Name:……………………………
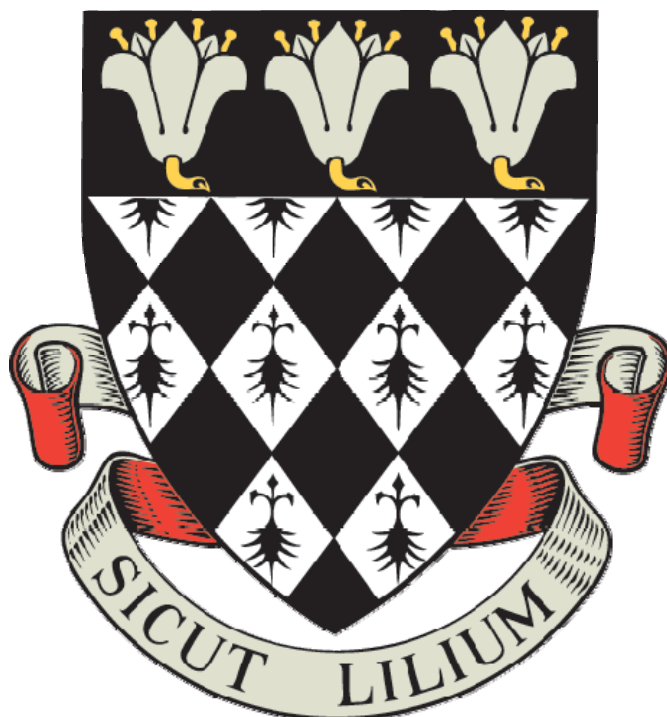
MAGDALEN COLLEGE SCHOOL
OXFORD

SAMPLE SCHOLARSHIP PAPER

MATHEMATICS I

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. (i) Multiply out to remove the brackets and simplify where possible:

(a) $(a^2 - ab + b^2)(a+b)$

Answer..................................[2]

(b) $(x^2 + 5)(3 - 2x)$

Answer..................................[2]

(ii) Factorise (i.e. put into brackets)

(a) $x^2 + 7x - 30$

Answer..................................[2]

(b) $x^2 - 17x + 16$

Answer..................................[2]

(c) $2x^2 - 6x$

Answer..................................[2]
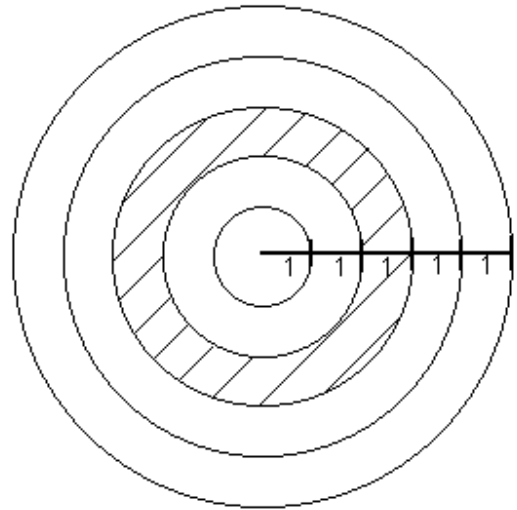
2. What fraction of each target area are the shaded rings?
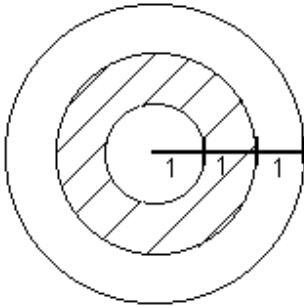
Target radius 3 `   Target radius 5

Answer: Radius 3: Fraction of area …………………………

Radius 5 : Fraction of area…………………………….

What do you think the middle ring area as a fraction of the total area will be if the target has radius 2n+1?

Answer   ……………………………………………………………………………………… [8]

3. (i) If $x = \dfrac{-b + \sqrt{b^2 - 4ac}}{2a}$, calculate x if $a = 3$, $b = -2.2$ and $c = -6$

Give your answer correct to **2 decimal places.**

Answer...........................[3]

(ii) If $S = \dfrac{n}{2}\{2a + (n-1)d\}$, calculate S if , a =9.8, $d = 5$ and n =3.

Answer...........................[2]

(iii) If $F = \dfrac{a(1-z)}{k\sqrt{z^2 + R^2}}$ find F when a=8.4, $k = \sqrt[3]{2}$, R = 6.5 and z = 7.9

Give your answer correct to **3 significant figures**.

Answer...........................[4]

4. (i) Simplify

(a) $\dfrac{x+x+x}{x}$

Answer...................[2]

(b) $(a+a)^3$

Answer...................[2]

(c) $\dfrac{y^2+3y}{2y+6}$

Answer................................[3]

(c) $3(2a-7b+1)-4(3a+6b-1)$

Answer..[3]

(d) $x(2x+3y)-y(y-4x)$

Answer..[3]

5. Solve the equations to find x:

(i) $9(x-2)-7(x+1)=-15$

Answer..............................[3]

(ii) $\dfrac{2x+1}{5}=\dfrac{x+3}{6}$

Answer..............................[3]

(iii) $8=4+\sqrt{7+x}$

Answer..............................[3]

6. Which of the two triangles below has the larger area?
   Explain your answer fully, including calculations.
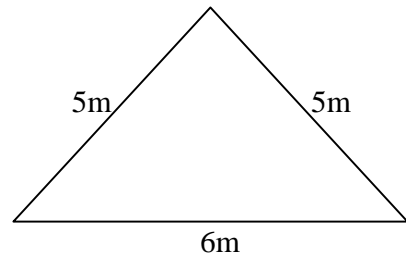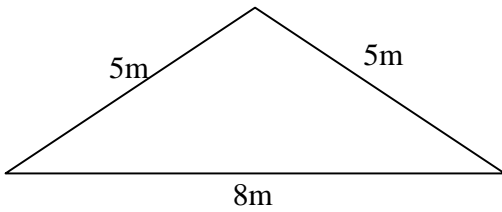
Answer ………………………………………………………………………………………..………………[6]

7. Sir Isaac Newton died in the year $x^3 + 1$ and was $7x$ years old when he died. (He had had his birthday in the year that he died.) In which year was he born?

Answer………………….[4]

8. Adam, Ben and Carl are weighing themselves.
Together Adam and Ben weigh 102kg.
Ben and Carl weigh 97kg.
Adam and Carl weigh 93kg.

What is the mean of their weights?

Answer...........................[4]

9. Regular dodecagons (12 sided polygons) form a semi regular tessellation (ie using one other regular polygon).
   (a) Calculate the interior angle of a regular dodecagon.

Answer.....................[3]

By considering the corners where the polygons of the semi regular tessellation meet, what is the other polygon?
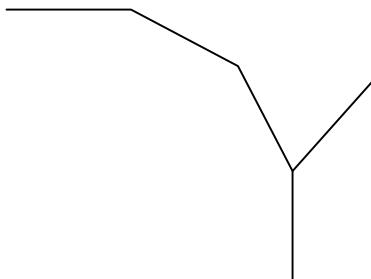
Answer.................................[3]

10. The sum of 5 consecutive odd numbers is 45. What is the first number?

Answer.....................[3]

11. A property owner has two houses for sale – one in a fashionable area (called Costaplenty), one in a less fashionable area (called Thisledo).

He manages to sell them for £156 000 each.

Based on what he originally paid for them, Costaplenty has made him a profit of 20%, while Thisledo has made him a loss of 20%.

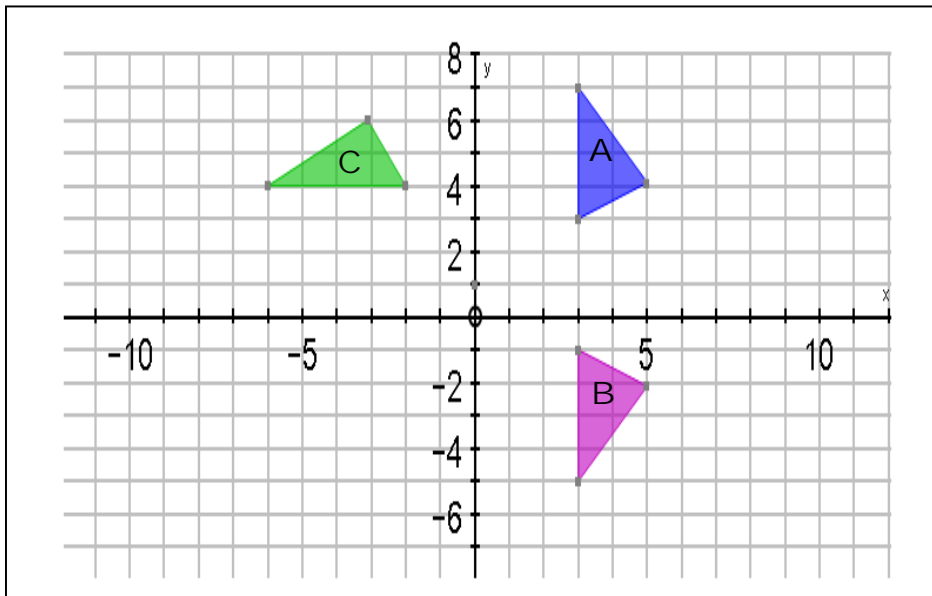(a) What was the profit he has made on Costaplenty?

Answer……………….[3]

(b) What was the loss he has made on Thisledo?

Answer…………………..[3]

12. A van travels 270km from Leeds to Trowbridge with an average speed of 60 kilometres per hour. What average speed does it need to achieve on the return journey to make the average speed for the whole journey 75 kilometres per hour?

Answer………………..[4]

13

(a) Describe fully the single transformation which will take shape A onto shape B.

Answer:……………………………………………. [2]

(b) Describe fully the single transformation which will take shape A onto shape C.

Answer ……………..……………………………. [3]

On the diagram draw the image of C when it has been enlarged by a scale factor of 2 about the point (0,5).   [3]

14.   On Mathland TV a political commentator summed up an election result as follows. This year there is a Conservative majority of 1654 (compared with the candidate in second place) in this election and the conservative candidate has obtained 38% of the poll. Labour has taken second place. The Liberal Democrat has obtained only 14% of the poll and has been beaten into fourth place by the SNP candidate who has 50 more votes than the Liberal Democrat.

Given that there were just four candidates and that the figures quoted were exact find the number of votes polled for each candidate.

Conservative.......................

Labour................................

Liberal Democrat.................

SNP..   [10]

END OF PAPER