GROUP ROUND

INSTRUCTIONS

- Your team will have 40 minutes to answer 10 questions. Each team will have the same questions.

- Each question is worth 6 points. However, some questions are easier than others!

- You will have to decide your team's strategy for this group competition. Do you split up so that individuals work on a few questions each or do you work in pairs on a greater number of questions? Working all together on all the questions may well take too long. You decide!

- There is only one answer sheet per team. Five minutes before the end of the time you will be told to finalise your answers and write them on to the answer sheet. This answer sheet is the only thing that will be marked.

Question 1

Anne, Becky and Charlotte had sums of money in the ratio 7:6:5. One of them gave £9 to one of the others and this changed the ratio (in the same order of names) to 6:5:4. The total sum of money remained the same; what was it?

Question 2

What is the value of the following expression?

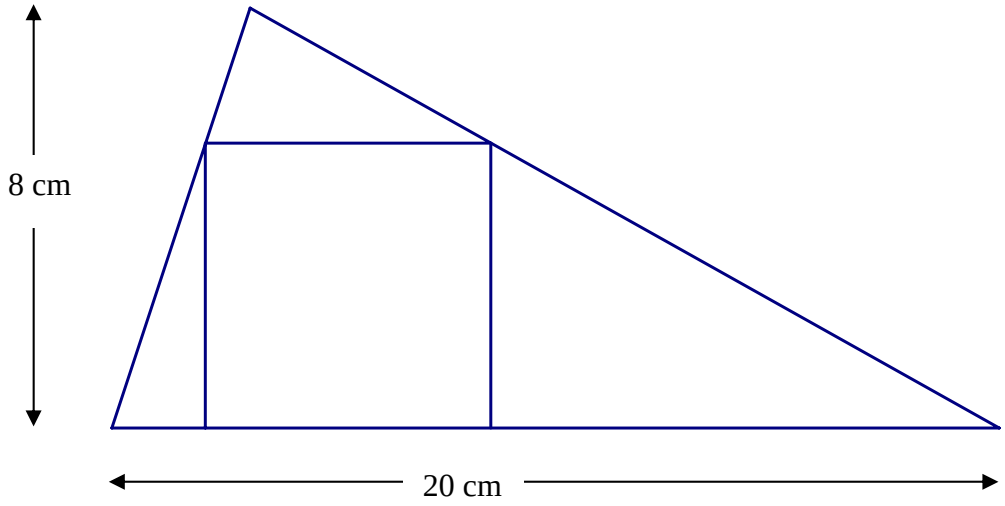
$$\frac{\left(1+\frac{1}{2}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{6}\right)\left(1+\frac{1}{8}\right)\ldots\ldots\left(1+\frac{1}{200_8}\right)}{\left(1-\frac{1}{2}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{6}\right)\left(1-\frac{1}{8}\right)\ldots\ldots\left(1-\frac{1}{200_8}\right)}$$

Question 3

If p is a positive prime number and $p^{2008} + p^{2009}$ is a perfect square what is the value of p?

Question 4

Find the area of the square in the diagram below.



Question 5

If

$$x^{11} + 2048 = (x + 2)(a_{10}x^{10} + a_9x^9 + a_8x^8 + a_7x^7 + a_6x^6 + a_5x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0)$$

what is the value of $a_{10}+a_8+a_6+a_4+a_2$?

Question 6

A company is trying to use its printers in a more environmentally friendly way. It already has a policy that it will never print a document containing more than ten pages. Suppose that the settings on each printer are changed from printing single sided sheets to printing double sided sheets with two pages per side.

Assuming that documents of all permitted lengths are equally likely, in the long run, what fraction of the paper used under the old settings will be saved under the new settings?

Question 7

If Adam and Ben worked together to paint a house they would take 12 hours. Adam and Colin as a team would take 15 hours to paint the house and Ben and Colin as a pair would take 20 hours.

Assuming that the rate at which each painter works is not affected by whom he works with, how long would it take to paint the house if they all worked together?

Question 8

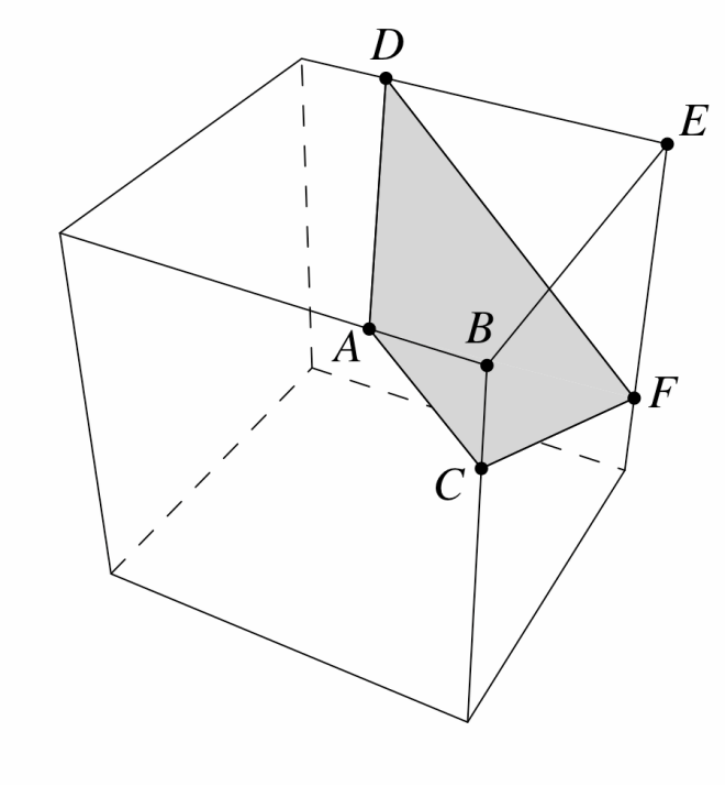
Given any three-digit number, x, define $A(x)$ to be

x – the sum of the squares of the digits of x

What is the maximum possible value of $A(x)$?

Question 9

The edges of the cube shown below are 8 cm long.
Also AB = BC = 2 cm and DE = EF = 6 cm.
Find the area of the trapezium ACFD.



Question 10

The three points (3, 6), (4, 6) and (4, 8) are reflected in the line $3x + 4y = 50$ to give three of the vertices of a parallelogram. The parallelogram is completed in such a way that the additional vertex P is as far from the origin as possible. What are the coordinates of P?

Senior Team Maths Challenge

Group answer sheet

Team number ……. School / College name…….……..……..

1. Total sum of money	**2.** Value of expression
3. p	**4.** Area of square cm^2
5. $a_{10}+a_8+a_6+a_4+a_2$	**6.** Fraction saved
7. Time to paint house hours	**8.** Maximum value of $A(x)$
9. Area of trapezium	**10.** Coordinates of vertex

Award 6 points for each correct answer:

TOTAL SCORE = _____