Adding and Subtracting Rational Numbers

Rational Numbers

- The term, <u>Rational Numbers</u>, refers to any number that can be written as a fraction.

- This includes fractions that are reduced, fractions that can be reduced, mixed numbers, improper fractions, and even integers and whole numbers.

  - An integer, like 4, can be written as a fraction by putting the number 1 under it.

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

Types of Rational Numbers

- Reduced Fractions: $\dfrac{2}{3}$

- Not Reduced Fractions: $\dfrac{4}{6}$

- Mixed Numbers: $5\dfrac{1}{4}$

- Improper Fractions: $\dfrac{6}{4}$

- Integers and Whole Numbers: $\dfrac{6}{1}$

Simplifying Fractions

- Simplifying fractions by dividing the numerator (top number) and denominator (bottom number) by the same value.

- Repeat this until there are no more numbers that divide into both the numerator & denominator.

- Example: $\dfrac{4 \div 2}{6 \div 2} = \dfrac{2}{3}$

- Example: $\dfrac{15 \div 5}{10 \div 5} = \dfrac{3}{2}$

- Example: $\dfrac{36 \div 6}{42 \div 6} = \dfrac{6}{7}$

Simplifying Fractions

- Example: $\dfrac{15}{14}$ is already simplified.

- Example: $3\dfrac{2}{5} = \dfrac{3 \cdot 5 + 2}{5} = \dfrac{17}{5}$ is already simplified.
(Rewrite mixed numbers as improper fractions before you simplify.)

- Example: $\dfrac{36 \div 2}{42 \div 2} = \dfrac{18 \div 3}{21 \div 3} = \dfrac{6}{7}$
(If after you divide, the fraction can still be simplified, keep going.)

Adding Rational Numbers

- First they must have a common denominator.

- Next, look at the signs. If they have the same signs you add the absolute values and keep the sign.

- If they have different signs subtract the absolute values keep the sign of the larger absolute value.

Use the song to help remind you if you need to:

http://www.teachertube.com/viewVideo.php?video_id=286228

Subtracting Rational Numbers

- First they must have a common denominator.

- Next, rewrite subtraction as addition – keep-change-change.

- Follow the rules for adding rational numbers.

Use the song to help remind you if you need to:

http://www.teachertube.com/viewVideo.php?video_id=286228

Getting a Common Denominator

- Use this formula to get two fractions to have a common denominator:

$$\frac{2}{3} + \frac{4}{5}$$

Common Denominator = 3•5=15.

$$\frac{2}{3} + \frac{4}{5} = \frac{2 \cdot 5 + 4 \cdot 3}{15}$$

$$\frac{2}{3} + \frac{4}{5} = \frac{2 \cdot 5 + 4 \cdot 3}{15} = \frac{22}{15} = 1\frac{7}{15}$$

Simplify if possible.

More Examples

1) $\dfrac{3}{4} + \dfrac{1}{6} = \dfrac{18}{24} + \dfrac{4}{24} = \dfrac{22}{24} = \dfrac{22 \div 2}{24 \div 2} = \dfrac{11}{12}$

Common Denominator

Divide to Simplify.

2) $\dfrac{5}{8} + \dfrac{3}{2} = \dfrac{5 \cdot 2 + 3 \cdot 8}{8 \cdot 2} = \dfrac{34}{16} = \dfrac{34 \div 2}{16 \div 2} = \dfrac{17}{8}$
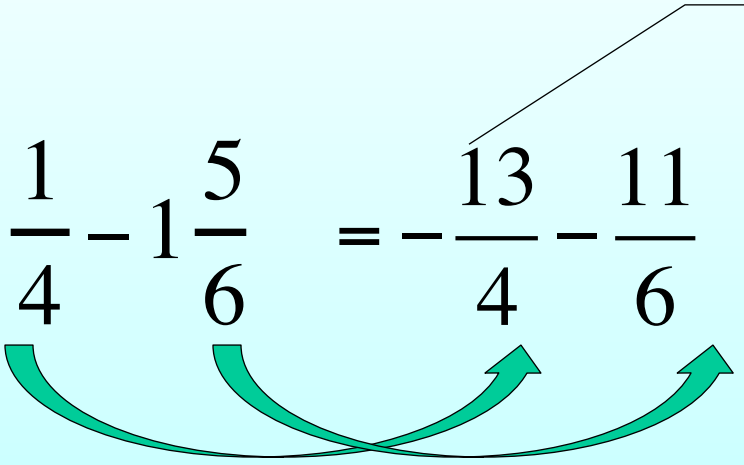
More Examples

3) $\dfrac{6}{5} - \dfrac{10}{3} = \dfrac{6}{5} + \dfrac{-10}{3}$ **Change Subtraction to Addition. (Keep-Change_Change.)**

$$= \dfrac{6 \cdot 3}{5 \cdot 3} + \dfrac{-10 \cdot 5}{3 \cdot 5} = \dfrac{18 + \left(-50\right)}{15} = \dfrac{-32}{15}$$

Note: A fraction with a negative numerator or denominator is a negative fraction.

$$\dfrac{-32}{15} = \dfrac{32}{-15} = -\dfrac{32}{15}$$

More Examples

4) $-3\dfrac{1}{4} - 1\dfrac{5}{6} = -\dfrac{13}{4} - \dfrac{11}{6} = \dfrac{-13}{4} + \dfrac{-11}{6}$

Change Mixed Numbers to Improper Fractions.

$$\dfrac{-13}{4} + \dfrac{-11}{6} = \dfrac{(-13)\cdot 6}{4\cdot 6} + \dfrac{(-11)\cdot 4}{6\cdot 4} = \dfrac{-78}{24} + \dfrac{-44}{24} = \dfrac{-122}{24} = \dfrac{-61}{12}$$

Get Common Denominator

Simplify.

You Try It!

Find each sum or difference.

1) $\dfrac{3}{5} + \dfrac{4}{3}$

2) $\dfrac{1}{8} - \dfrac{7}{10}$

3) $5\dfrac{2}{5} + (-2\dfrac{1}{4})$

4) $-3\dfrac{1}{2} - \dfrac{1}{5}$

Solutions

1) $\dfrac{3}{5} + \dfrac{4}{3} = \dfrac{3 \cdot 3 + 4 \cdot 5}{5 \cdot 3} = \dfrac{29}{15}$

2) $\dfrac{1}{8} - \dfrac{7}{10} = \dfrac{1}{8} + \dfrac{-7}{10} = \dfrac{1 \cdot 10 + (-7) \cdot 8}{8 \cdot 10} = \dfrac{-46}{80} = -\dfrac{23}{40}$

3) $5\dfrac{2}{5} + \left(-2\dfrac{1}{4}\right) = \dfrac{27}{5} + \left(-\dfrac{9}{4}\right) = \dfrac{27 \cdot 4}{5 \cdot 4} + \left(-\dfrac{9 \cdot 5}{4 \cdot 5}\right) = \dfrac{108}{20} + \left(-\dfrac{45}{20}\right) = \dfrac{63}{20} = 3\dfrac{3}{20}$

4) $-3\dfrac{1}{2} - \dfrac{1}{5} = -\dfrac{7}{2} - \dfrac{1}{5} = \dfrac{-7}{2} + \dfrac{-1}{5} = \dfrac{(-7)5 + (-1)2}{2 \cdot 5} = -\dfrac{37}{10}$