

Name: _____

Date: _____

Aim: How can we multiply and divide rational numbers?

do now:

1) If the product of a and b is positive, what do you know about the signs of a and b ?

a and b must be the same sign

Evaluate each of the following expressions:

2) $-2\frac{1}{2} \times 3\frac{3}{4}$ $-\frac{5}{2} \cdot \frac{15}{4}$

$$-\frac{75}{8} \rightarrow \boxed{-9\frac{3}{8}}$$

3) $-2\frac{1}{2} \div -3\frac{3}{4}$ $-\frac{5}{2} \div -\frac{15}{4}$

$$\frac{-5}{2} \cdot \frac{-4}{15} \rightarrow \boxed{\frac{2}{3}}$$

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

$$\frac{-99.6}{12}$$

$$12 \overline{) 99.6} \begin{array}{r} 8.3 \\ \underline{96} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

$\boxed{-8.3 \text{ meters per sec}}$

Multiplying Rational Numbers: change mixed numbers into improper fractions ... remember your rules for multiplying integers

Dividing Rational Numbers: Dividing is the same as multiplying by the multiplicative inverse. AKA Keep, Change, Flip!

Every number has a multiplicative inverse (reciprocal) except for 0.

1) $\left(-3\frac{3}{4}\right)\left(-2\frac{3}{10}\right)$

$$\frac{-15}{4} \cdot \frac{-23}{10} = \frac{69}{8} = \boxed{8\frac{5}{8}}$$

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

$$-\frac{3}{10} \cdot \frac{-15}{5} = \frac{9}{10} = \boxed{\frac{9}{10}}$$

3) $\frac{1}{2} \div -\frac{7}{8}$

$$\frac{1}{2} \cdot \frac{-8}{7} = \frac{-4}{7} = \boxed{\frac{-4}{7}}$$

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

$$-\frac{5}{2} \cdot \frac{23}{5} = \frac{-23}{2} = \boxed{-11\frac{1}{2}}$$

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

$$\frac{-36}{1} \cdot \frac{-4}{9} = \frac{-16}{1} \cdot \frac{-1}{8} = \boxed{-2}$$

6) $-2.4(3)$

$$\begin{array}{r} 2.4 \\ \times 3 \\ \hline 7.2 \end{array} \rightarrow \boxed{-7.2}$$

We can write division expressions as complex fractions which have a fraction in the numerator, denominator, or both.

Examples:

a) $\frac{12}{\frac{3}{4}} \quad 12 \div \frac{3}{4}$
 $\frac{12}{1} \cdot \frac{4}{3}$
 $\frac{16}{1} \quad \boxed{16}$

b) $\frac{\frac{2}{3}}{-2\frac{1}{3}} \quad \frac{2}{3} \div -2\frac{1}{3}$
 $\frac{2}{3} \div -\frac{7}{3}$
 $\frac{2}{3} \cdot -\frac{3}{7}$
 $\boxed{-\frac{2}{7}}$

Connections/Word Problem

A 30 minute TV program consists of three commercials, each $2\frac{1}{2}$ minutes long, and four equal-length entertainment segments. How long is each entertainment segment?

$3 \times 2\frac{1}{2}$
 $\frac{3 \cdot 5}{1 \cdot 2} = 7\frac{1}{2}$ minutes

$30 - 7\frac{1}{2}$
 $22\frac{1}{2}$ minutes

$22\frac{1}{2} \div 4$
 $\frac{45}{2} \cdot \frac{1}{4}$
 $\frac{45}{8} = \boxed{5\frac{5}{8}}$ min

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

$\frac{-99.6}{12}$

- 8.3 meters per sec

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 overall change in temperature outside a plane flying at an altitude of 5 kilometers above Brigham Airport?

-6.8×5
 $\boxed{-34^{\circ}\text{C change}}$

Final temp:
 $12 - 34$
 $12 + (-34)$
 -22°C



Complex fractions can be rewritten horizontally as

division expressions