

COMMON PITFALLS IN MATH 121

1. DISTRIBUTIVE PROPERTY

Did you know that other than multiplication nothing distributes over addition?

The Distributive property says: $c(a + b) = ca + cb$

That is $c(a + b) = ca + cb$ and $c(a - b) = ca - cb$ since subtraction is really addition of opposites.

- **Roots Do Not Distribute over addition:** $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$
- **Powers Do Not Distribute over addition:** $(a+b)^n \neq a^n + b^n, n \neq 1$
- **Reciprocals Do Not distribute over addition:** $\frac{1}{a+b} \neq \frac{1}{a} + \frac{1}{b}$
- **Logs Do Not Distribute over addition:** $\log(a+b) \neq \log a + \log b$

2. MAIN PRINCIPLE OF ADDITION

This principle says that the only things you can add are **SAME THINGS**.

That is, **a of something + b of something = (a + b) of something.**

For example $3x + 4x = 7x$, or $3 \text{ dogs} + 4 \text{ dogs} = 7 \text{ dogs}$.

Can you add $3x + 4y$? The answer is no, they are not same things.

Can you answer the following questions?

When can I add fractions?

When can I add polynomials?

When can I add radicals?

When can I add anything? When I understand what **SAME THINGS** means for anything. You get the picture.

3. MAIN PRINCIPLE OF MULTIPLICATION

It says that you can multiply anything by anything.

4. SIMPLIFYING FRACTIONS

What does it mean to simplify a fraction?

Is $\frac{x^2 - 4}{x + 4} = x$? What did I do? I canceled the x 's and the 4's.

When it comes to simplifying fractions canceling is **Bad Language**. We do not cancel things to simplify fractions.

To simplify a fraction we factorize a **1**.

That is, given a fraction, factor the numerator and the denominator and remove any unnecessary **1**'s.

For example:

$$\frac{x^2 - 4}{x + 2} = \frac{(x+2)(x-2)}{x+2} = \frac{(x+2)}{x+2} \frac{(x-2)}{1} = 1 \cdot (x-2) = x-2$$

Can I simplify $\frac{x^2 - 4}{x + 4}$? That is, can I factorize a **1**? Let us see.

$$\frac{x^2 - 4}{x + 4} = \frac{(x-2)(x+2)}{x+4} \quad \text{So the answer is no.}$$