Set 1

Problem 1. Compute $1-2+3-4+5-6+\cdots+19-20$.

Problem 2. How many diagonals are in a hexagon?

Problem 3. Using only 3 straight cuts, what is the maximum number of pieces into which a cube can be cut?

Problem 4. Find all two-digit numbers $\underline{AB}$ that satisfy the equation $\sqrt{A+\sqrt{\underline{AB}}}=A$, where A is the tens digit, B is the units digit, and $\underline{AB}$ is a two-digit number.

28th TJIMO
Alexandria, Virginia

Round: **Practice Guts**

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Set 2

Problem 5. Akshaj is struggling in APUSH. His test scores were $47, 51, 43, 64$, and 35. If he gets a 42 on his next test, what will be the average of all his test scores?

Problem 6. There are 30 people in one of the math-team trailers. 25 of them like geometry, 14 of them like algebra, and 20 of them like number theory. If 10 of them like algebra and geometry, 12 of them like algebra and number theory, and 8 of them like geometry and number theory, how many of them like all 3 subjects?

Problem 7. What is the remainder when 2^{2016} is divided by 7?

Problem 8. In quadrilateral $ABCD$, $\angle DAC = 75^\circ$, $\angle ACB = 40^\circ$, $\angle DBC = 75^\circ$, and $\angle BDC = 25^\circ$. Find the measure of angle $\angle ABD$.

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Set 3

Problem 9. Lilian does Alex's evil bidding. If Lilian averages 30 tasks per hour between 7 pm and 9 pm and does 51 tasks between 7 pm and 8:30 pm, how many tasks does she do between 8:30 pm and 9 pm?

Problem 10. Michael has a playlist with 10 songs on it. The lengths of the songs form an arithmetic sequence with common difference 6 seconds and sum 30 minutes. What is the length of the shortest song in seconds?

Problem 11. How many distinct, non-congruent rectangles with positive integer side lengths have an area that is 52 more than their perimeter?

Problem 12. There is a 70% chance that it is cloudy, and a 60% chance that it will rain. It is twice as likely to rain when it is cloudy than when it is not. What is the probability that it will rain, given that it is not cloudy?

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