MTHW1

**Math 9 – Unit 1: Real Numbers** Name: Mrs. Jacy

**Lesson #2: Multiplying and Dividing Fractions** Date: Feb 03, 2025

**Learning Goal**: We are learning to multiply and divide fractions.

Much of Mathematics is learning the rules. These next few lessons have rules. Follow them and you will succeed.

**Multiplying Fractions:**

The process to multiplying fractions is straight-forward:

1. Multiply the numerators together
2. Multiply the denominators together
3. Reduce to lowest terms.

**Examples:**

a) $\frac{2}{3}\times\frac{4}{5}$ $= \frac{8}{15}$

b) $\frac{-8}{5}\times\frac{15}{4}$ $= \frac{-6}{1} = -6$

c) $\frac{4}{3}\times\frac{2}{7}\times\frac{5}{3}$ $= \frac{40}{63}$

CROSS CANCELLING !!!

Typically, the hardest part is reducing. There is another way to approach multiplying fractions. First reduce ANY numerator with ANY denominator (this is sometimes called cross reducing). Let's look at example two again, but this time reduce first.

$\frac{-8}{5}\times\frac{15}{4}$ $= -6$

Another! $\frac{6}{7}\times\frac{21}{12}$ $= \frac{3}{2}$

And a big one! $\frac{7}{5}\times\frac{8}{3}\times\frac{9}{14}\times\frac{25}{4}$ $= 15$

***NOTE: You may reduce first or last, it does not matter, but you must always reduce***

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KEEP - CHANGE - FLIP

**Dividing Fractions:**

The process to dividing has one extra step done BEFORE the multiplying steps. We need to change the division to a multiplication, so instead of dividing by a fraction, we multiply by the RECIPROCAL. This means to FLIP the fraction to the RIGHT of the division sign. Once this is done, you now have a multiplication question and can follow the steps from above.

**Examples:**

a) $\frac{4}{5} \div \frac{3}{7}$

$= \frac{4}{5} \times \frac{7}{3}$

$= \frac{28}{15}$

b) $\frac{9}{4} \div \frac{8}{3}$ (note: you may be tempted to reduce, but not yet!)

$= \frac{9}{4} \times \frac{3}{8}$

$= \frac{27}{32}$

$-\frac{N}{D} = \frac{-N}{D} = \frac{N}{-D}$

c) $\frac{6}{11} \div \frac{-3}{2}$

$= \frac{6}{11} \times \frac{-2}{3}$

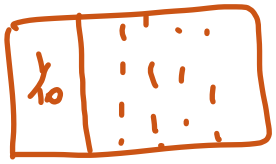
$= \frac{-4}{11}$

d) $\frac{5}{9} \div \frac{6}{7} \div \frac{12}{14}$

$= \left(\frac{5}{9} \times \frac{7}{6}\right) \times \frac{14}{12} = \frac{245}{324}$

**Application:** A chemist is measuring the acid needed for an experiment. If she has $2\frac{1}{5}$ cylinders (or $\frac{11}{5}$) and she needs $\frac{1}{10}$ of a cylinder for each experiment, how many experiments can she do?

11/5 cylinders




$\frac{11}{5} \div \frac{1}{10} = \frac{11}{5} \times \frac{10}{1} = 22$

∴ The chemist can perform 22 experiments with the cylinder.

**Success Criteria**:

- I can multiply fractions by reducing before OR after multiplying
- I can divide fractions by multiplying by the reciprocal of the divisor

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**Build your Skills: :)**

Determine the area of the rectangle on the right.

area $= \ell w = \left(5\frac{2}{3}\right)\left(4\frac{1}{5}\right) = \frac{17}{3} \times \frac{21}{5} = \frac{119}{5} = 23\frac{4}{5}\ cm^2$

$4\frac{1}{5}$ cm $= w$

$5\frac{2}{3}$ cm $= \ell$

Determine the area of the triangle on the right.

area $= \frac{bh}{2} = \frac{1}{2}bh = \frac{1}{2}\left(2\frac{3}{4}\right)\left(4\frac{3}{8}\right) = \frac{1}{2}\left(\frac{11}{4}\right)\left(\frac{35}{8}\right) = \frac{385}{64} = 6\frac{1}{64}$ sq. inches

$4\frac{3}{8}$ inches $= h$

$2\frac{3}{4}$ inches $= b$

Omar uses an adapter to change the size of the plug on his headphones cable. The original plug has a diameter of 18 " and the adapter converts this diameter to 14 ".

14 inches

a) Does the adapter increase or decrease the diameter of the original plug?

18" → 14" Clearly, DECREASES

b) How many times larger is the diameter of the larger plug than that of the smaller plug?

$\frac{\text{larger}}{\text{smaller}} = \frac{18"}{14"} = \frac{9}{7}$ ∴ The diameter of the larger plug is $\frac{9}{7}$ times that of the smaller plug.

c) By how many inches is the diameter of the larger plug greater than that of the smaller plug?

larger − smaller = 18" − 14" = 4"

∴ The larger plug is 4" larger than the smaller plug.

Show how $\frac{1257}{370} \times \frac{121}{2411} \times \frac{18}{121} \times \frac{370}{1257}$ can be quickly evaluated without using large numbers.

$\frac{\cancel{1257}}{\cancel{370}} \times \frac{\cancel{121}}{2411} \times \frac{18}{\cancel{121}} \times \frac{\cancel{370}}{\cancel{1257}}$

$= \frac{18}{2411}$

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Among other ingredients, a banana bread recipe that will serve 10 people calls for 3 bananas, $\frac{2}{3}$ cup sugar and $1\frac{1}{2}$ cups of flour.

$= \frac{3}{2}$

a) How much of each of these ingredients would be needed to serve twice as many people?

20 people

| Ingredients | for 10 people | for 20 people (twice) |
|---|---|---|
| Banana | 3 | $3 \times 2 = 6$ bananas |
| Sugar | $\frac{2}{3}$ cup | $\frac{2}{3} \times 2 = \frac{4}{3} = 1\frac{1}{3}$ cups |
| Flour | $\frac{3}{2}$ cups | $\frac{3}{2} \times \frac{2}{1} = 3$ cups |

b) How much of each of these ingredients is needed to serve 24 people?

| Ingredients | for 10 people | for 1 person | for 24 people |
|---|---|---|---|
| Banana | 3 | $\frac{3}{10}$ | $\frac{3}{10} \times \frac{24}{1} = \frac{36}{5} = 7\frac{1}{5}$ bananas |
| Sugar | $\frac{2}{3}$ cups | $\frac{2}{3} \div 10 = \frac{2}{30}$ cups | $\frac{2}{30} \times \frac{24}{1} = \frac{8}{5} = 1\frac{3}{5}$ cups |
| Flour | $\frac{3}{2}$ cups | $\frac{3}{2} \div 10 = \frac{3}{20}$ cups | $\frac{3}{20} \times \frac{24}{1} = \frac{18}{5} = 3\frac{3}{5}$ cups |

c) If $1\frac{1}{2}$ cups of sugar are used to make this banana bread, how many cups of flour should be used?

Comparing → Sugar : Flour

$\frac{2}{3} : \frac{3}{2} :: 1\frac{1}{2} : \underset{x \text{ (say)}}{\text{Flour}}$

Product of Extremes = Product of Means

$\Rightarrow \frac{2}{3}x = \left(\frac{3}{2}\right)\left(1\frac{1}{2}\right) = \left(\frac{3}{2}\right)\left(\frac{3}{2}\right) = \frac{9}{4}$

$\Rightarrow \frac{2}{3}x = \frac{9}{4}$

$\Rightarrow x = \frac{9}{4} \times \frac{3}{2} = \frac{27}{8} = 3\frac{3}{8}$

$\therefore 1\frac{1}{2}$ cups of sugar is used, then $3\frac{3}{8}$ cups of flour should be used.

d) If a loaf that is $\frac{3}{2}$ the size of the given recipe is to be baked, how much of each of these ingredients is needed? How many people will it serve?

| Ingredients | for 1 loaf | for $\frac{3}{2}$ loaves |
|---|---|---|
| Banana | 3 | $3 \times \frac{3}{2} = \frac{9}{2} = 4\frac{1}{2}$ bananas |
| Sugar | $\frac{2}{3}$ cups | $\frac{2}{3} \times \frac{3}{2} = 1$ cup sugar |
| Flour | $\frac{3}{2}$ cups | $\frac{3}{2} \times \frac{3}{2} = \frac{9}{4} = 2\frac{1}{4}$ cups flour |