Exponents

The exponent of a number says how many times to use the number in a multiplication

$8^2 = 8 \times 8 = 64$ (① ②)

A NEGATIVE exponent says how many times to DIVIDE the number instead of multiply. An easier way to calculate the negative exponent is to calculate using the positive exponent and then use the reciprocal (flip fraction upside-down).

$5^{-3} \rightarrow 5^3 = \frac{125}{1}$ 5

$5^{-3} = \frac{1}{125}$

What if the exponent is 0 or 1?

If the exponent is 1, you just have the number itself

$9^1 = 9$

If the exponent is 0, you get 1

$9^0 = 1$

0^0 = indeterminate

What if the exponent is a fraction? This is called a *rational exponent*.

In this case, the exponent becomes a root.

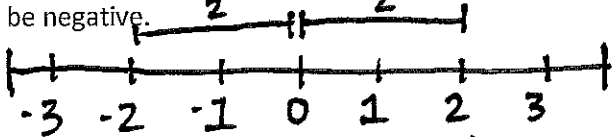
$4^{1/2} = \sqrt{4}$ (square root)

$4^{1/3} = \sqrt[3]{4}$ (cube root)

$4^{1/4} = \sqrt[4]{4}$ (fourth root)

Absolute Value

The absolute value of a number is how far that number is away from 0. Absolute value can never be negative.



absolute value of $-2 = 2$

To show that we want the absolute value of something, we put "|" marks either side (they are called "bars").

absolute value of -7:

$|-7| = 7$

Vectors and Matrices

A vector is a list of numbers (they can either be in a row or column). Two numbers signify a 2 dimensional shape, 3 numbers signify a 3 dimensional shape.

$\begin{bmatrix} 2 & 3 & 8 \end{bmatrix}$ ← vectors → $\begin{bmatrix} 5 \\ 12 \\ 4 \end{bmatrix}$

A matrix is an array of numbers – multiple columns or rows together.

$\begin{bmatrix} 7 & 9 & 6 \\ 8 & 6 & 2 \\ 1 & 4 & 10 \end{bmatrix}$ → matrix

To add or subtract matrices, simply add or subtract the numbers in the matching spots.

To multiply by a single number, simply multiply each number that that number.

$\begin{bmatrix} 1 & 2 \\ 4 & 6 \end{bmatrix} + \begin{bmatrix} 5 & 7 \\ 2 & 2 \end{bmatrix} = \begin{bmatrix} 6 & 9 \\ 6 & 8 \end{bmatrix}$

$2 \times \begin{bmatrix} 1 & 2 \\ 4 & 6 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 8 & 12 \end{bmatrix}$

To multiply or divide matrices with each other, use your calculator.

2nd – matrix; edit; enter matrix under [A], and second matrix under [B], and then complete operations.

Complex Numbers

A complex number is a combination of both a real number and an imaginary number.

A real number is nearly any number you can think of!

Imaginary numbers are numbers with an *i* attached to it. The *i* signifies that the number needs to be multiplied by the square root of negative one.

$i = \sqrt{-1}$, so $7i = 7 \times \sqrt{-1}$

$7i$: imaginary number

real number → $7 + 3i$ ← imaginary number

$7 + 3i$: complex number

To multiply complex numbers, use the FOIL method.

Greatest Common Factor

Factors are numbers we multiply together to get another number.

factor → $2 \times 3 = 6$ ← factor

A number can have multiple factors, and common factors are the numbers that are factors of two different numbers. The *Greatest Common Factor* is the largest of these numbers.

To find the GCF, list all the factors of two numbers and find the greatest common one.

You can use this to help simplify a fraction – divide the top and bottom of the fraction by the GCF to find the simplest form.

$\frac{12}{30}$ → 1, 2, 3, 4, (6), 12
→ 1, 2, 3, 5, (6), 10, 15, 30

$\frac{12 \div 6}{30 \div 6} = \frac{2}{5}$ (simple form)

Least Common Multiple

We get a multiple of a number when we multiply it by another number.

multiples of 4:
4, 8, 12, 16, 20 and so on!

Every number has many multiples, and common multiples are the multiples that two or more numbers have in common. The *Least Common Multiple* is the smallest of these numbers.

To find the LCM, list all the multiples of two or more numbers and find the smallest common one.

You can use this to find the common denominator to add or subtract fractions.

$\frac{1}{3} + \frac{1}{6}$ 3: 3, (6), 9, 12
6: (6), 12

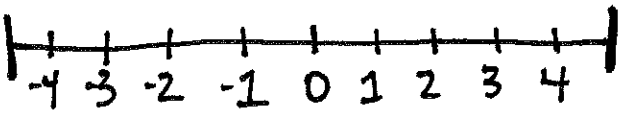
answer ↓

$\frac{1}{3}\frac{(2)}{(2)} + \frac{1}{6}\frac{(1)}{(1)} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

Number Line

A number line is a visual way to add, subtract, and tell how far apart numbers are.

Zero is in the center, positive numbers (greater than zero) are to the right, and negative numbers (less than zero) are to the left.



Prime Numbers

A prime number must be a whole number greater than 1 and can ONLY be divided evenly by 1 and itself.

$7 \times 1 = 7$ → prime number

The opposite, a composite number, can be divided by many numbers.

$1 \times 6 = 6$
$2 \times 3 = 6$ → composite number

Rational and Irrational Numbers

Rational numbers can be written as a simple fraction.

$1.5 = \frac{3}{2}$ → rational

Irrational numbers cannot be written as a simple fraction.

$1.4142135\ldots = \frac{?}{?}$ → irrational

This concept is used when solving quadratic formulas.