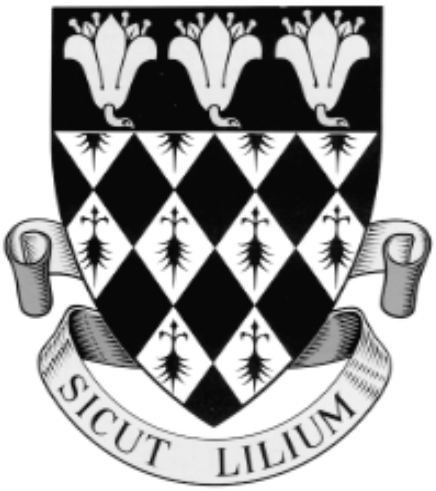
Name:……

MAGDALEN COLLEGE SCHOOL
OXFORD



SAMPLE SCHOLARSHIP PAPER

MATHEMATICS II

Please read this information before the examination starts:

1. This examination is 1 hour long.
2. Please try as many questions as you can.
3. Calculators are allowed.

1. A cup of tea costs 10p less than a cup of coffee, while a cup of hot chocolate costs 20p more than a cup of coffee. Three cups of coffee, five cups of tea and two cups of hot chocolate cost £8.90.

.

(a) Form an equation in x, with x representing the cost of a cup of coffee.

Answer…….[3]

(b) Solve your equation to find the cost of a cup of coffee.

Answer……..[3]

2. The length of a man's forearm (f cm) and his height (h cm) are approximately related by the formula

$$h = 3f + 90$$

(a) Part of a skeleton of a man is found and the forearm is 19cm long. Use the formula to estimate the man's height.

Answer…….[2]

(b) A man's height is 162cm. Use the formula to estimate the length of his forearm.

Answer…….[2]

(c) Anthony is 1 year old and he is 70cm tall. Find the value the formula gives for the length of his forearm and state why this value is impossible.

Answer……

……..[3]

3. James and Michael are arguing. James says that

$n^2 + n + 41$ is a prime number for any positive integer n. He uses the example

When n=1, $n^2 + n + 41$ = 1+1+41=43 which is a prime number.

Michael is not sure, wants to try out a few more values of n and then wants to think about the problem.

(a) Try n=2. Is $n^2 + n + 41$ a prime number?

Answer…….[2]

(b) Try n=3. Is $n^2 + n + 41$ a prime number?

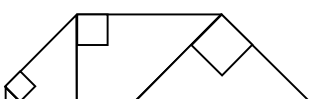
Answer…….[2]

(c) Do you think that $n^2 + n + 41$ is a prime number for any value of n?

Explain your reasoning fully.

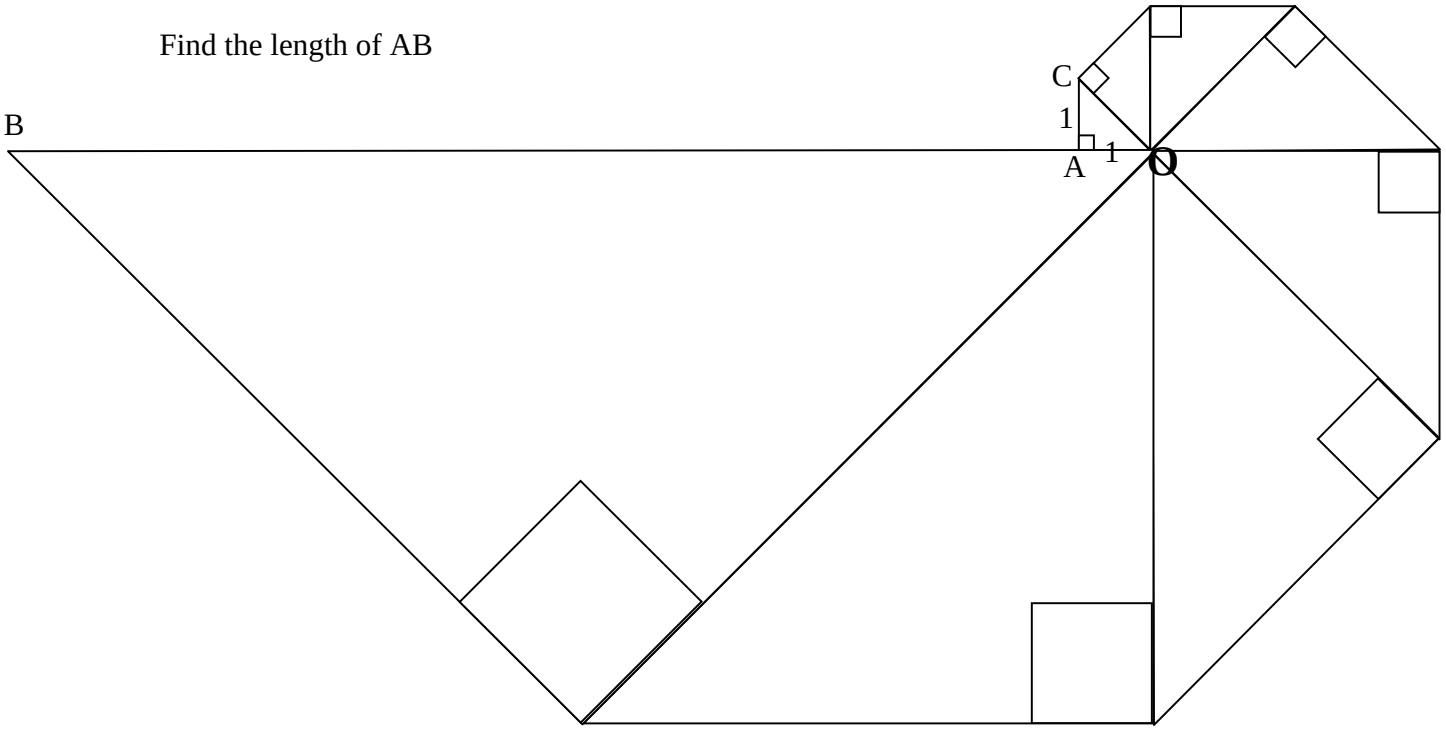
Answer……

…….[4}



4. The diagram shows triangle OAC, where AC=AO=1cm.

Find the length of AB



Answer…….[8]

5. Leaving your answers as fractions work out:

(a) $\dfrac{1}{1+\dfrac{1}{2}}$. =

(b) $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{2}}}$ =

(c) $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{2}}}}$ =

[5]

(d) Predict the next two answers if the pattern in the question continues in the same way.

Answer ……, ……..[4]

(e) Suppose the nth term in the sequence is $\dfrac{k}{m}$.

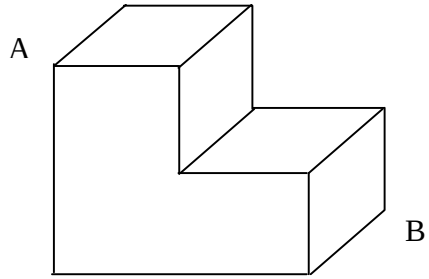
What will the (n+1)th term be in terms of k and m?

What will the (n+2)th term be in terms of k and m?

Answer (n+1)th term……..[2]

Answer (n+2)th term …….[2]

6. A polystyrene moulding has a cross section in the shape of a letter L with its longer edges 10cm and all other measurements 5cm, including its depth.



(a) What is its volume?

Answer…….[3]

(b) What is its total surface area?

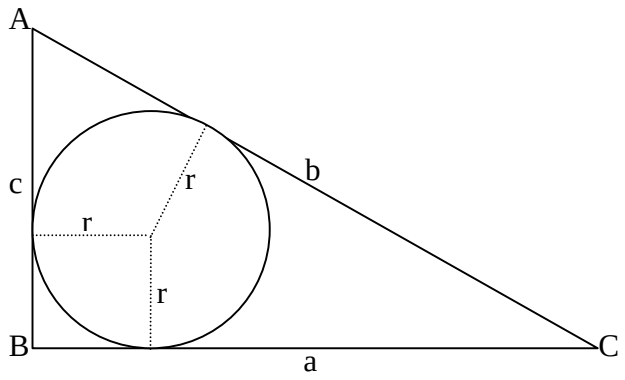
Answer …….[4]

(c) What is the shortest distance from A to B travelling on the surface of the moulding?

Answer ……..[6]

7. The diagram below shows triangle ABC, which has a right angle at B, with a circle drawn inside it which touches each side of the triangle.

The lengths of the sides of the triangle are BC=a, AC=b and AB=c. The radius of the circle is r.
Find the equation connecting a, b, c and r.



Answer.....[6]

8. (a) Complete the table below

x	-3	-2	-1	-0.5	-0.25	0.25	0.5	1	2	3
$y = \frac{2}{x}$			-2							

[3]

(b) $x = 0$ is not included in this table. If you enter $\frac{2}{0}$ in your calculator, what is displayed?

Answer…….[1]

(d) What does this tell you and how is it relevant to drawing the graph $y = \frac{2}{x}$?

Answer…….[2]

(d) Draw the graph of $y = \frac{2}{x}$ on the axes opposite. [3]

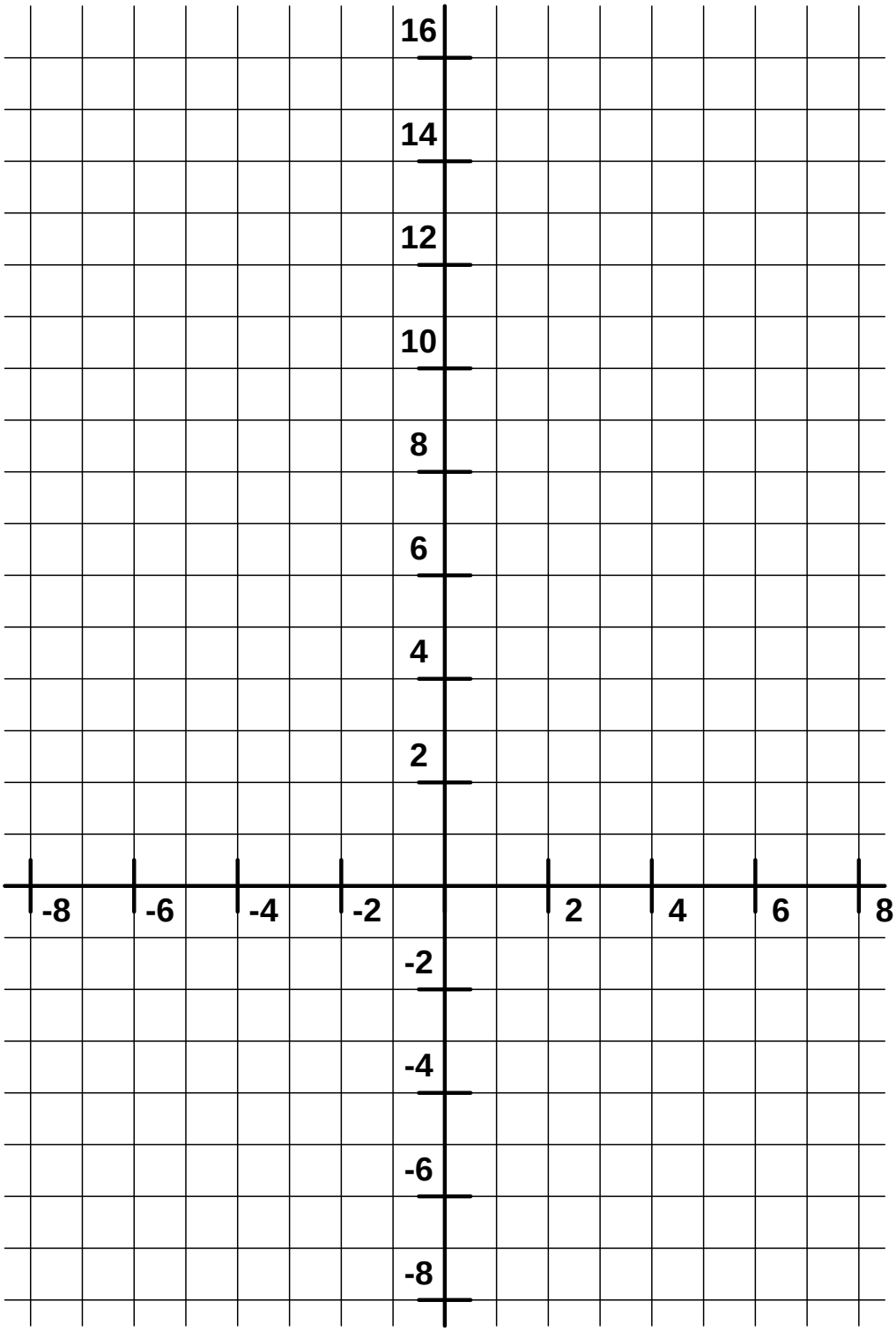
(e) Draw the line $y = 2x - 5$ on the same axes. [3]

(f) What are the x values of the points of intersection?

Answer……[2]

(g) Write down the equation that has your answer to part (f) as solutions.

Answer…….[3]


16
14
12
10
8
6
4
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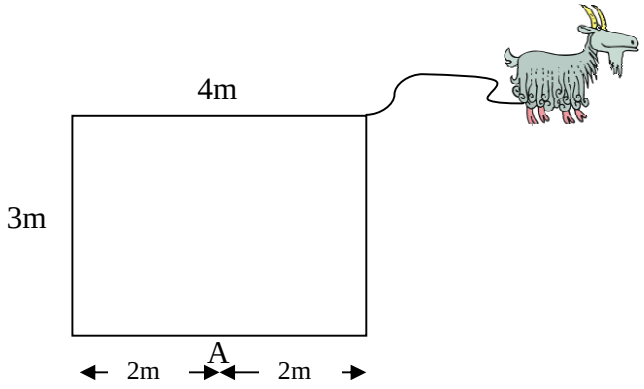
-8
-6
-4
-2
2
4
6
8
-2
-4
-6
-8

9. Billy the goat is tied to the corner of a barn 4m x 3m by a rope of length 4m.

(a) On the diagram below sketch the area of grass that he can graze.

[5]



(b) Calculate the area of grass he can graze

[5]

(c)If he is tied to point A, can he graze a larger area or smaller area?
Explain your answer fully including calculations to achieve full marks.

Answer……..[6]

END OF TEST