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.

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Question 1

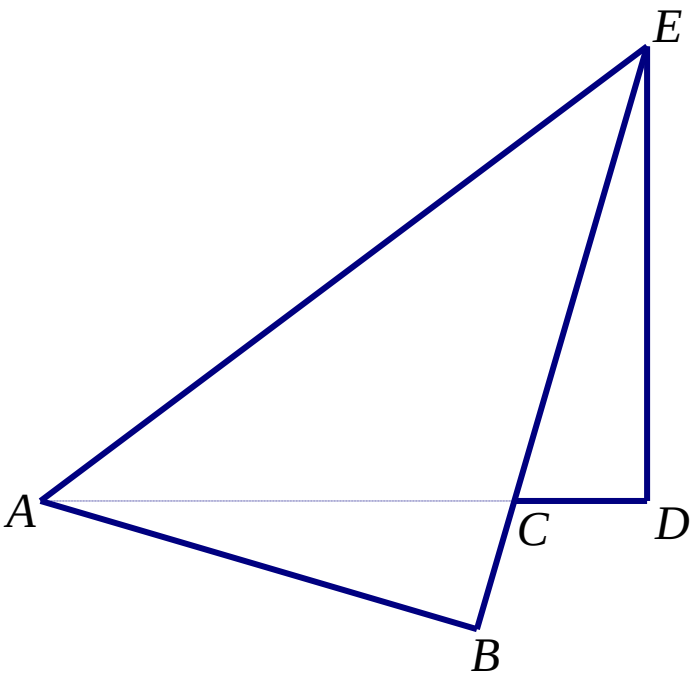
What is the ratio of the area of a square inscribed in a semicircle to the area of a square inscribed in the whole circle?

Question 2

$N = 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
How many positive factors does N have?

Question 3

A 3 by 4 rectangle is folded along one of its diagonals to form pentagon *ABCDE*, as shown. Calculate the perimeter of this pentagon.



Question 4

Six dots are arranged on the page so that they form the vertices of two adjacent squares. Three of these dots are chosen at random and joined with straight lines. What is the probability that a right-angled triangle will be formed?

Question 5

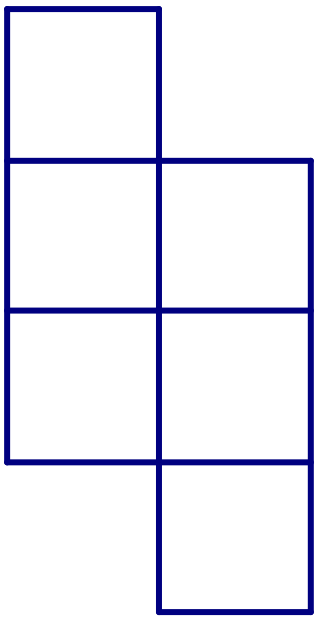
The number

$$(10^2 - 8^2)(9^2 - 7^2)(8^2 - 6^2)(7^2 - 5^2)(6^2 - 4^2)(5^2 - 3^2)(4^2 - 2^2)(3^2 - 1^2)$$

can be written in the form $k \times 2^n$, where k and n are positive integers. What are the values of k and n?

Question 6

Put a single digit in each of the six squares below, with no repetitions, so that the two columns, reading downwards, each contain a three-digit perfect square, and the middle two rows, reading across, each contain a two-digit perfect square. What is the sum of the six digits used?



Question 7

M is the smallest positive integer which has the property that, for n = 2, 3, 4, 5, 6, 7, 8, 9 and 10, the remainder when M is divided by n is $n - 1$.

What is the value of M ?

Question 8

A club with x members is organized into four committees in accordance with the following rules:

1) Each member belongs to two and only two committees.
2) Each pair of committees has one and only one member in common.

What is the value of x?

Question 9

Three students (Tony, Becky and Jenny) are doing some surveying work on a piece of level ground and are currently standing at points T, B and J respectively.
Jenny says to Becky, "I've noticed that the mean of our distances from Tony is the same as the distance between us."
Becky replied, "Yes, and the cosine of the angle BJT is equal to $\frac{TB}{TJ}$."
At that point, Tony said, "Ah, now I can work out the numerical value of cos BJT."
What is it?

Question 10

In southern Iraq, during an excavation of the ancient city of Ur, a set of dice was found. Each of these dice was the shape of a regular tetrahedron with one of the vertices marked with a dot. If three of these dice are thrown the score is the number of marked vertices that appear at the top. What is the probability that the total score on two consecutive throws of the three dice is 2?

Senior Team Maths Challenge

Group answer sheet

Team number ……. **Team name ……..**

1. Ratio	**2.** Number of positive factors
3. Perimeter of pentagon	**4.** Probability of a right-angled triangle
5. k = n =	**6.** Sum of the digits
7. M =	**8.** x =
9. Numerical value of cos BJT	**10.** Probability of total score 2

Award 6 points for each correct answer:

TOTAL SCORE = _____