DUSO Mathematics League 2016 - 2017

Contest #1. **Calculators are not permitted on this contest.**

Part I. **ALGEBRA I** *Time Limit: 10 minutes*

The word "compute" calls for an exact answer in simplest form.

1 - 1. Compute the greatest integer value of x such that $20x + 16 \leq 2016$

1 - 2. Compute the values of x that satisfy the following equation: $(x+1)^2 + (x-2)^2 = (2x-1)^2$

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Part II. **GEOMETRY** *Time Limit: 10 minutes*

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1 - 3. An isosceles triangle has integer side lengths. If one side has length 3, compute the least possible perimeter of the triangle.

1 - 4. Given square $SQUA$. The point R is the midpoint of $\overline{QU}$. Point E is the intersection of $\overline{SU}$ and $\overline{AR}$. The area of $\triangle EUR$ is 7. Compute the area of $SQUA$.

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Part III. **ALGEBRA II / ADVANCED TOPICS** *Time Limit: 10 minutes*

The word "compute" calls for an exact answer in simplest form.

1 - 5. Compute the remainder when $x^3 - 4x^2 + 3x - 5$ is divided by $x - 4$.

1 - 6. The roots of $32x^3 - 48x^2 + 6x + 5 = 0$ are in arithmetic progression. If the roots are p, q, and r with $p < q < r$, compute $r - p$.

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R-1. If 12% of a number is 144, compute the number.

R-2. *Let N be the number you will receive.* If $N = A \cdot B!$ for some positive integers A and B, compute the least possible value of A.

R-3. *Let N be the number you will receive.* When the hands of a standard clock are at N o'clock, compute the measure of the supplement of the acute angle between the hands.

R-4. *Let N be the number you will receive.* Compute the least positive integer x such that $\sqrt{2N + x^2}$ is a whole number.

R-5. *Let N be the number you will receive.* A set of N consecutive whole numbers has a sum of 2018. Compute the greatest of the whole numbers.