UIL: Mathematics Questions
Stasya S., Richardson HS, Guide

1   All Information to Know

Pythagorean Formula: $c^2 = a^2 + b^2$

Area of an Equilateral Triangle: $\frac{s^2\sqrt{3}}{4}$ or $\frac{h^2\sqrt{3}}{3}$

Area of Rhombus: bh or half the product of the diagonals

Permutations: $_nP_r = \frac{n!}{(n-r)!}$

The nth triangular number: $\frac{(n)(n+1)}{2}$

In the form $ax^2 + bx + c$:

- Sum of roots: $-\frac{b}{a}$
- Product of roots: $\frac{c}{a}$

An n-polygon has $\frac{n(n-3)}{2}$ distinct diagonals.

The sum of the measures in an n-gon is $360\deg$

The measure of an exterior angle is $\frac{360\deg}{n}$

$a^2 - b^2 = (a+b)(a-b)$

$b^{-n} = \frac{1}{b^n}$

$n^{\frac{p}{q}} = (\sqrt[q]{n})^p$

Rules for simplifying radicals:

- The radicand can't contain a factor that is a perfect square.
- The radicand can't be a common fraction.
- A square root cannot appear in the denominator of a fraction.

For Addition and Subtraction of Fractions:

- Multiply the denominator of the fraction on the right with the numerator of the fraction on the left
- Multiply the denominator of the fraction on the left with the numerator on the right
- The sum of the results on the first two steps will be the numerator of the answer
- Multiply the two denominators of the two fractions
- Determine if the resulting fraction can be simplified

To find the LCM of two numbers:

- The product of the LCM and GCF will be the product of the two numbers.
- Therefore, the LCM = the product of the numbers divided by the GCF

To convert Base 10 to Base x:

- The first digit of the answer is the remainder when you divide the given number by the base.
- Divide the quotient of step one by the base, this is the second digit.
- Continue dividing the quotient of the previous answer until all digits are found/

To convert from Base x to Base-10:

- Multiply the first digit to the left by the base.
- Add the middle digit from the result with the first step.
- Multiply this result by the base.
- Add the digit to the right by the result from the previous step.

Remember the order of operations:

- First, do all operations within parenthesis
- Next, do any exponents or radicals
- From left to right, do any multiplication or division
- From left to right, do any addition or subtraction

A rule: $1 + 3 + 5 + \cdots + k = \left(\frac{k+1}{2}\right)^2$

Given a mixed number as a percentage:

- Convert the mixed number into an improper fraction
- Add two zeroes to the denominator and simplify to lowest terms

Roman Numerals: M is 1000, D is 500, C is 100, L is 50, X is 10, V is 5, I is 1.

The range is the difference between the smallest and biggest numbers.

When comparing if a fraction is larger or smaller, cross multiply each fraction. The smaller number will be the fraction with the smaller product.

Given a n-element set, there are 2^n subsets.

The power set of a given set is a set whos elements are the subsets of the set.

2 Algebra

3 Geometry

4 Pre-Calculus

5 Statistics

6   Calculus