Pre-Algebra

Essential Question: How do we multiply and divide rational numbers?

Do Now:

a) $2\frac{1}{2} \bullet 3\frac{3}{4}$ $\frac{5}{2} \cdot \frac{15}{4}$ $\frac{75}{8}$ or $9\frac{3}{8}$

b) $2\frac{1}{2} \div 3\frac{3}{4}$ $\frac{5}{2} \div \frac{15}{4}$ $\frac{\cancel{5}^{1}}{\cancel{2}_{1}} \cdot \frac{\cancel{4}^{2}}{\cancel{15}_{3}} = \frac{2}{3}$

How do we multiply and divide rational numbers? Consider a and b from the Do Now.

a) How does the product change if the expression is $-2\frac{1}{2} \bullet 3\frac{3}{4}$? $-9\frac{3}{8}$ $- \bullet + = -$

b) How does the quotient change if the expression is $-2\frac{1}{2} \div -3\frac{3}{4}$? $\frac{2}{3}$ $- \div - = +$

Multiplying Rational Numbers	**Dividing Rational Numbers**
1) Change all mixed numbers to improper fractions.	**1) Dividing by multiplying by the multiplicative inverse (*reciprocal*). "Keep, Change, Flip"**
2) Follow rules for multiplying integers.	**2) Follow rules for dividing integers.**

Simplify each numerical expression.

1) (-2.4)(3) ⊖

$\overset{+1}{2.4}\ \overset{1}{}$
$\times\ 3\ \ \overset{+0}{1}$
7.2

-7.2

2) $-\frac{3}{10} \div -\frac{5}{15}$ ⊕

$\frac{-3}{\cancel{10}_{2}} \cdot \frac{\cancel{-15}^{-3}}{5}$

$\frac{9}{10}$

3) $\frac{1}{2} \div -\frac{7}{8}$ ⊖

$\frac{1}{\cancel{2}_{1}} \cdot \frac{\cancel{-8}^{-4}}{7}$

$\frac{-4}{7}$

4) $-2\frac{1}{2} \bullet 4\frac{3}{5}$ ⊖

$\frac{\overset{-1}{\cancel{-5}}}{2} \cdot \frac{23}{\cancel{5}_{1}}$

$\frac{-23}{2}$ or $-11\frac{1}{2}$

5) $-36 \bullet \left(-\frac{4}{9}\right) \bullet -\frac{1}{8}$ ⊖

$\frac{\overset{-4}{\cancel{-36}}}{1} \cdot \frac{\overset{-1}{\cancel{-4}}}{\cancel{9}_{1}} \cdot \frac{-1}{\cancel{8}_{2}}$

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

6) $7.5 \div -0.5$ ⊖

$0.5\overline{)7.5}$

$5\overline{)75}$
$-5\downarrow$
25
-25
0

-15

7) $\frac{12}{\frac{3}{4}}$ $12 \div \frac{3}{4}$ (+)

$\frac{12}{1} \cdot \frac{4}{3}$

16

8) $\frac{\frac{2}{3}}{-2\frac{1}{3}}$ (−)

$\frac{2}{3} \div -2\frac{1}{3}$

$\frac{2}{3} \div \frac{-7}{3}$

$\frac{2}{3} \cdot \frac{3}{-7}$

$-\frac{2}{7}$

Numbers 7 and 8 are examples of complex fractions.

A complex fraction is a fraction where the numerator, denominator, or both contain a fraction.

Think about this...

Does every number have a multiplicative inverse? Every real number except 0 has a reciprocal.

↑ reciprocal

IT'S YOUR TURN NOW

9) (-1.8)(2) (−)

1.8 × 2 = 3.6

-3.6

10) $-\frac{1}{8} \times 5 \times -\frac{2}{3}$ (+)

$-\frac{1}{8} \cdot \frac{5}{1} \cdot \frac{-2}{3}$

$\frac{5}{12}$

11) A hot air balloon descended 99.6 meters in 12 seconds. What was the balloon's average rate of change in meters per second?

$-99.6 \div 12$ (−)

-8.3

The balloon descends 8.3 meters per second.

$$12\overline{)99.6}$$

8.3

−96

36

−36

0

12) The ground temperature at Brigham Airport is 12°C. The temperature decreases by 6.8°C for every increase of 1 kilometer above the ground. What is the temperature outside of a plane flying at an altitude of 5 kilometers above the airport?

-6.8×5

6.8 × 5 = 34.0

$-34°$

$12 - 34$

$12 + (-34)$

-22°C is the temperature 5km above the airport.

The TAKE AWAY

The rules for multiplying and dividing rational numbers are the same as the rules for multiplying and dividing integers.

When dividing fractions, KEEP CHANGE FLIP