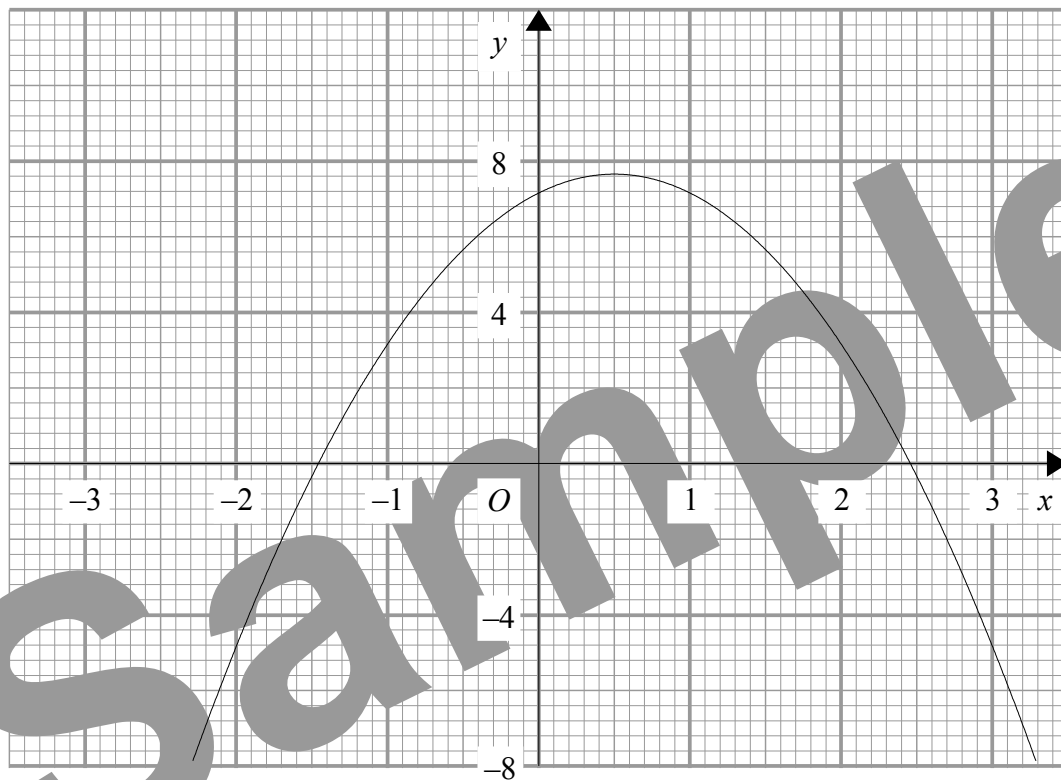
Q18

19. Prove algebraically that the sum of three consecutive even numbers is always a multiple of 6.

Q19

(Total 3 marks)

20.



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

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

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

$x = \dots\dots\dots$ or $x = \dots\dots\dots$
(1)

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

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

.....
.....
.....

(2)

(Total 3 marks)

Q20

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.

(4)

(Total 9 marks)

Q21

22.

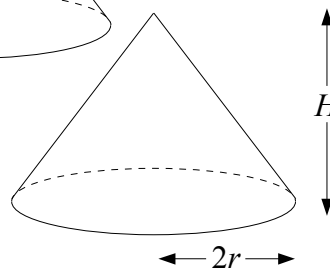
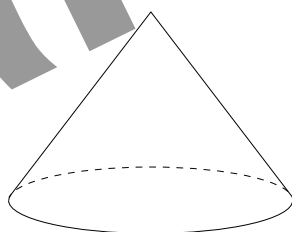
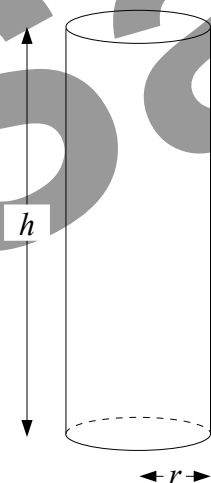


Diagram **NOT**
accurately drawn

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.

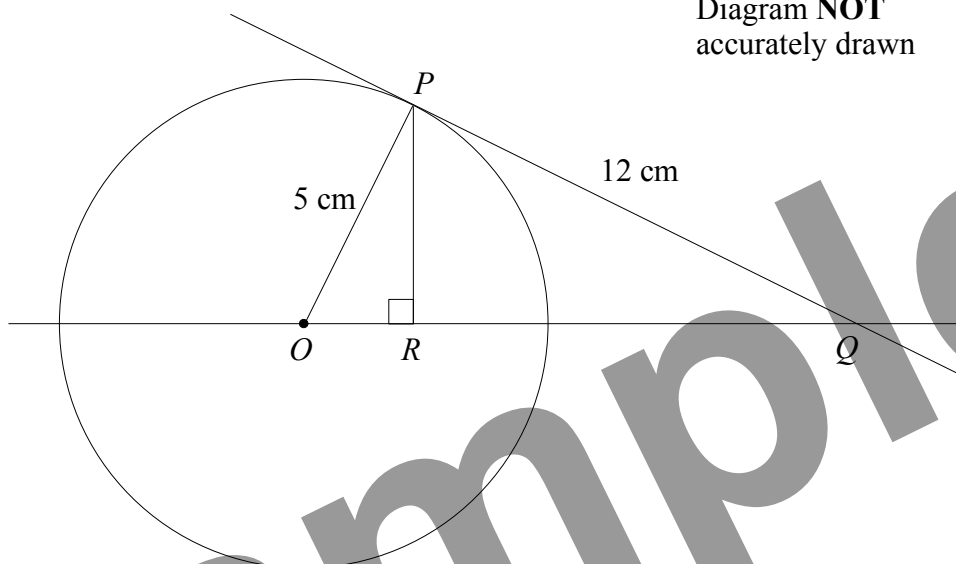
$H = \dots\dots\dots$

(Total 4 marks)

Q22

23.

Diagram **NOT**
accurately drawn



P is a point on a circle, centre O .
The line PQ is the tangent to the circle at P .
 R is the point on OQ such that angle $ORP = 90^\circ$.

(a) Prove that triangle OPR and triangle OPQ are similar.

(3)

$OP = 5$ cm.
 $PQ = 12$ cm.

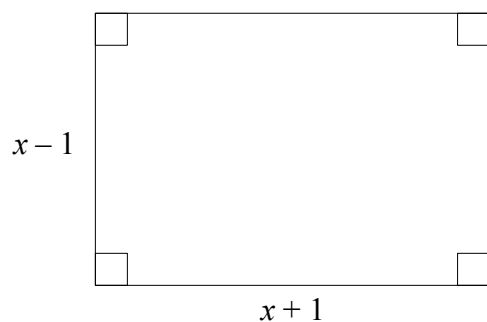
(b) Find the exact length of OR .

..... cm
(4)
(Total 7 marks)

Q23

24.

Diagram **NOT**
accurately drawn



The diagram shows a rectangle measuring $(x - 1)$ cm by $(x + 1)$ cm.

The diagonals of the rectangle are each 10 cm long.

Find the area of the rectangle.

Sample

.....cm²

(Total 5 marks)

Q24

TOTAL FOR PAPER: 100 MARKS

END