Dividing with Fractions
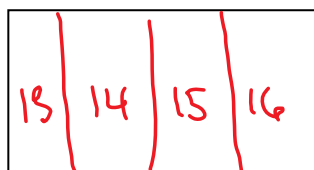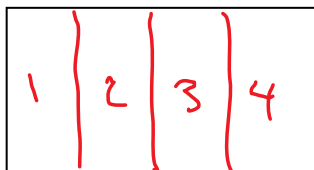
I. Dividing a whole number by a fraction:

Example 1: James has 5 yards of wood. How many $\frac{1}{4}$ yard pieces of wood can be cut?

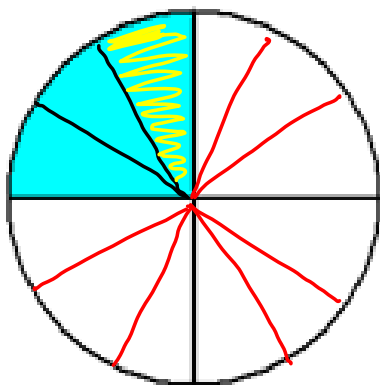In other words, how many groups of $\frac{1}{4}$ are in 5 wholes? $5 \div \frac{1}{4} = 20$

| 1 | 2 | 3 | 4 |

| 5 | 6 | 7 | 8 |

| 9 | 10 | 11 | 12 |

$5 \times 4 = 20$

| 13 | 14 | 15 | 16 |

| 17 | 18 | 19 | 20 |

$\underline{1 yd} = 4$ $\frac{1}{4}$-yd pieces

(20)

II. Dividing a fraction by a whole number:

Example 2: The Numero family has $\frac{1}{4}$ of a pizza left. The three children, Addison, Multiplica, and Quochant, want to split the rest of the pizza. What fraction of the original pizza is each of their slices?

$$\frac{1}{4} \div 3 = \left(\frac{1}{12}\right)$$

$$\frac{1}{4} \div 3 = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

What is the reciprocal?

The reciprocal is the numerator and denominator flipped or switched.

$$\frac{2}{3} \rightarrow \frac{3}{2}$$

Any number times its reciprocal = 1

$$\frac{3}{4} \times \frac{4}{3} = \frac{12}{12} = 1 \qquad \frac{7}{8} \times \frac{8}{7} = \frac{56}{56} = 1$$

How will the reciprocal help me with dividing fractions?

Using the reciprocal allows us to change division into multiplication!

Skip, flip, multiply OR Keep, change, flip!

Let's try the following problems using the reciprocal method!

1) $5 \div \frac{1}{4} =$ **20**

$$\frac{5}{1} \times \frac{4}{1} = \frac{20}{1}$$

2) $\frac{1}{4} \div 3 =$ **$\frac{1}{12}$**

$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

3) $12 \div \frac{3}{10} =$ **40**

$$\frac{\overset{4}{\cancel{12}}}{1} \times \frac{10}{\underset{1}{\cancel{3}}} = \frac{40}{1}$$

What do we do if we have to divide with a mixed number?

When dividing with mixed numbers, **convert the mixed numbers into improper fractions**. Then, divide using rules for dividing with fractions!

4) $5\frac{1}{4} \div 3 =$ **$1\frac{3}{4}$**

$$\frac{21}{4} \div \frac{3}{1}$$

$$\frac{\overset{7}{\cancel{21}}}{4} \times \frac{1}{\underset{1}{\cancel{3}}} = \frac{7}{4}$$

5) $10 \div 3\frac{1}{3} =$

$$\frac{10}{1} \times \frac{10}{3}$$

$$\frac{\overset{1}{\cancel{10}}}{1} \times \frac{3}{\underset{1}{\cancel{10}}} = \textbf{3}$$

6) $8\frac{1}{3} \div 15 =$

$$\frac{25}{3} \div \frac{15}{1} = \frac{25}{3} \times \frac{1}{15} = \frac{\textbf{5}}{\textbf{9}}$$
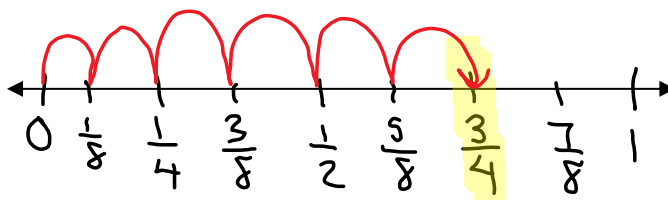
III. Dividing a fraction by a fraction:

<u>Example 1</u>: Jane has half of her birthday cake left. She has been cutting the cake in $\frac{1}{16}$ slices. How many slices will she be able to cut if she continues to cut the cake in this manner?
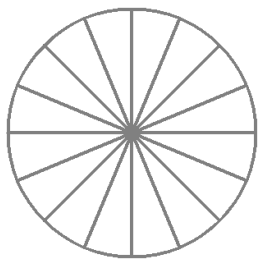
<u>Example 2</u>: $\frac{3}{4} \div \frac{1}{8}$

How many $\frac{1}{8}$s in $\frac{3}{4}$?

$\frac{3 \cdot 1}{4 \div 8} = 6$

$\frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \times \frac{\overset{2}{8}}{1} = \frac{6}{1}$

Number line: $0 \quad \frac{1}{8} \quad \frac{1}{4} \quad \frac{3}{8} \quad \frac{1}{2} \quad \frac{5}{8} \quad \frac{3}{4} \quad \frac{7}{8} \quad 1$

Let's try the following problems using the reciprocal method!

1) $7\frac{1}{5} \div \frac{2}{5} = 18$ ← answers

$\frac{36}{5} \cdot \frac{2}{5} = \frac{36}{5} \times \frac{5}{2} = \frac{18}{1}$

2) $\frac{3}{8} \div 2\frac{1}{4} =$ answer $= \frac{1}{6}$

$\frac{3}{8} \div \frac{9}{4} = \frac{3}{8_2} \times \frac{4}{9_3} = \frac{1}{6}$

3) You are making a batch of chocolate chip cookies and need $2\frac{1}{4}$ cups of flour but only have $\frac{3}{4}$ cup measuring cup. How many times do you need to fill this measuring cup to have the exact amount of flour necessary for the recipe?

$2\frac{1}{4} = \frac{9}{4}$

$\frac{9}{4} \times \frac{4}{3} = \frac{36}{12} = 3$

Now you try! Work with your 6:00 partner to complete the following problems:

1) $\frac{9}{10} \div \frac{3}{4}$

2) $\frac{1}{9} \div \frac{5}{12}$

3) $\frac{5}{6} \div \frac{5}{12}$

4) $\frac{7}{9} \div \frac{1}{7}$

5) $\frac{5}{6} \div \frac{3}{8}$

6) $\frac{7}{10} \div 2\frac{5}{8}$

7) $6 \div 2\frac{2}{5}$

8) $1\frac{3}{4} \div \frac{3}{4}$

9) $\frac{5}{6} \div \frac{5}{12}$

10) $3\frac{5}{6} \div 1\frac{1}{3}$

11) $6\frac{3}{5} \div 2\frac{3}{5}$

12) $4\frac{2}{3} \div 2\frac{2}{9}$

13) **EXERCISE** Del Ray can run $20\frac{1}{2}$ miles in $2\frac{1}{4}$ hours. How many miles per hour can he run?