EXPRESSIONS & EXPONENTS

COORDINATE ALGEBRA

WHY DO WE USE VARIABLES AND WHAT IS THE SIGNIFICANCE OF USING THEM IN EXPRESSIONS AND EQUATIONS?

We use variables to represent unknowns or when we want to find the value of something. We can use variables to write equations and then solve for those unknown values. We may also use variables to prove something to be true for any given number.

THE FOUR OPERATIONS

- Multiplication: $a \cdot b$.

  The multiplication sign is a centered dot. We do not use the multiplication cross X, because we don't want to confuse it with a variable.

- Division: $\frac{a}{b}$

  In algebra we use the horizontal divisor bar.

- Addition: $a + b$.

  The operation sign is "+"

- Subtraction: a – b.

  The operation sign is "–"

WHICH OF THE FOLLOWING ALGEBRAIC EXPRESSIONS REPRESENTS THE STATEMENT?

A number is increased by five and squared?

How do we write a number increased by five?

$X + 5$

A. $X + 5^2$

B. $X^2 + 5$

C. $X^2 + 5^2$

D. $(X + 5)^2$ Our Answer

Because this needs to be done before we square it we need to add parentheses

$(X + 5)$

Now square it

$(X + 5)^2$

EVALUATE THE EXPRESSION FOR X = -2

$x^2 + 4x + 3$

Anywhere we see an "X", we need to substitute a "-2"

$(-2)^2 + 4(-2) + 3$

$= 4 + (-8) + 3 = -1$

WHAT IS THE DIFFERENCE BETWEEN A NUMBER CUBED AND THE NUMBER….IF THE NUMBER IS 3

How would we write this expression?

$X^3 – X = ??$

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USE SUBSTITUTION…

$3^3 – 3 =$

$27 – 3 =$

Our Answer

The area of a triangle is found by using the formula

$A = \frac{1}{2}(BH)$

where B is the base and H is the height.

What is the area, if the triangle has a base of 5 cm and a height of 12?

$$A = \frac{1}{2}(5 \cdot 12) = \frac{1}{2}(60) = 30$$

SIMPLIFYING ALGEBRAIC EXPRESSIONS

By simplifying an algebraic expression, we mean writing it in the most efficient manner without changing the value of the expression.

This involves combining like terms.

COMBINING LIKE TERMS

$3x$, $2x$ and x are LIKE terms.

$3y^2$, $10y^2$, and $\frac{1}{2} y^2$ are LIKE terms.

x^2y and xy^2 are NOT like terms, because the same variable is not raised to the same power.

SIMPLIFY THE EXPRESSION

$5x + 2y - 3x + 9$

$5x - 3x$

$2x + 2y + 9$

SIMPLIFY THE EXPRESSION.

$$\frac{8N + 3 - 6N}{2}$$

First, combine LIKE terms. $8N - 6N = 2N$

$$\frac{2N + 3}{2}$$

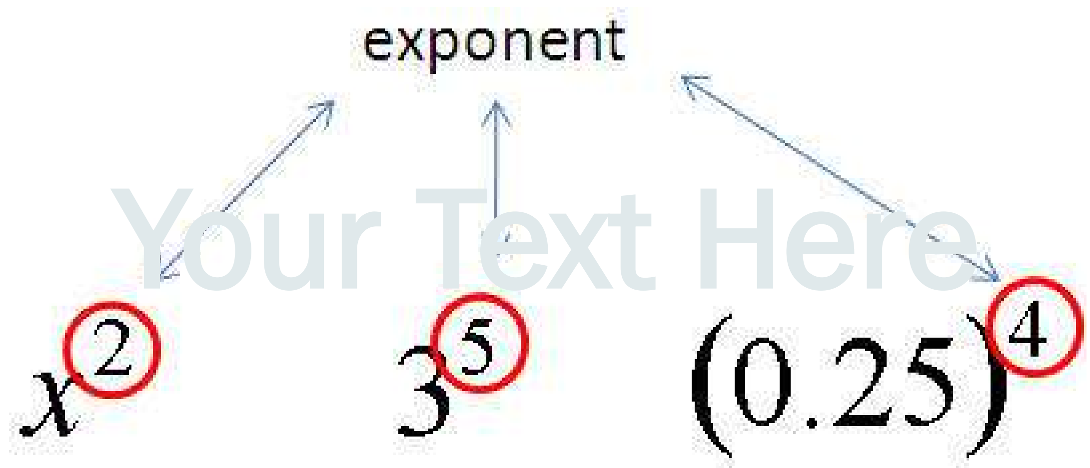
What's another way to write this? $\frac{2N}{2} + \frac{3}{2}$

Now SIMPLIFY! $\frac{\cancel{2}N}{\cancel{2}} + \frac{3}{2}$

$$N + \frac{3}{2}$$

EXPONENTS

The number in an exponential expression that indicates how many factors of the base are being multiplied.



x• x 3 • 3 • 3• 3 • 3 0.25 • 0.25 • 0.25 • 0.25

LAWS OF EXPONENTS

$x^1 = x$

Example:

$5^1 = 5$

ZERO EXPONENT

$x^0 = 1$

Example:

$8^0 = 1$

REMEMBER

Raising any base to the power of ZERO will yield <u>1</u>

NEGATIVE EXPONENTS

$x^{-1} = 1/x$

Example:

$3^{-1} = 1/3$

MULTIPLYING POWERS WITH SAME BASE

$x^m x^n = x^{m+n}$

With this law, how many times will you end up multiplying "x"?

Answer: first "m" times, then BY ANOTHER "n" times, for a total of "m+n" times.

Example:

$x^2 x^4 = x^{2+4} = x^6$

$x^2 x^4 = (xx)(xxxx) = xxxxxx = x^6$

DIVIDING POWERS

$x^m / x^n = x^{m-n}$

With this law, how many times will you end up multiplying "x"?

Answer: first "m" times, then reduce that by"n" times, for a total of "m-n" times.

Example:

$x^5 / x^2 = x^{5-2} = x^3$

$x^5\ x^2 = (xxxxx)/(xx) = xxx = x^3$

POWER OF A POWER PROPERTY

$(x^m)^n = x^{mn}$

How many times will you end up multiplying "x"?

Answer: "m" times…then you have to do that "n times" for a total of m · n times.

Example:

$(x^2)^3 = x^{2 \cdot 3} = x^6$

$(x^2)^3 = (xx)(xx)(xx) = xxxxxx = x^6$

POWER OF A PRODUCT PROPERTY

$(xy)^n = x^n y^n$

Think of re-arranging all the "x"s and "y"s in this example.

Example:

$(xy)^3 = x^3y^3$

$(xy)^3 = (xy)(xy)(xy) = xyxyxy = xxxyyy$
$= (xxx)(yyy) = x^3y^3$

POWER OF A FRACTION

$(x/y)^n = x^n/y^n$

Think of re-arranging all the "x"s and "y"s in this example.

Example:

$(x/y)^3 = x^3/y^3$

$(x/y)^3 = (x/y)\,(x/y)\,(x/y) = (xxx)/(yyy) = x^3/y^3$

RADICALS

$$x^{\frac{m}{n}} = \sqrt[n]{x^m}$$

$$= \left(\sqrt[n]{x}\right)^m$$

Example:

$$x^{\frac{2}{3}} = \sqrt[3]{x^2}$$

$$= \left(\sqrt[3]{x}\right)^2$$

THE FOLLOWING EXPRESSIONS IS EQUIVALENT TO

$$\frac{1}{B^5} = B^{-5}$$

$$\frac{1}{A^7} = A^{-7}$$

HOW DO I DO THIS?

$(5x^4y^3)^2$

This is the same as.....

$(5)^2(x)^2(4)^2(y^3)^2$

$25 \cdot x^2 \cdot 16 \cdot y^6$

NOW....
multiply 25 and 16

=400

And the answer is.....????

$400x^2y^6$

EXAMPLE....CAN YOU SIMPLIFY?

$$\frac{x^{-2}y^{0}}{2^{-1}w^{0}z^{3}} \rightarrow \frac{2}{x^{2}z^{3}}$$

SIMPLIFY

$$\frac{C}{4Y^{-3}} = \frac{CY^{3}}{4}$$

The variable with the negative exponent is what needs to be moved in order to become positive. Remember not to move the coefficient!

ANY QUESTIONS

REFERENCES

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