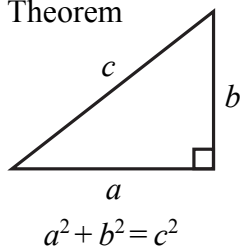


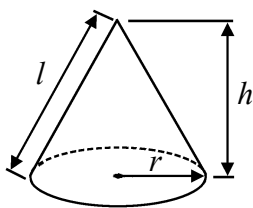
**IGCSE MATHEMATICS 4400
FORMULA SHEET – HIGHER TIER**

Pythagoras' Theorem



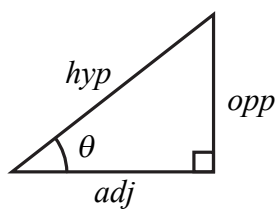
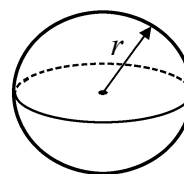
Volume of cone = $\frac{1}{3} \pi r^2 h$

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



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

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



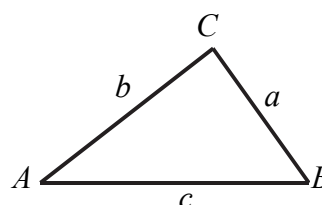
adj = hyp \times cos θ
opp = hyp \times sin θ
opp = adj \times tan θ

or $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

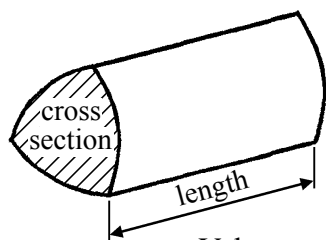
In any triangle ABC



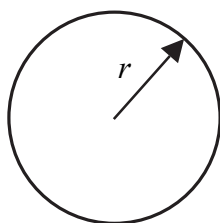
Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



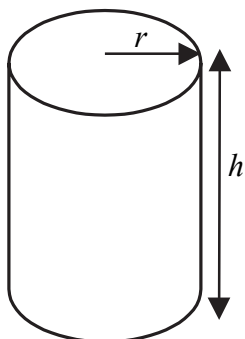
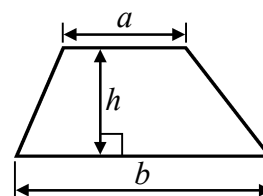
Volume of prism = area of cross section \times length



Circumference of circle = $2\pi r$

Area of circle = πr^2

Area of a trapezium = $\frac{1}{2} (a + b)h$



Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi r h$

The Quadratic Equation

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

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



Leave blank

Answer ALL NINETEEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. Solve the equation

$$3p + 5 = 7p + 3$$

$p = \dots\dots\dots$

(Total 3 marks)

Q1

2. Krishnan used 611 units of electricity.
The first 182 units cost £0.0821 per unit.
The remaining units cost £0.0704 per unit.
Tax is added at 5% of the total amount.

Complete Krishnan's bill.

182 units at £0.0821 per unit	£.....
..... units at £0.0704 per unit	£.....
Total amount	£.....
Tax at 5% of the total amount	£.....
Amount to pay	£.....

(Total 7 marks)

Q2



3. In the diagram, PQR and PST are straight lines.
 QS and RT are parallel lines.
 Angle $QRT = 70^\circ$.
 Angle $QST = 120^\circ$.

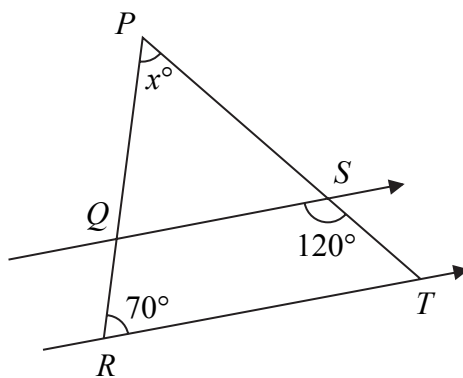


Diagram **NOT** accurately drawn

- (a) Work out the value of x .

$x = \dots\dots\dots$
(3)

- (b) Give a reason for each step in your working.

.....

(2) **Q3**

(Total 5 marks)



Leave
blank

4. (a) Simplify

(i) $p \times p \times p \times p$

.....

(ii) $2a + 3b - 5a + b - 7$

.....

(iii) $\frac{q^3 \times q^5}{q^2}$

.....

(4)

(b) Multiply out $x(2x + 3)$

.....

(2)

(c) Multiply out and simplify $(y - 1)(y + 2)$

.....

(2)

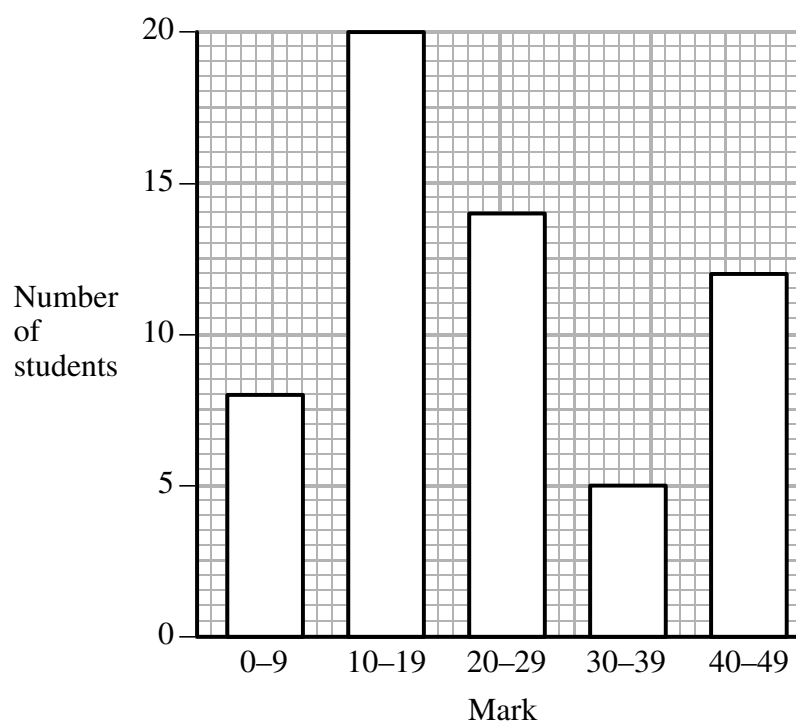
(Total 8 marks)

Q4



Leave blank

5. The frequency diagram gives information about the marks gained by a group of 59 students in a test.



- (a) Which is the modal class?

.....
(1)

A student is chosen at random from the whole group.

- (b) Find the probability that this student's mark is less than 30.

.....
(2)

- (c) Calculate an estimate of the total number of marks scored by all the students in the group.

.....
(3)

(Total 6 marks)

Q5



Leave blank

6. In a club, $\frac{1}{2}$ of the members are left-handed and $\frac{1}{4}$ of the members wear glasses.
A member is chosen at random.

Stavros says “The probability that this member is left-handed **or** wears glasses is $\frac{3}{4}$ ”

Is he correct?

.....

Explain your answer.

.....

.....

(Total 2 marks)

Q6

7. The diagram shows a triangle LMN .
 $MN = 15$ cm. $LN = 8$ cm.
Angle $LMN = 90^\circ$.

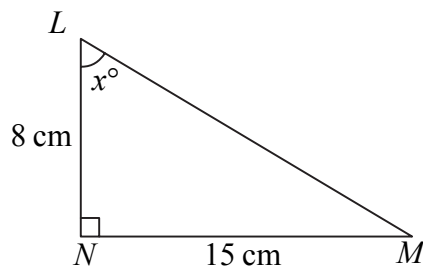


Diagram **NOT** accurately drawn

- (a) Calculate the length of ML .

..... cm
(3)

- (b) Write down the value of $\tan x^\circ$.

.....
(1)

(Total 4 marks)

Q7



Leave blank

8. (a) The universal set, $\mathcal{C} = \{\text{Angela's furniture}\}$.
 $A = \{\text{Chairs}\}$.
 $B = \{\text{Kitchen furniture}\}$.

Describe fully the set $A \cap B$.

.....
.....
(2)

- (b) $P = \{2, 4, 6, 8\}$.
 $Q = \{\text{Odd numbers less than 10}\}$

(i) List the members of the set $P \cup Q$.

.....

(ii) Is it true that $P \cap Q = \emptyset$?

.....

Explain your answer.

.....
.....
(3)

(Total 5 marks)

Q8

9. The formula for the curved surface area, A , of a cylinder is

$$A = 2\pi rh$$

where r is the radius and h is the height.

Calculate the value of r when $A = 19.8$ and $h = 2.1$
Give your answer correct to one decimal place.

$A = \dots\dots\dots$

(Total 2 marks)

Q9



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10. The table shows the annual world production of four foods.

Food	Annual world production, in tonnes
Cocoa	1.75×10^6
Coffee	1.85×10^6
Sugar	9.72×10^7
Wheat	4.98×10^8

(a) Calculate the total annual world production of coffee and sugar.

..... tonnes
(2)

(b) Brazil produces 9.7% of the world's sugar.
Calculate the annual production of sugar from Brazil.

..... tonnes
(2)

(c) Express the world production of wheat as a percentage of the total production of all four foods.

.....%
(3)

(Total 7 marks)

Q10



Leave
blank

11. (a) Solve the simultaneous equations

$$2x + 3y = 4$$

$$6x + 5y = 8$$

$$x = \dots\dots\dots y = \dots\dots\dots$$

(3)

(b) Write down the coordinates of the point of intersection of the two lines whose equations are

$$2x + 3y = 4 \text{ and}$$

$$6x + 5y = 8$$

$$(\dots\dots\dots, \dots\dots\dots)$$

(1)

(Total 4 marks)

Q11



Leave
blank

13. f and g are functions.

$$f : x \mapsto 2x - 3$$

$$g : x \mapsto 1 + \sqrt{x}$$

(a) Calculate $f(-4)$

.....
(2)

(b) Given that $f(a) = 5$, find the value of a .

$a =$
(2)

(c) Calculate $gf(6)$

.....
(2)

(d) Which values of x cannot be included in the domain of g ?

.....
(1)

(e) Find the inverse function g^{-1} in the form $g^{-1} : x \mapsto \dots$

.....
(3)

(Total 10 marks)

Q13



14. A farmer wants to make a rectangular pen for keeping sheep. He uses a wall, AB , for one side. For the other three sides, he uses 28 m of fencing. He wants to make the area of the pen as large as possible.

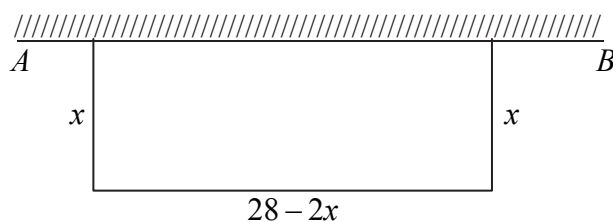


Diagram **NOT** accurately drawn

The width of the pen is x metres.
The length parallel to the wall is $(28 - 2x)$ metres.

- (a) The area of the pen is $y \text{ m}^2$.
Show that $y = 28x - 2x^2$.

(1)

- (b) For $y = 28x - 2x^2$

- (i) find $\frac{dy}{dx}$,

.....

- (ii) find the value of x for which y is a maximum.

$x =$

- (iii) Explain how you know that this value gives a maximum.

.....

.....

(5)

- (c) Find the largest possible area of the pen.

..... m^2
(2)

(Total 8 marks)

Q14



N 2 2 1 2 5 A 0 1 3 2 0

Leave blank

15. A fan is shaped as a sector of a circle, radius 12 cm, with angle 110° at the centre.

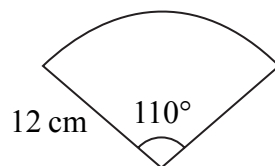


Diagram **NOT** accurately drawn

(a) Calculate the area of the fan.

..... cm^2
(2)

Another fan is shaped as a sector of a circle, radius r cm, with angle 120° at the centre.

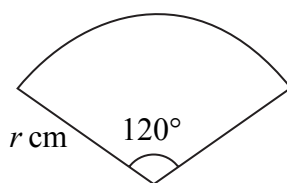


Diagram **NOT** accurately drawn

(b) Show that the total perimeter of this fan is $\frac{2}{3}r(3 + \pi)$ cm.

(3)

Q15

(Total 5 marks)



16. PQR is a triangle.
 M and N are the midpoints of PQ and PR respectively.

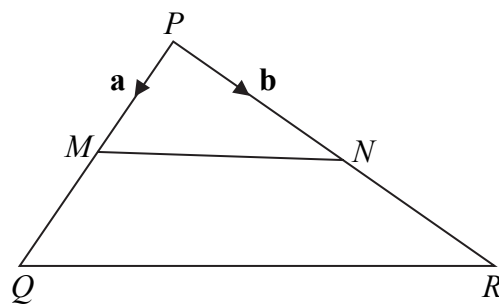


Diagram NOT accurately drawn

$\vec{PM} = \mathbf{a}$ $\vec{PN} = \mathbf{b}$.

(a) Find, in terms of \mathbf{a} and/or \mathbf{b} ,

(i) \vec{MN}

.....

(ii) \vec{PQ}

.....

(iii) \vec{QR}

.....

(3)

(b) Use your answers to (a)(i) and (iii) to write down two geometrical facts about the lines MN and QR .

.....

.....

(2)

(Total 5 marks)

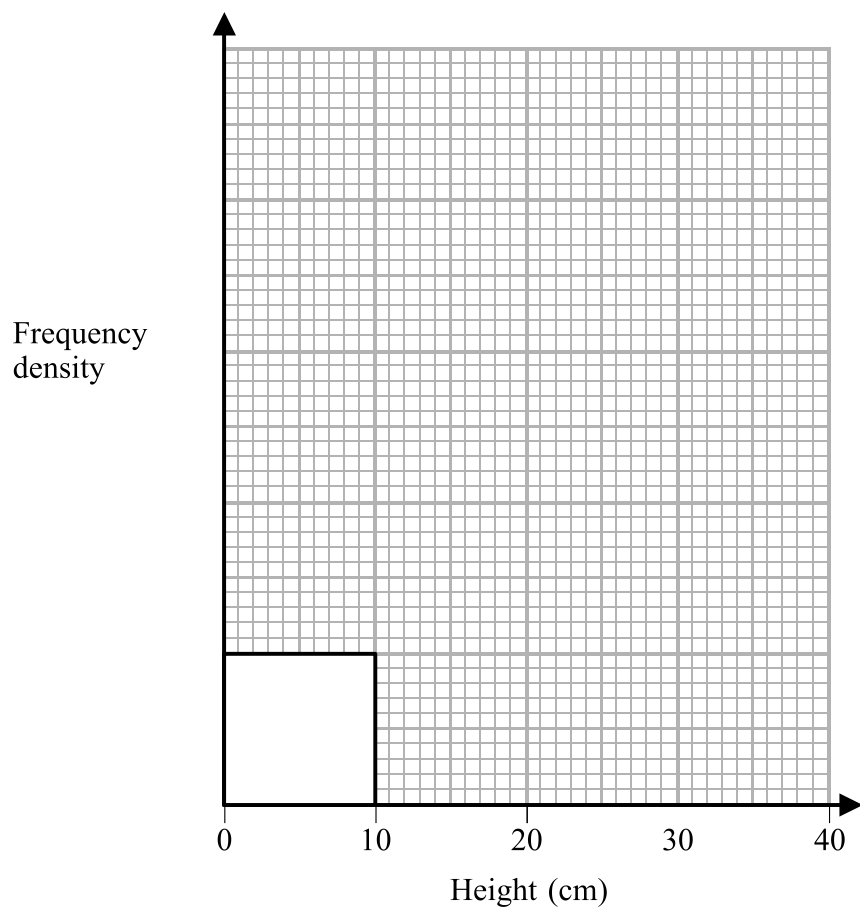
Q16



17. In an experiment, 52 plants were grown and their heights were measured. The results are summarised in the table.

Height	$0 \leq h < 10$	$10 \leq h < 15$	$15 \leq h < 20$	$20 \leq h < 40$
Number of plants	10	20	14	8

(a) Complete the histogram for these results.



(4)

The plants with heights from 17.5 cm to 25 cm are chosen for a display.

(b) Calculate an estimate of the number of plants chosen for the display.

(2)

Q17

(Total 6 marks)



Leave blank

18. In order to start a course, Bae has to pass a test.
He is allowed only two attempts to pass the test.

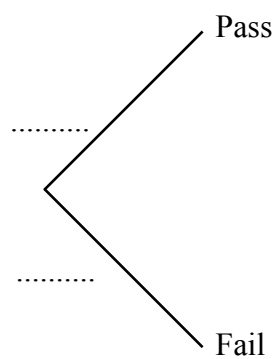
The probability that Bae will pass the test at his first attempt is $\frac{2}{5}$.

If he fails at his first attempt, the probability that he will pass at his second attempt is $\frac{3}{4}$.

- (a) Complete the probability tree diagram.

First attempt

Second attempt



(3)

- (b) Calculate the probability that Bae will be allowed to start the course.

.....
(3)

Q18

(Total 6 marks)



19. Convert 0.5̄1 to a fraction.

Leave
blank

.....
(Total 2 marks)

Q19

TOTAL FOR PAPER: 100 MARKS

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