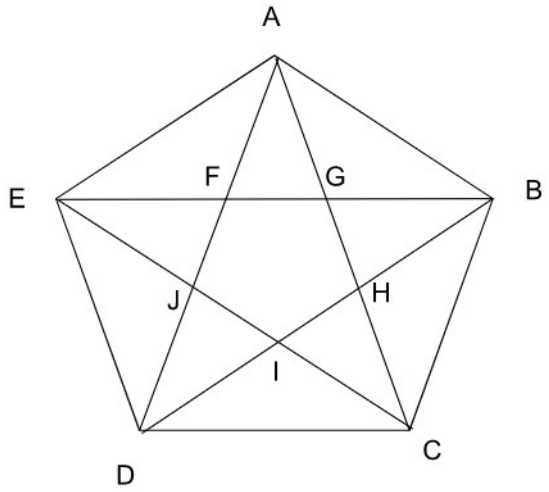
2023 Gauss Math Tournament Target Round (Div. 2)

June 10, 2023

1. Hayley makes a regular pentagon, marking points $A, B, C, D, E, F, G, H, I, J$ as shown. She designates the area of triangle AFG as the *standard area*. How many ways can anyone choose three points that form a triangle that has the *standard area*?



2. What is the sum of $\frac{1}{3} + (\frac{1}{3})^2 + (\frac{1}{3})^3 + (\frac{1}{3})^4 + \cdots$?

3. Evaluate the following: $\binom{12}{0} + \binom{12}{3} + \binom{12}{6} + \binom{12}{9} + \binom{12}{12}$.

4. 5 bits is equal to 9 dafts. 51 dafts is equal to 13 bleets. 7 bleets is equal to 1 blarp. How many bits are 39 blarps?

5. Emma and Ava start at the same time from two locations, A and B, and travel towards each other. It takes Emma 6 hours to complete the entire journey. When they meet, the ratio of the distances they have traveled is 3:2. At that point, Emma has traveled 18 kilometers more than Ava. Find the speed of Ava in kilometers per hour (do not include units in your answer).

6. Suppose that $ABCDEF$ is an equiangular hexagon where $BC = CD = EF = FA = 4$ and $AB = ED = 2$. What is the area of $ABCDEF$?

7. Pord Frefect is hitchhiking across the galaxy to fill the bestselling book, The Hitchhiker's Guide to the Galaxy. He has to travel across 9 planets, and he has a 0.5 chance that he survives the planet. Then, he has a 0.1 chance that he successfully hitchhikes to the next world. What is the probability that Pord Frefect is able to accomplish his goal? Give your answer in scientific form.

8. Suppose that ABCD is a tetrahedron with AB=AC=AD=10 and BC=CD=BC=6. What is the volume of ABCD?