Adding Fractions

Parts of a fraction:

$$\frac{a}{b}$$

a ← numerator

b ← denominator

When adding fractions, the denominators must be equal.

- The denominators do not change
- Simply add the numerators together

ex $\frac{4}{5} + \frac{12}{5} = \ldots$

$\rightarrow \frac{4+12}{5} = \boxed{\frac{16}{5}}$

If the denominators are NOT equal, we need to make them equal:

- Look at the smallest denominator
- Check to see if it can evenly go into the biggest denominator

ex $\frac{2}{5} + \frac{3}{10} = \ldots$

5 can go into 10

- How many times can the smaller denominator fit into the larger?

$$\frac{2}{5} + \frac{3}{10}$$

5 can fit into 10 two times
(5 can go into itself once)

- Multiply the smallest denominator by the number of times it can go into the biggest denominator. Do the same to its numerator.

$$\frac{2}{5}\left(\frac{2}{2}\right) = \frac{2\times2}{5\times2} = \frac{4}{10}$$

↑ because 5 goes into 10 twice

↑ Now both denominators are 10

We now have

$$\frac{4}{10} + \frac{3}{10}$$

and add like normal:

$$\frac{4+3}{10} = \boxed{\frac{7}{10}}$$

Subtracting Fractions

Subtraction works the exact same way as addition. The only difference is that you're adding in the opposite direction, and can get negative numbers.

Multiplying Fractions

When multiplying fractions,

- Multiply the numerators
- multiply the denominators
- denominators do NOT need to be equal

ex $\frac{6}{4} \times \frac{3}{8} = \ldots$

- Multiply numerators : $\frac{6 \times 3}{4 \times 8} = \boxed{\frac{18}{32}}$
- multiply denominators:
- Reduce when necessary

Dividing Fractions

When dividing fractions, remember the phrase "copy, dot, flip."

ex $\frac{6}{4} \div \frac{3}{8} = \ldots$

copy ↓ $\frac{6}{4}$ dot ↓ $\cdot$ flip ↓ $\frac{8}{3}$

$\frac{6}{4} \cdot \frac{8}{3}$

Note: The dot, ".", means multiply. You can also write "x" if you prefer.

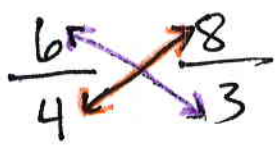
- After flipping, multiply like normal:

$\frac{6}{4} \cdot \frac{8}{3} \rightarrow \frac{6 \times 8}{4 \times 3} = \frac{48}{12} \xrightarrow{\text{Reduce}} \boxed{\frac{4}{1}}$

After flipping, instead of multiplying like normal, you can "cross divide." This reduces your fraction for you.

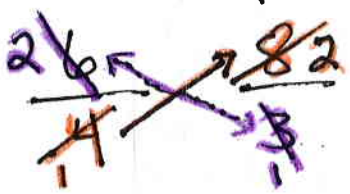
ex $\frac{6}{4} \cdot \frac{8}{3}$

- Look diagonally: does 4 go into 8, and 3 into 6?



4 goes into 8 two times
3 goes into 6 two times

- Replace the numerator with the number of times the opposite denominator fits into it:



The denominators also reduce.
4 goes into itself one time, and
3 goes into itself one time.

We are left with

$\frac{2}{1} \cdot \frac{2}{1}$

and multiply like normal:

$\frac{2 \times 2}{1 \times 1} = \boxed{\frac{4}{1}}$