

KU Mathematics and Statistics Competition
Department of Mathematics
University of Kansas



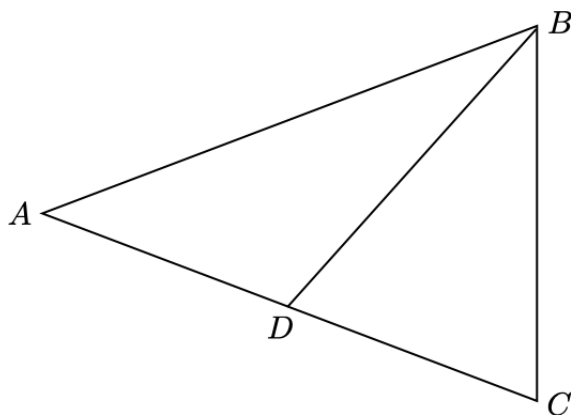
Competition for 6th-8th Grades
April 2, 2022

INSTRUCTIONS:

- You have **40 minutes** for the **five problems**.
 - Show all of the necessary work and **provide a complete justification for each answer**.
 - Solve **each problem on a separate sheet** of paper.
 - Enclose each **final answer in a box**.
 - You are allowed to use a calculator.
 - You are not allowed to borrow or interchange calculators during the test.
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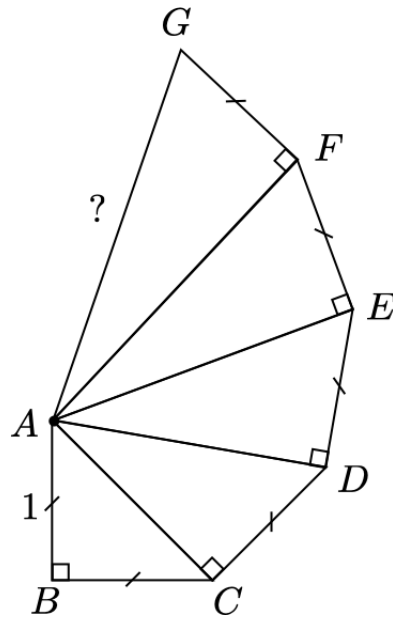
Problem 1. Let a and b be two real numbers such that $\frac{2022a + b}{a - b} = 2021$. What values can $\frac{a}{b}$ have?

Problem 2. Let $\triangle ABC$ be an isosceles triangle with base BC and let D be the midpoint of AC . Provided that $\triangle BCD$ is also an isosceles triangle with base CD and $|BC| = 2022$, what is the area of $\triangle ABC$?



Problem 3. We call an integer *very even* if all digits of this number are even. For example, both 6 and 2002 are very even, but 1032 is not very even because it includes the odd digits 1 and 3. Suppose we randomly choose an integer between 1 and 2022 (including 1 and 2022). What is the probability that this integer is very even?

Problem 4. In the given figure, $|AB| = |BC| = |CD| = |DE| = |EF| = |FG| = 1$ and the angles at B, C, D, E and F are right angles as marked on the figure below. How long is the segment AG ?



Problem 5. The weather forecast states there is $1/4$ chance of rain on Friday, $2/5$ on Saturday, and $1/6$ on Sunday. Find the probability that it will rain exactly two of these three days, assuming these are independent events from each other.