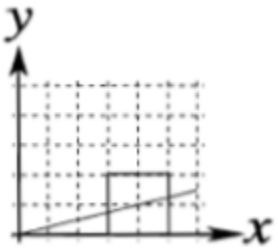
Bergen County Math League

Contest #2 **2021-2022** **Answers/Solutions**

2-1. **Answer:** 0

The expressions within the parentheses are opposites, so the sum of their cubes is always 0.

2-2. **Answer:** 0.25 or $\frac{1}{4}$

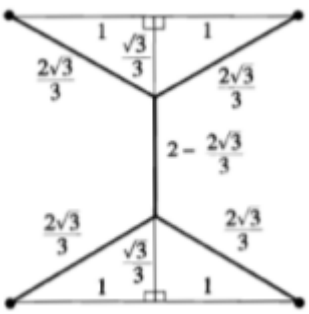


Every line through the center of the square will divide the square into two regions of equal area. The line shown in the diagram is the required line. This line passes through $(0,0)$ and $(4,1)$, and it has a slope of $\frac{1}{4}$ or 0.25.

2-3. **Answer:** 2021

Let the integers be x and $x+1$. Their squares will always differ by $2x+1$, which is also the sum of the two integers. Since the difference of the squares is 2021, the sum of the integers must also be 2021.

2-4. **Answer:** $(2,2,3)$



The total Y-length is $4\left(\frac{2\sqrt{3}}{3}\right)+2-\frac{2\sqrt{3}}{3}=2+2\sqrt{3}$. Thus we have $(a,b,c)=(2,2,3)$.

2-5. **Answer:** 42,857

The positive integer *N* has 5 digits, so the value of *N*1 is $10N+1$, and the values of 1*N* is $100{,}000+N$. From the information given, we can write the equation $10N+1=3(100{,}000+N)$. Solve this equation to get N=42,857.

2-6. **Answer:** 5

Expressing 1 as a sum of the indicated type is similar to expressing $\frac{1}{8}$ as a sum of decimals that consist only of 0's and 1's. We will multiply these decimals by 8 to answer this problem. Since $\frac{1}{8}=0.125$, we know that $1=8x0.125$. If we split $\frac{1}{8}=0.125$ into decimals that only use the digits 0 and 1, we can multiply by 8 to split 1 into decimals that use only the digits 0 and 8. Let's get the 1's as far left as possible so we will use as few decimals as possible. Begin by writing $0.125=0.111+0.011+0.001+0.001+0.001$. Multiplying by 8, $1=0.888+0.088+0.008+0.008+0.008$. We need at least 5 such decimals.