Centre No.						Surname	Initial(s)
Candidate No.						Signature	

Paper Reference(s)

4400/4H

Examiner's use only

Team Leader's use only

London Examinations IGCSE

Mathematics

Paper 4H

Higher Tier

Friday 13 May 2005 – Morning

Time: 2 hours

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Total	

Materials required for examination
Ruler graduated in centimetres and millimetres, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations.

Information for Candidates

There are 20 pages in this question paper. All blank pages are indicated.
The total mark for this paper is 100. The marks for parts of questions are shown in round brackets: e.g. **(2)**.
You may use a calculator.

Advice to Candidates

Write your answers neatly and in good English.

Turn over

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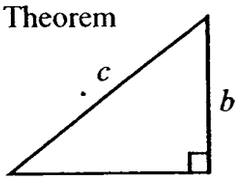
IGCSE MATHEMATICS 4400
FORMULA SHEET – HIGHER TIER

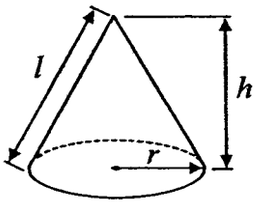
Pythagoras' Theorem



$a^2 + b^2 = c^2$

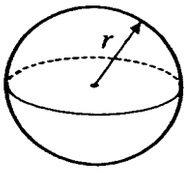
Volume of cone = $\frac{1}{3}\pi r^2 h$

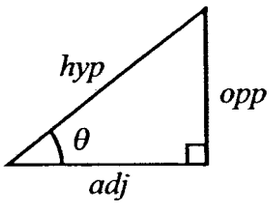
Curved surface area of cone = $\pi r l$



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

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





adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

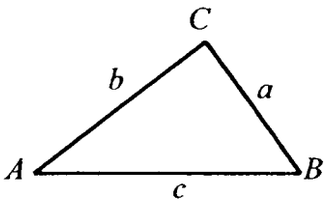
or

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

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

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

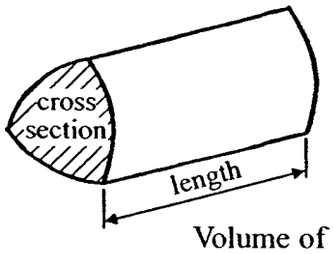
In any triangle ABC



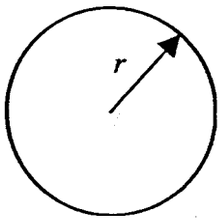
Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



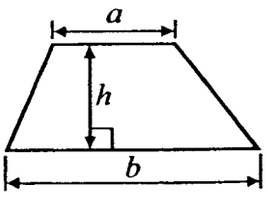
Volume of prism = area of cross section × length

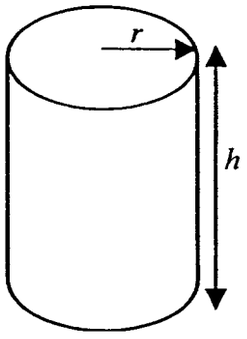


Circumference of circle = $2\pi r$

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 = $2\pi rh$

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

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

$p =$ .....

(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

Leave blank

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

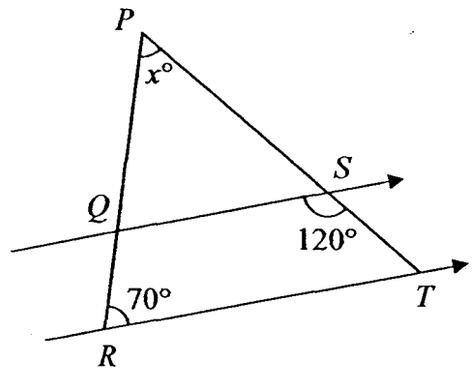


Diagram **NOT** accurately drawn

(a) Work out the value of x.

$x =$ .....

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

.....

(4)

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

.....

(2)

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

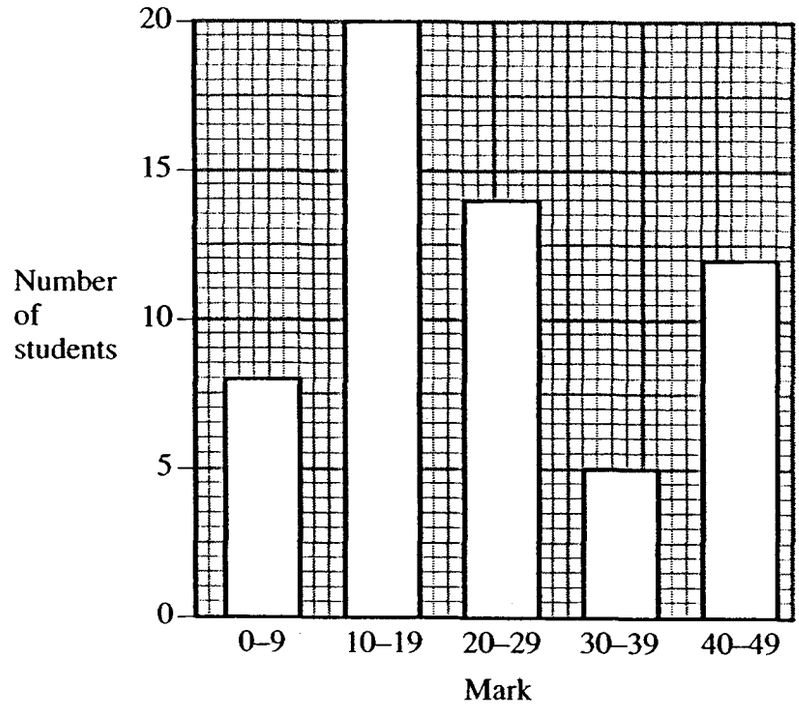
.....

(2) **Q4**

(Total 8 marks)

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.

.....

.....

Q6

(Total 2 marks)

7. The diagram shows a triangle LMN.
$MN = 15$ cm. $LN = 8$ cm.
Angle $LNM = 90°$.

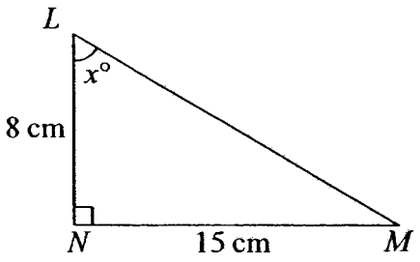


Diagram **NOT** accurately drawn

(a) Calculate the length of ML.

..... cm

(3)

(b) Write down the value of tan $x°$.

.....

(1)

Q7

(Total 4 marks)

Leave blank

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

Describe fully the set $A \cap B$.

.....

.....

(2)

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

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

.....

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

.....

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 = ...

(Total 2 marks)

Q9

Leave blank

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

$$2x + 3y = 4$$
$$6x + 5y = 8$$

$x =$ ..... $y =$ .....

(3)

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

$$2x + 3y = 4 \text{ and}$$
$$6x + 5y = 8$$

(....., ...)

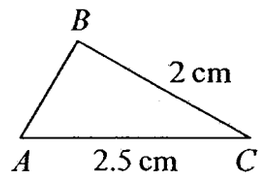
(1)

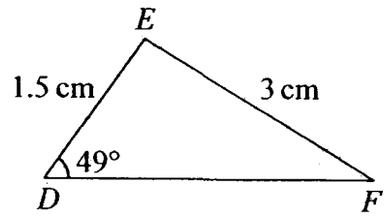
Q11

(Total 4 marks)

Leave blank

12. Triangles *ABC* and *DEF* are similar.





Diagrams **NOT** accurately drawn

$AC = 2.5$ cm $BC = 2$ cm $DE = 1.5$ cm $EF = 3$ cm Angle $EDF = 49°$

(a) Find the size of angle *BAC*.

.....°

(1)

(b) Work out the length of

(i) *DF*,

..... cm

(ii) *AB*.

..... cm

(4)

(Total 5 marks)

Q12

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 $g^{-1}: x \mapsto \ldots$

.....

(3)

(Total 10 marks)

Q13

Leave blank

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.

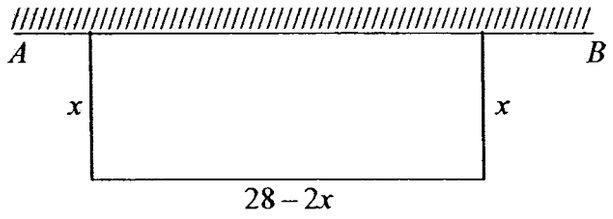


Diagram **NOT** accurately drawn

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 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

Leave blank

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

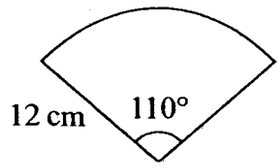


Diagram **NOT** accurately drawn

(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.

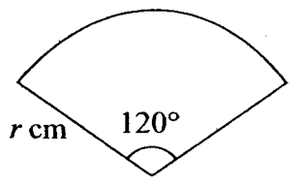


Diagram **NOT** accurately drawn

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

(3)

Q15

(Total 5 marks)

Leave blank

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

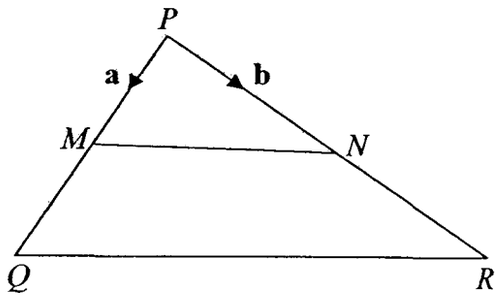


Diagram **NOT** accurately drawn

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

(a) Find, in terms of **a** and/or **b**,

(i) $\overrightarrow{MN}$

.....

(ii) $\overrightarrow{PQ}$

.....

(iii) $\overrightarrow{QR}$

.....

(3)

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

.....

.....

(2) **Q16**

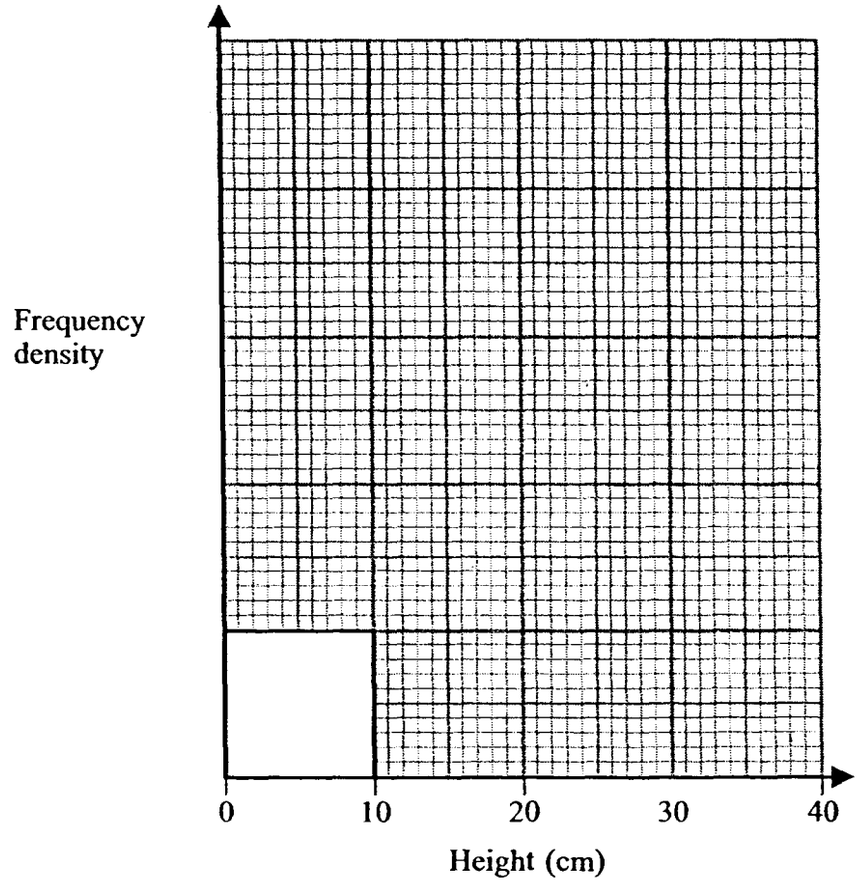
(Total 5 marks)

Leave blank

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

Height	$0 \leqslant h < 10$	$10 \leqslant h < 15$	$15 \leqslant h < 20$	$20 \leqslant h < 40$
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)

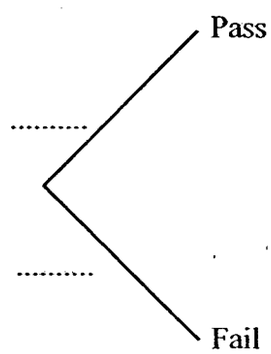
Leave blank

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.



(3)

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

.....

(3)

(Total 6 marks)

Q18

Leave blank

19. Convert $0.5\dot{1}$ to a fraction.

.....

Q19

(Total 2 marks)

TOTAL FOR PAPER: 100 MARKS

END