Round 1

1) What is the sum of the digits of the product $2^{2012} \times 5^{2014}$?

2) Simplify the following expression $1-\dfrac{1}{1-\dfrac{1}{1-\dfrac{1}{2014}}}$.

Round 2

1) Expand $(1-x^2)(1+x^3)$

2) The point (4, 3) is reflected in the x-axis to a point P.
Then P is reflected in the y-axis to a point Q.
What is the sum of the coordinates of Q?

Round 3

1) Find the derivative of $\ln\left(\frac{4x^2 - 1}{3x + 1}\right)$ when x = 1.

   Answer in simplest form $\frac{a}{b}$, where a and b $\in \mathbb{Z}$

2) Suppose five days before the day after tomorrow was Wednesday. What day of the week was yesterday?

Round 4

1) Calculate, in its simplest form, the value of i^{2014}, where $i = \sqrt{-1}$.

2) Find the numerical value of the derivative of Sin(3x) when x = $\frac{\pi}{3}$.

Round 5

1) A total of twenty eight handshakes were exchanged at the end of a party. Assuming that everyone shook hands with everyone else at the party, how many people attended the party?

2) Find the value of $(4^{-1} - 3^{-1})^{-1}$ in its simplest form.

Round 6

1) A bag has 3 red and k white marbles. Two marbles are chosen at random from the bag. If the probability that the two marbles are the same colour is $\frac{1}{2}$, find the value of k, if $k > 1$.

2) In the subtraction below some of the digits have been replaced by letters.

$$\begin{array}{r} A4B7C \\ 5D8E6 \\ \hline 28499 \end{array}$$

Find the numerical value of A + B + C + D + E.

Round 7

1) In how many ways can a pigeon fancier separate his 10 pigeons into a group of 4 and a group of 6 if he has to keep a certain two of the pigeons in separate groups?

2) Components made by a certain process have a thickness which is normally distributed about a mean of 3 cm with a standard deviation 0·03 cm. A component is considered defective if its thickness is greater than 3·05 cm or less than 2·95 cm. What percentage of the components are defective? Answer correct to 1 decimal place.

3) Three fair dice are tossed once. What is the probability that the faces show three consecutive integers? Answer in simplest form $\frac{a}{b}$ where a and b $\in \mathbb{N}$.

4) Two candles of equal length are lit at 10 pm. Each candle burns at a different constant rate. One candle takes 6 hours to burn out; the other takes 3 hours. At what time is one candle exactly twice as long as the other?

Round 8

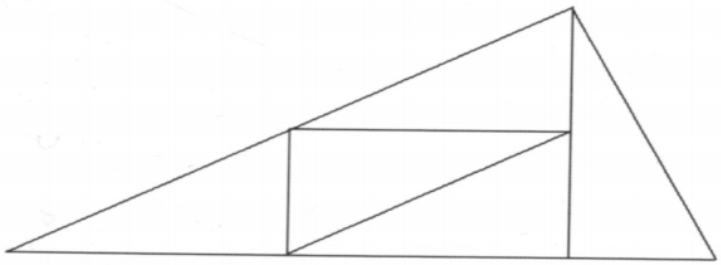
1) Solve for x : $2.3^{2x+1} - 5.3^{x} - 6 = 0$.

Answer correct to 2 decimal places.

2) Find the value of x If $\log_2(\log_2(\log_2(x))) = 2$

Answer in the form a^b, where a and b $\in$ N, and b is the smallest integer greater than 1

3) The architecture of a sculpture in a certain city is based on frames as shown in which a large triangle is subdivided into 5identical triangles, each similar to the large triangle.



If the shortest side of one of the smallest triangles is 1metre, how many metres of framing are required to construct the whole shape? Answer in the form $a + b\sqrt{c}$, where a, b and $c \in$ N

4) The product of a two-digit number and the same number with its digits reversed is 3154. Find the sum of the two numbers.

Tie Breakers

1) My house number is the lowest number on the street that, when divided by 2, 3 , 4 , 5 or 6 , will always leave a remainder of 1.
However when divided by 11 there is no remainder.
What is my house number?

2) In a knock-out tennis tournament all players who entered took part. (there were no walkovers). In all there were 39 matches played before the outright winner emerged.
How many players entered the competition?