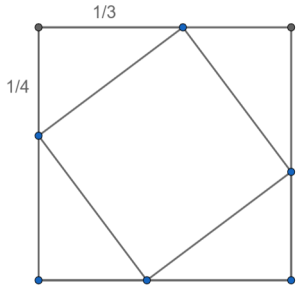
Beginner Test 1

January Camp 2021

Time: $2\frac{1}{2}$ hours

1. What is the ratio of the areas of the two squares given below:



   Remember to prove your answer.

2. Find, with proof, the smallest three different positive integers whose squares sum to the square of an integer.

3. Find, with proof, 4 fractions strictly between $\frac{1}{3}$ and $\frac{1}{2}$ with denominator less than 10.

4. What fraction of the following shape is shaded:

   Prove your answer.
   Note: The dots are spaced evenly around the circle and the only interior point used is the center of the circle.

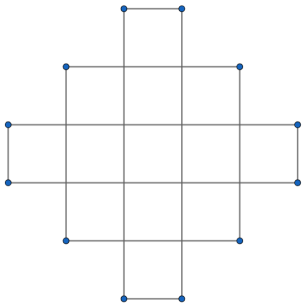
5. You are given that T,W,O,N,E are all different digits from 1 to 9 such that T+O+N=6 and:

		T	E	N
+		T	W	O
		O	N	E

   Find, with proof, the values of T,W,O,N,E.

6. Ralph and Phil are playing a game. They have R12 in a bank account and can only withdraw coins of values R1, R2 and R5. The winner is the player who withdraws the last coin. If Ralph starts and they then alternate withdrawing one coin each (with a value of their choice), who has the winning strategy and how can they win?
   Note: A winning strategy must be able to beat any sequence of moves that the opposing player decides to make.

7. You are given the following shape:



   You need to tile this with L-shapes made of 3 blocks. Which single blocks could you shade out of the original diagram to make this possible?

8. Find all natural numbers x, y and z satisfying

$$x + \frac{1}{y + \frac{1}{z}} = \frac{850862}{421}$$

- Submit your solutions at https://forms.gle/bVQiJtvePFiUyBLw6.
- Submit each question in a single separate PDF file (with multiple pages if necessary).
- If you take photographs of your work, use a document scanner such as Office Lens to convert to PDF.
- If you have multiple PDF files for a question, combine them using software such as PDFsam.

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