

Multiplying Fractions

Goal: Multiply fractions and mixed numbers.

Vocabulary

Multiplicative inverse:

Multiplying Fractions

Words The product of two or more fractions is equal to the product of

the divided by the product of the .

Numbers $\frac{2}{5} \cdot \frac{7}{9} = \frac{2 \cdot 7}{5 \cdot 9} = \frac{\text{ } \cdot \text{ }}{\text{ } \cdot \text{ }} = \frac{\text{ } \cdot \text{ }}{\text{ } \cdot \text{ }}$

Algebra $\frac{a}{\text{ } \cdot \text{ }} \cdot \frac{c}{d} = \frac{a \cdot \text{ } \cdot \text{ }}{b \cdot d} \quad (b, d \neq 0)$

Remember that the product of two numbers with the same sign is positive. The product of two numbers with different signs is negative.

EXAMPLE 1 Multiplying Fractions

a. $-\frac{3}{4} \cdot \left(-\frac{5}{8}\right) = \frac{\text{ } \cdot \text{ } \cdot (-5)}{4 \cdot \text{ } \cdot \text{ }} = \frac{\text{ } \cdot \text{ } \cdot \text{ }}{\text{ } \cdot \text{ } \cdot \text{ }} = \frac{\text{ } \cdot \text{ }}{\text{ } \cdot \text{ }}$

Use rule for multiplying fractions.

Evaluate numerator and denominator.

b. $-\frac{2}{3} \cdot \frac{9}{10} = \frac{\text{ } \cdot \text{ } \cdot \text{ }}{3 \cdot \text{ } \cdot \text{ }} = \frac{\text{ } \cdot \text{ } \cdot \text{ }}{\text{ } \cdot \text{ } \cdot \text{ }} = \frac{\text{ } \cdot \text{ }}{\text{ } \cdot \text{ }} = \frac{\text{ } \cdot \text{ }}{\text{ } \cdot \text{ }}$

Use rule for multiplying fractions.

Divide out common factors.

Multiply.

Inverse Property of Multiplication

Words The product of a nonzero number and its is 1.

Algebra $a \cdot \frac{1}{a} = \frac{1}{a} \cdot a = \text{}$, where $a \neq 0$

Example $\cdot \frac{1}{6} = \frac{1}{6} \cdot \text{} = 1$

EXAMPLE 2 Multiple Choice Practice

What is the value of $\frac{7}{12} \cdot \frac{3}{5} \cdot \frac{12}{7}$?

(A) $\frac{7}{12}$

(B) $\frac{5}{3}$

(C) $\frac{7}{20}$

(D) $\frac{3}{5}$

Solution

$$\frac{7}{12} \cdot \frac{3}{5} \cdot \frac{12}{7} = \frac{7}{12} \cdot \text{} \cdot \text{$$

Commutative property of multiplication

$$= 1 \cdot \text{$$

Inverse property of multiplication

$$= \text{$$

Identity property of multiplication

Answer: The correct answer is .

(A)

(B)

(C)

(D)

Guided Practice Find the product. Simplify if possible.

1. $\frac{11}{12} \cdot 18$

2. $-\frac{4}{5} \cdot \frac{5}{6}$

3. $\frac{1}{5} \cdot \frac{3}{8} \cdot 5$

4. $\frac{6}{13} \cdot \frac{13}{6}$

EXAMPLE 3 Multiplying Mixed Numbers

Jigsaw Puzzle A completed puzzle is $31\frac{1}{4}$ inches long and $18\frac{2}{5}$ inches wide. What is the area of the puzzle?

Solution

To find the area of the puzzle, use an area formula.

$$\text{Area} = \text{length} \cdot \text{width}$$

$$= 31\frac{1}{4} \cdot 18\frac{2}{5}$$

$$= \frac{125}{4} \cdot \frac{94}{5}$$

$$= \frac{125 \cdot 94}{4 \cdot 5}$$

$$= \frac{125 \cdot 23}{1}$$

$$= 2875$$

Write formula for area of a rectangle.

Substitute values.

Write as improper fractions.

Use rule for multiplying fractions.

Divide out common factors.

Multiply.

Remember that when you multiply mixed numbers, you first write them as improper fractions.

Answer: The area of the puzzle is 2875 square inches.

Guided Practice Find the product. Simplify if possible.

5. $2\frac{1}{3} \cdot 1\frac{1}{2}$

6. $-6 \cdot 4\frac{2}{3}$

7. $-\frac{5}{8} \cdot (-3\frac{1}{10})$

8. $1\frac{1}{2} \cdot 1\frac{2}{9}$

WATCH OUT!

Be careful when you write a number as an improper fraction.

$$-3\frac{4}{5} = \frac{-3 \cdot 5 + (-4)}{5}$$

$$-3\frac{4}{5} \neq \frac{-3 \cdot 5 + 4}{5}$$

EXAMPLE 4 Evaluating an Algebraic Expression

Algebra Evaluate xy^2 when $x = -\frac{3}{8}$ and $y = -\frac{5}{6}$.

$$\begin{aligned}
 xy^2 &= \boxed{} \cdot \left(-\frac{5}{6}\right)^2 \\
 &= \boxed{} \cdot \left(-\frac{5}{6}\right) \cdot \boxed{} \\
 &= \boxed{} \\
 &= \boxed{} \\
 &= \boxed{}
 \end{aligned}$$

Substitute values.

Write $-\frac{5}{6}$ as a factor $\boxed{}$ times.

Use rule for multiplying fractions.

Divide out common factor.

Multiply.

Guided Practice

Evaluate the expression when $x = -\frac{1}{2}$ and $y = \frac{2}{5}$.
Simplify if possible.

Homework

9. $-\frac{2}{3}x$

10. $-7y$

11. $\frac{5}{9}xy$

12. x^2y