

Get out your book and turn to page 311! Warm Up on the problems below.

Classwork - Multiplying Fractions and Mixed Numbers

Warm Up: Solve the following.

A) $5(-9) = \underline{-45}$ B) $-8(-3) = \underline{24}$ C) $-6(7) = \underline{-42}$

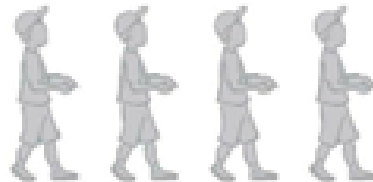
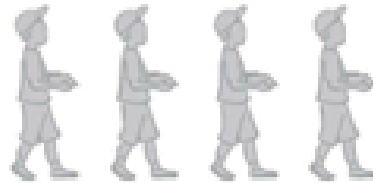
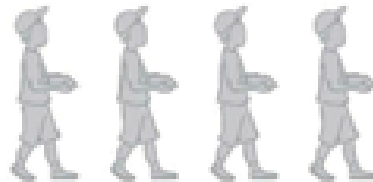


Real-World Link

Lunch There are 12 students at the lunch table. Two thirds of the students ordered a hamburger for lunch. One half of those students that ordered a hamburger put cheese on it.

Step 1

Draw an X through the students that did not order a hamburger.



Step 2

Draw a C on the students that ordered cheese on their hamburger.

1. What fraction of the students at the lunch table ordered a cheeseburger? Write in simplest form. _____
2. What is $\frac{1}{2}$ of $\frac{2}{3}$? Write in simplest form. _____
3. Write your own word problem that involves fractions that can be solved using a diagram like the one above.



Essential Q

WHAT happens when you subtract, multiply, and divide fractions?



Common Core State Standards

Content Standards

7.NS.2, 7.NS.2a, 7.NS.2c
7.EE.3

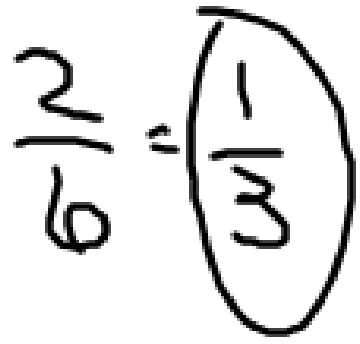
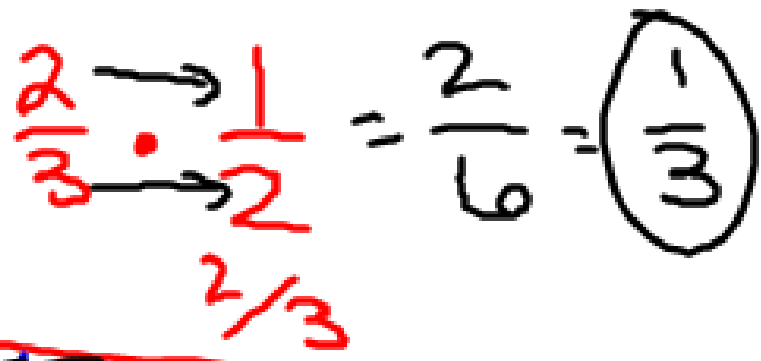
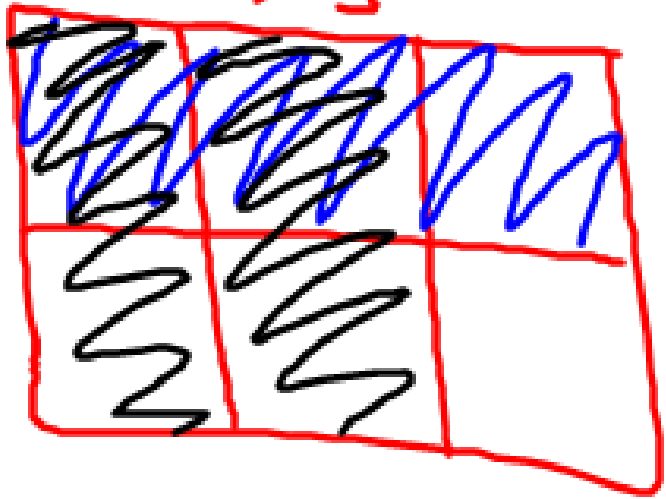


Mathematical Practices

1, 3, 4



$n/2$



Multiply Fractions

Words To multiply fractions, multiply the numerators and multiply the denominators.

Examples **Numbers** $\frac{1}{2} \times \frac{2}{3} = \frac{1 \times 2}{2 \times 3}$ or $\frac{2}{6}$ **Algebra** $\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$ or $\frac{ac}{bd}$, where $b, d \neq 0$

When multiplying two fractions, write the product in simplest form. The numerator and denominator of either fraction may have common factors. If this is the case, you can simplify before multiplying.

Examples

Multiply. Write in simplest form.

1. $\frac{1}{2} \times \frac{1}{3}$

$$\begin{aligned} \frac{1}{2} \times \frac{1}{3} &= \frac{1 \times 1}{2 \times 3} && \leftarrow \text{Multiply the numerators.} \\ &= \frac{1}{6} && \leftarrow \text{Multiply the denominators.} \\ & && \text{Simplify.} \end{aligned}$$

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

$$\begin{aligned} 2 \times \left(-\frac{3}{4}\right) &= \frac{2}{1} \times \left(-\frac{3}{4}\right) && \text{Write 2 as } \frac{2}{1} \text{ and } -\frac{3}{4} \text{ as } \frac{-3}{4}. \\ &= \frac{2 \times (-3)}{1 \times 4} && \leftarrow \text{Multiply the numerators.} \\ &= \frac{-6}{4} \text{ or } -1\frac{1}{2} && \leftarrow \text{Multiply the denominators.} \\ & && \text{Simplify.} \end{aligned}$$

3. $\frac{2}{7} \times \left(-\frac{3}{8}\right) = \frac{-6}{56} = \frac{-3}{28}$ (Divide -6 and 56 by their GCF, 2.)

$\frac{2}{7} \times \left(-\frac{3}{8}\right) = \frac{2}{7} \times \left(-\frac{3}{8}\right)$ (Divide 2 and 8 by their GCF, 2.)

$= \frac{1 \times (-3)}{7 \times 4}$ or $-\frac{3}{28}$ (Multiply.)

$\frac{1}{7} \times \left(-\frac{2}{4}\right) = \frac{-2}{28} = \frac{-1}{14}$

(Divide -2 and 28 by their GCF, 2.)

Got it? Do these problems to find out.

Multiply. Write in simplest form.

a. $\frac{3}{5} \times \frac{1}{2}$

$\frac{3}{10}$

b. $\frac{2}{3} \times (-4)$

$\frac{2}{3} \times \left(-\frac{4}{1}\right) = \frac{-8}{3}$

c. $-\frac{1}{3} \times \left(-\frac{3}{7}\right)$

$-\frac{1}{3} \times \left(-\frac{3}{7}\right) = \frac{3}{21} = \frac{1}{7}$

$\frac{1}{7} \times \left(-\frac{2}{4}\right) = \frac{-2}{28} = \frac{-1}{14}$

Multiply Mixed Numbers

When multiplying by a mixed number, you can rename the mixed number as an improper fraction. You can also multiply mixed numbers using the Distributive Property and mental math.

Example



4. Find $\frac{1}{2} \times 4\frac{2}{5}$. Write in simplest form.

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

Method 1 Rename the mixed number.

$$\begin{aligned}\frac{1}{2} \times 4\frac{2}{5} &= \frac{1}{2} \times \frac{22}{5} \\ &= \frac{1 \times 11}{1 \times 5} \\ &= \frac{11}{5} \\ &= 2\frac{1}{5}\end{aligned}$$

Rename $4\frac{2}{5}$ as an improper fraction, $\frac{22}{5}$.
Divide 2 and 22 by their GCF, 2.

Multiply.

Simplify.

Simplify.

Method 2 Use mental math.

The mixed number $4\frac{2}{5}$ is equal to $4 + \frac{2}{5}$.

So, $\frac{1}{2} \times 4\frac{2}{5} = \frac{1}{2} \left(4 + \frac{2}{5} \right)$. Use the Distributive Property to multiply, then add mentally.

$$\begin{aligned}\frac{1}{2} \left(4 + \frac{2}{5} \right) &= 2 + \frac{1}{5} \\ &= 2\frac{1}{5}\end{aligned}$$

Think Half of 4 is 2 and half of 2 fifths is 1 fifth.

Rewrite the sum as a mixed number.

Check for Reasonableness $2\frac{1}{5} \approx 2$ ✓

$$\text{So, } \frac{1}{2} \times 4\frac{2}{5} = 2\frac{1}{5}.$$

Using either method, the answer is $2\frac{1}{5}$.

Got it? Do these problems to find out.

Multiply. Write in simplest form.

d. $\frac{1}{4} \times 8\frac{4}{9} = \frac{76}{9}$

$\frac{1}{4} \cdot \frac{76}{9} = \frac{19}{9}$
 $\frac{1}{4} \cdot \frac{76}{9} = \frac{19}{9}$
 $\frac{1}{4} \cdot \frac{76}{9} = \frac{19}{9}$

e. $5\frac{1}{3} \times 3$

$5\frac{1}{3} \cdot 3 = 16$
 $5\frac{1}{3} \cdot 3 = 16$
 $5\frac{1}{3} \cdot 3 = 16$

f. $-1\frac{7}{8} \times \left(-2\frac{2}{5}\right)$

$-1\frac{7}{8} \cdot \left(-2\frac{2}{5}\right) = 2\frac{4}{5}$
 $-1\frac{7}{8} \cdot \left(-2\frac{2}{5}\right) = 2\frac{4}{5}$
 $-1\frac{7}{8} \cdot \left(-2\frac{2}{5}\right) = 2\frac{4}{5}$



Example



5. Humans sleep about $\frac{1}{3}$ of each day. Let each year equal $365\frac{1}{4}$ days. Determine the number of days in a year the average human sleeps.

Find $\frac{1}{3} \times 365\frac{1}{4}$.

Estimate $\frac{1}{3} \times 360 = 120$

$$\frac{1}{3} \times 365\frac{1}{4} = \frac{1}{3} \times \frac{1,461}{4}$$

Rename the mixed number as an improper fraction.

$$= \frac{1}{3} \times \frac{487}{4}$$

Divide 3 and 1,461 by their GCF, 3.

$$= \frac{487}{4} \text{ or } 121\frac{3}{4}$$

Multiply. Then rename as a mixed number.

Check for Reasonableness $121\frac{3}{4} \approx 120$ ✓

The average human sleeps $121\frac{3}{4}$ days each year.

$$\#4) \frac{1}{5} \times 80\frac{1}{2}$$

$$\frac{1}{5} \times \frac{161}{2} = \frac{161}{10}$$

$$\frac{161}{10} = 16\frac{1}{10} \text{ pounds}$$

Do Guided Practice #4 for Got It?

4. **STEM** The weight of an object on Mars is about $\frac{2}{5}$ its weight on Earth. How much would an $80\frac{1}{2}$ -pound dog weigh on Mars? (Example 5) _____