P2

Math 9

1.3 Rational Numbers in Fraction Form

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Learning Goals: *I will learn to*

- apply multiple strategies to add and subtract rational numbers in fraction form
- apply multiple strategies to multiply and divide rational numbers in fraction form
- solve problems using rational numbers in fraction form

Explore and Analyze

Canada officially adopted metric measurement in the 1970s, but many building materials, food, and other goods are still sold using imperial measurements. For example, many recipes use fractions. Why would you need to use operations on fractions in recipes?

A cake recipe calls for $\frac{1}{4}$ cup of milk.

1. If you double the recipe, you could measure a $\frac{1}{4}$ cup of milk twice. How else could you add the correct amount?

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

$= \frac{1}{2}$

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

$= \frac{1}{2}$

add half a cup

2. Suppose you work at a bakery and you want to make enough batter for 10 cakes.

   a) Would you measure a $\frac{1}{4}$ cup of milk 10 times? Explain why or why not.

- probably NOT → take a long time
  → easy to lose count
  → not efficient.

   b) How much milk would you need?

$\frac{10}{1} \times \frac{1}{4} = \frac{10}{4}$

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

need $2\frac{1}{2}$ cups

3. The recipe also calls for a $\frac{1}{2}$ cup of flour. If you have $4\frac{1}{2}$ cups of flour, could you make 10 cakes? Explain your reasoning.

we don't have enough.

we need: $\frac{10}{1} \times \frac{1}{2} = \frac{10}{2}$

$= 5$ cups

$4\frac{1}{2}$ is not enough. (we only have enough for 9 cakes → $\frac{1}{2}$ cup short)

Develop Understanding

Example 1: Add or Subtract Rational Numbers in Fraction Form

Calculate. Simplify if necessary

a) $\frac{2}{5} - \left(-\frac{1}{10}\right)$

$= \frac{4}{10} + \left(+\frac{1}{10}\right)$

$= \frac{5}{10}$

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

b) $3\frac{2}{3} + \left(-1\frac{3}{4}\right)$

SAFEST METHOD

* CHANGE TO IMPROPER FRACTIONS

$3\frac{2}{3} + \left(-1\frac{3}{4}\right)$

$= \frac{11}{3} + \left(-\frac{7}{4}\right)$

$= \frac{44}{12} + \left(-\frac{21}{12}\right)$

$= \frac{23}{12}$

$= \boxed{1\frac{11}{12}}$

or

WORK WITH MIXED NUMBERS

$3\frac{2}{3} + \left(-1\frac{3}{4}\right)$

$= 3\frac{8}{12} + \left(-1\frac{9}{12}\right)$

$= 2 \text{ and } \frac{8}{12} + \frac{-9}{12}$

$= 2 \text{ and } -\frac{1}{12}$

$= 1\frac{12}{12} - \frac{1}{12}$

$= \boxed{1\frac{11}{12}}$

can be hard to keep track of negatives/positives when we work with mixed numbers.

Show You Know

Evaluate. Simplify if necessary.

a) $-\frac{3}{4}-\frac{1}{5}$ (×5, ×4 / ×5, ×4)

$=-\frac{15}{20}-\frac{4}{20}$

$=\boxed{-\frac{19}{20}}$

b) $-2\frac{1}{2}+1\frac{9}{10}$

MIXED NUMBERS (or) IMPROPER FRACTIONS

$-2\frac{1}{2}+1\frac{9}{10}$ (×5)

$=-2\frac{5}{10}+1\frac{9}{10}$

$=-1$ and $-\frac{5}{10}+\frac{9}{10}$

$=-1$ and $\frac{4}{10}$

$=-\frac{10}{10}+\frac{4}{10}$

$=-\frac{6}{10}$ (÷2 / ÷2) $=\boxed{-\frac{3}{5}}$

$-2\frac{1}{2}+1\frac{9}{10}$

$=-\frac{5}{2}+\frac{19}{10}$ (×5 / ×5)

$=-\frac{25}{10}+\frac{19}{10}$

$=-\frac{6}{10}$ (÷2 / ÷2)

$=\boxed{-\frac{3}{5}}$

Example 2: Multiply or Divide Rational Numbers in Fraction Form

Evaluate. Simplify if necessary.

a) $\frac{3}{4}\times\left(-\frac{2}{3}\right)$

$=-\frac{6}{12}$ (÷6 / ÷6)

$=\boxed{-\frac{1}{2}}$

b) $-1\frac{1}{2}\div\left(-2\frac{3}{4}\right)$

$=-\frac{3}{2}\div\left(-\frac{11}{4}\right)$

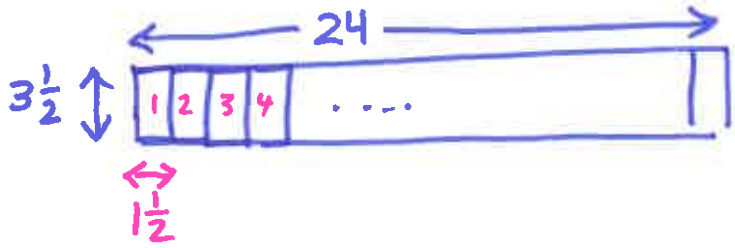
$=-\frac{3}{1\cancel{2}}\times-\frac{\overset{2}{\cancel{4}}}{11}$

$=\boxed{\frac{6}{11}}$

Example 3: Apply Rational Numbers

A "two by four" or 2 x 4, is a standard building material used throughout Canada. The piece of lumber measures 2 inches by 4 inches and comes in a variety of lengths. After the wood has been dried and planed smooth, it actually measures $1\frac{1}{2}$ inches by $3\frac{1}{2}$ inches but is still called a "two by four"! Layering wood together gives additional strength. This process is called laminating.

You are building a work bench by laminating 2 x 4s together so the top surface is 24 inches wide and $3\frac{1}{2}$ inches thick. How many 2 x 4s will you need?



$1\frac{1}{2} \times \_\_ = 24$

$$\frac{24}{1} \div 1\frac{1}{2}$$

$$= \frac{24}{1} \div \frac{3}{2}$$

$$= \frac{8}{\cancel{24}}{}^{1} \times \frac{2}{\cancel{3}_{1}}$$

$$= \frac{16}{1}$$

we need 16 2x4s