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

Paper Reference(s)

4400/3H

Examiner's use only

Team Leader's use only

London Examinations IGCSE

Mathematics

Paper 3H

Higher Tier

Monday 6 November 2006 – Morning

Time: 2 hours

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, 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 24 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.

Page Number	Leave Blank
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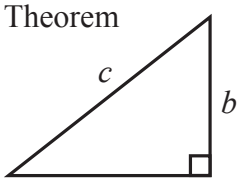
IGCSE MATHEMATICS 4400
FORMULA SHEET – HIGHER TIER

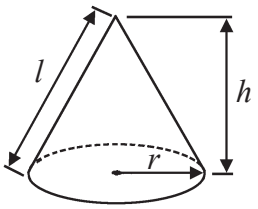
Pythagoras' Theorem



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

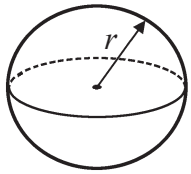
Volume of cone = $\frac{1}{3}\pi r^2 h$

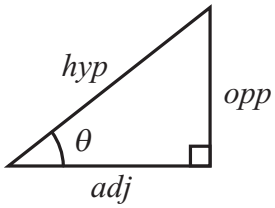
Curved surface area of cone = $\pi r l$



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

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





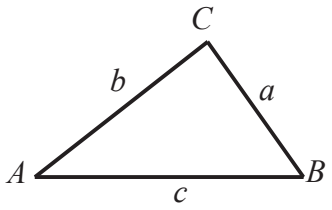
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

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

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

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

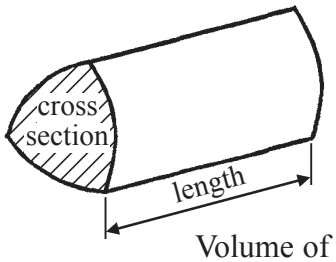
In any triangle ABC



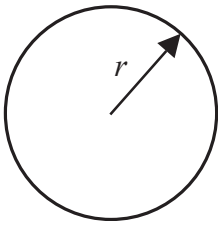
Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



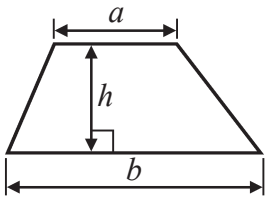
Volume of prism = area of cross section × length

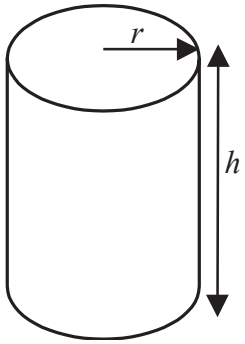


Circumference of circle = $2\pi r$

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

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

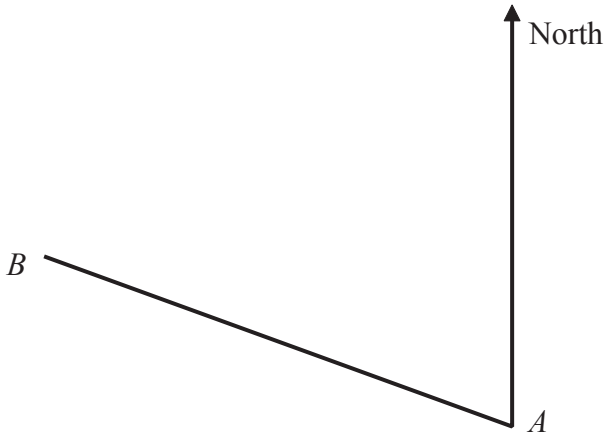
Leave blank

Answer ALL TWENTY-ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1.



(a) By measurement, find the bearing of B from A.

.....°

(2)

(b) The bearing of another point, C, from A is 226°.
Work out the bearing of A from C.

.....°

(2) **Q1**

(Total 4 marks)

Leave blank

2. Rectangular tiles have width x cm and height $(x + 7)$ cm.

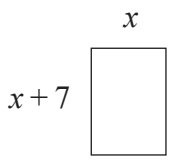


Diagram **NOT** accurately drawn

Some of these tiles are used to form a shape.
The shape is 6 tiles wide and 4 tiles high.

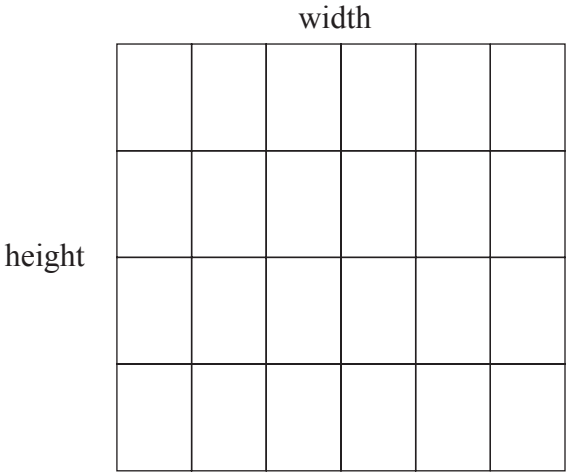


Diagram **NOT** accurately drawn

(a) Write down expressions, in terms of x, for the width and height of this shape.

width = ... cm

height = ... cm

(2)

(b) The width and the height of this shape are equal.

(i) Write down an equation in x.

.....

(ii) Solve your equation to find the value of x.

x =.....

(4)

Q2

(Total 6 marks)

Leave blank

3.

Andrea's Café

Delicious cakes
Only $4.00 each

Andrea buys 100 cakes to sell in her café.
She pays $1.80 for each cake.

On Monday she sells 60 cakes.
She sells these cakes for $4.00 each.

On Tuesday she reduces the price of each cake by $\frac{1}{5}$

She sells 35 cakes at this reduced price.

Andrea then gives away the 5 unsold cakes.

Calculate the total profit that Andrea makes on the cakes.

$.....

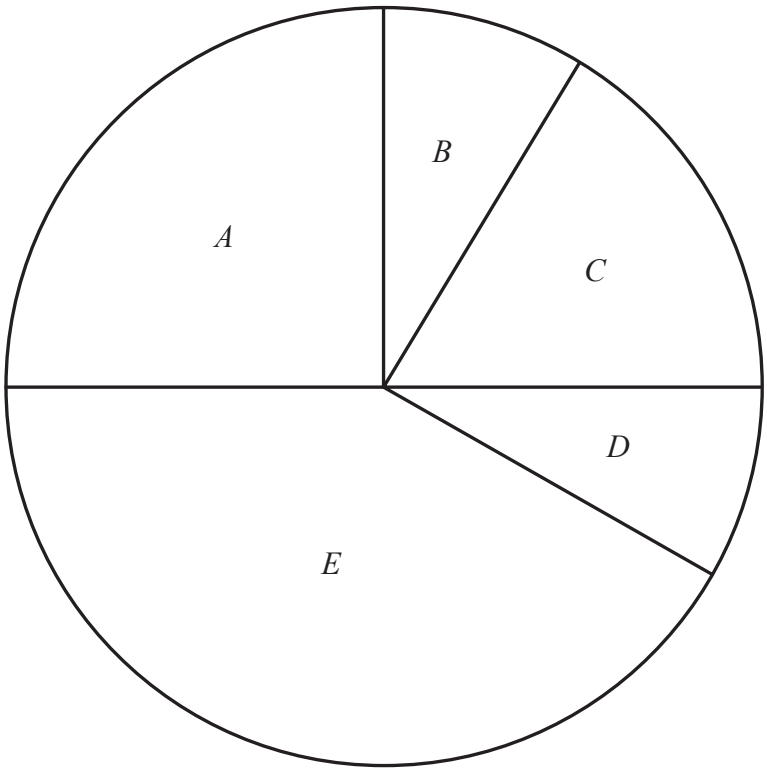
Q3

(Total 6 marks)

Leave blank

4. There are 5 classes in a school.

(a) The pie chart shows information about the number of students in each class.
The pie chart is accurately drawn.



A student from the school is chosen at random.
Find the probability that this student is in class *E*.

.....

(2)

Leave blank

(b) The table shows information about the ages of the students.

Age, x years	Frequency
$9 \leqslant x < 11$	30
$11 \leqslant x < 13$	12
$13 \leqslant x < 15$	18
$15 \leqslant x < 19$	60

Calculate an estimate of the mean age of these students.
Give your answer correct to 3 significant figures.

..... years
(4)

(Total 6 marks)

Q4

5. The number of workers in a factory decreases from 60 to 48
Work out the percentage decrease in the number of workers.

..... %

(Total 3 marks)

Q5

Leave blank

6. Rajesh and Gudi share some money in the ratio 2:5
Rajesh receives £240

Work out the amount of money that Gudi receives.

£ .....

Q6

(Total 2 marks)

7. Solve the inequality $9x - 2 < 5x + 4$

.....

Q7

(Total 3 marks)

Leave blank

8. Four girls run in a race.
The table shows the probability that each of three girls will win the race.

Name	Probability
Angela	0.5
Beverley	0.1
Caris	0.3
Danielle	

Calculate the probability that either Caris or Danielle will win the race.

.....

(Total 3 marks)

Q8

Leave blank

9. *ABC* is a triangle.
AB = *AC* = 13 cm.
BC = 10 cm.
M is the midpoint of *BC*.
Angle *AMC* = 90°.

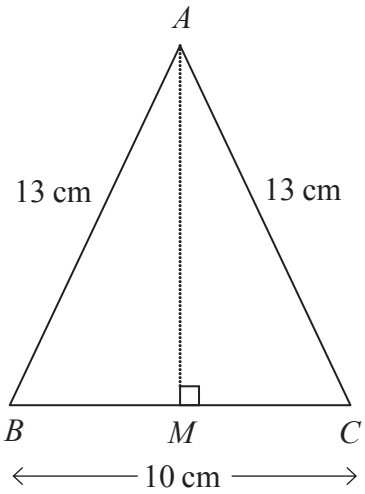


Diagram **NOT** accurately drawn

(a) Work out the length of *AM*.

..... cm
(4)

Leave blank

(b) A solid has five faces.
Four of the faces are triangles identical to triangle *ABC*.
The base of the solid is a square of side 10 cm.

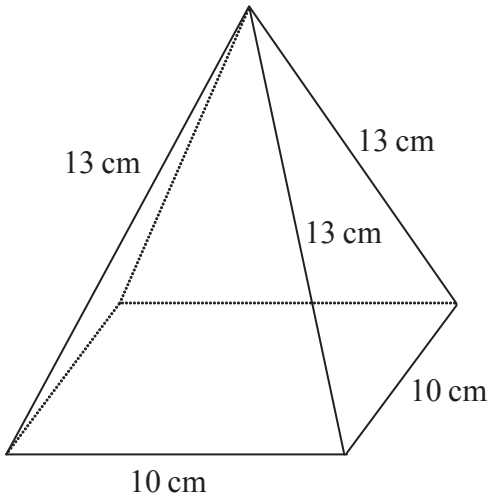


Diagram **NOT** accurately drawn

Calculate the total surface area of this solid.

..... cm^2

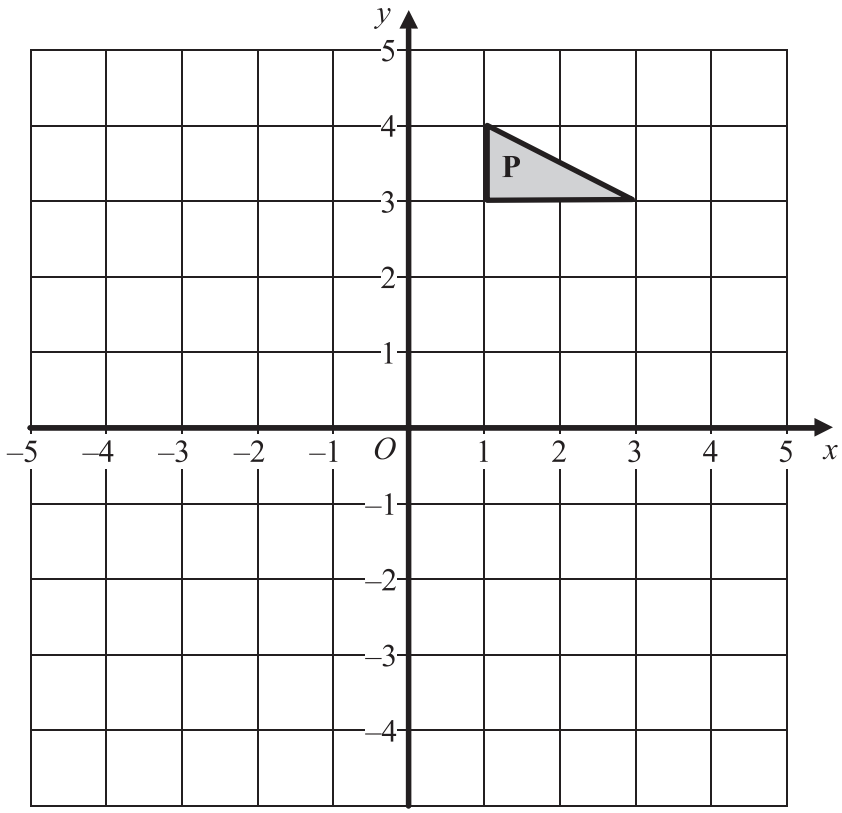
(4)

Q9

(Total 8 marks)

Leave blank

10.



Reflect triangle **P** in the *y*-axis to give triangle **Q**.
Then rotate triangle **Q** about *O* through 90° clockwise to give triangle **R**.

Describe fully the **single** transformation which maps triangle **P** onto triangle **R**.

.....

.....

Q10

(Total 4 marks)

Leave blank

11. There are 15 students in class *A*.

In a test, the students gained these marks.

2 1 2 5 5 6 9 2 5 6 7 5 6 5 6

(a) Find the interquartile range of these marks.

.....

(3)

The students in class *B* took the same test.
Their marks had a median of 7 and an interquartile range of 2

(b) Make **two** comparisons between the marks of the two classes.

(i) .....

.....

(ii) .....

.....

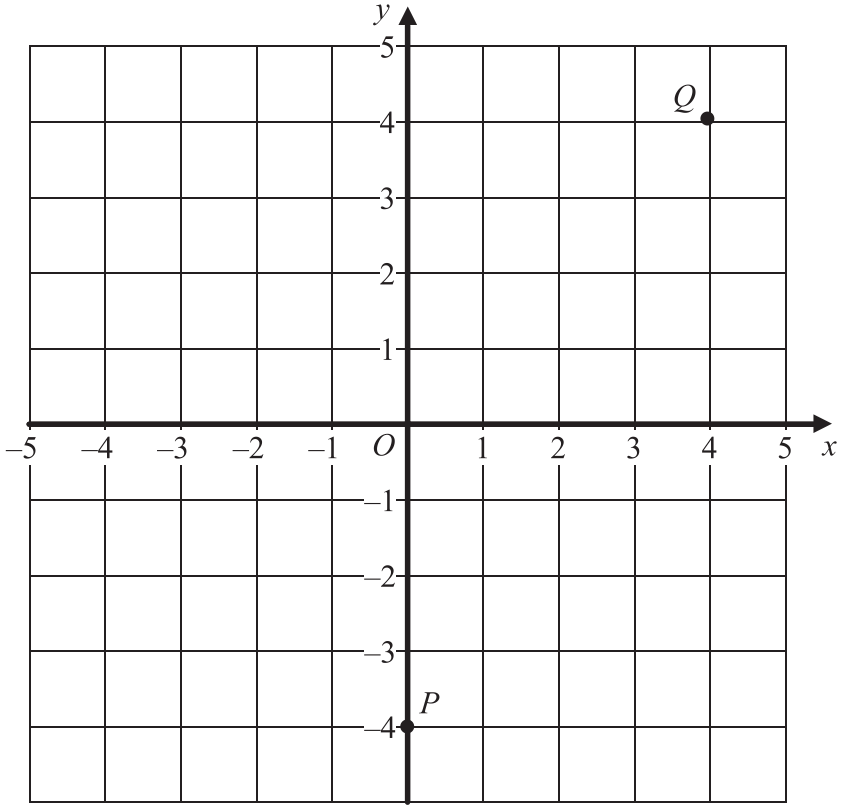
(2)

Q11

(Total 5 marks)

Leave blank

12.



(a) P and Q are points with coordinates (0, –4) and (4, 4).
Find the equation of the straight line which passes through P and Q.

.....

(4)

(b) On the grid, draw the line with equation $y = -\frac{1}{2}x + 1$

(3)

Q12

(Total 7 marks)

Leave blank

13. Evaluate the following.
Give your answers as fractions.

(a) 2^{-3}

.....
(1)

(b) $\left(\frac{27}{343}\right)^{\frac{1}{3}}$

.....
(1)

(c) $\left(\sqrt{\frac{3}{8}}\right)^{4}$

.....
(1) **Q13**

(Total 3 marks)

Leave blank

14. (a) For the equation $y = 5000x - 625x^2$, find $\frac{dy}{dx}$.

.....

(2)

(b) Find the coordinates of the turning point on the graph of $y = 5000x - 625x^2$.

(..... , ...)

(3)

(c) (i) State whether this turning point is a maximum or a minimum.

.....

(ii) Give a reason for your answer.

.....

.....

(2)

(d) A publisher has to set the price for a new book.
The profit, £y, depends on the price of the book, £x, where

$$y = 5000x - 625x^2$$

(i) What price would you advise the publisher to set for the book?

£ .....

(ii) Give a reason for your answer.

.....

.....

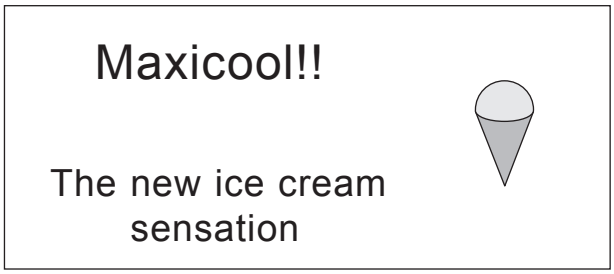
(2)

(Total 9 marks)

Q14

Leave blank

15.



A Maxicool consists of a cone full of ice cream with a hemisphere of ice cream on top.
The radius of the hemisphere is 3 cm.
The radius of the base of the cone is 3 cm.
The height of the cone is 10 cm.

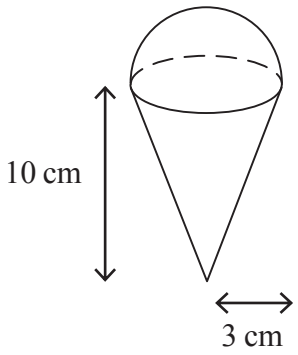


Diagram **NOT** accurately drawn

Calculate the total volume of ice cream in a Maxicool.
Give your answer correct to 3 significant figures.

..... cm^3

Q15

(Total 4 marks)

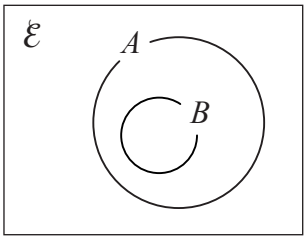
Leave blank

16.

Statements				
$A \subset B$	$B \subset A$	$A \cup B = \mathcal{E}$	$A \cap B = \emptyset$	$A \cap B = A$

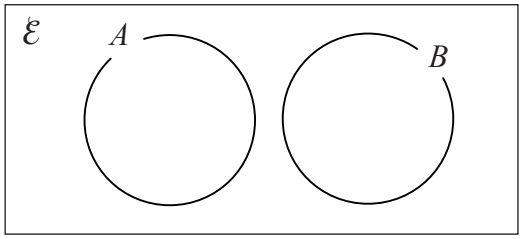
Choose a statement from the box that describes the relationship between sets A and B.

(i)



.....

(ii)



.....

Q16

(Total 2 marks)

Leave blank

17. The function f is defined as $f(x) = \frac{x}{x-1}$.

(a) Find the value of

(i) f(3),

.....

(ii) f(–3).

.....

(2)

(b) State which value(s) of x must be excluded from the domain of f.

.....

(1)

(c) (i) Find ff(x).
Give your answer in its most simple form.

ff(x) = ...

(ii) What does your answer to (c)(i) show about the function f?

.....

.....

(4)

Q17

(Total 7 marks)

Leave blank

18. Solve the simultaneous equations

$$y = x^2$$
$$y = 2x + 15$$

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

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

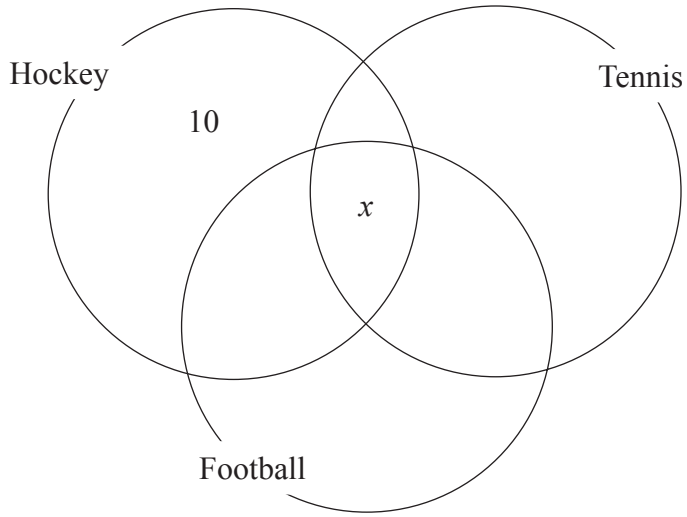
Q18

(Total 5 marks)

Leave blank

19. Each student in a group plays at least one of hockey, tennis and football.

10 students play hockey only
9 play football only.
13 play tennis only.
6 play hockey and football but not tennis.
7 play hockey and tennis.
8 play football and tennis.
x play all three sports.



(a) Write down an expression, in terms of x, for the number of students who play hockey and tennis, but not football.

.....

(1)

There are 50 students in the group.

(b) Find the value of x.

$x =$ .....

(3)

Q19

(Total 4 marks)

Leave blank

20. (a) The ratio of the areas of two similar triangles is $1 : k$.
Write down, in terms of k, the ratio of the lengths of their corresponding sides.

.....

(1)

(b)

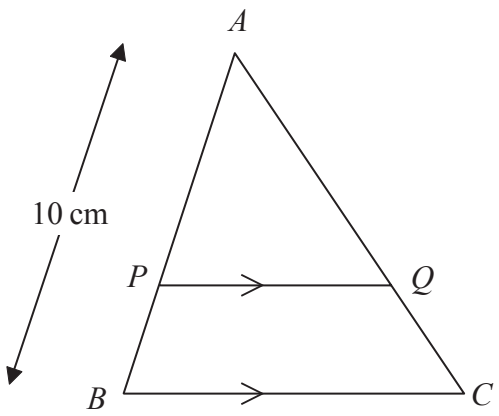


Diagram **NOT** accurately drawn

$AB = 10$ cm.
PQ is parallel to BC.

The area of triangle APQ is half the area of triangle ABC.

Calculate the length of AP.
Give your answer correct to 2 significant figures.

..... cm

(2)

Q20

(Total 3 marks)

Leave blank

21. $\frac{1}{3}$ of the people in a club are men.

The number of men in the club is n.

(a) Write down an expression, in terms of n, for the number of people in the club.

.....

(1)

Two of the people in the club are chosen at random.

The probability that both these people are men is $\frac{1}{10}$

(b) Calculate the number of people in the club.

.....

(5) **Q21**

(Total 6 marks)

TOTAL FOR PAPER: 100 MARKS

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