

3.3 Multiplication with Fractions and the Area of a Triangle

1. Rule for Multiplying Fractions: The product of two fractions is the fraction whose numerator is the product of the two numerators and whose denominator is the product of the two denominators. In symbols, if a, b, c and d represent any numbers and b and d are not zero, then

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$$

Example: Multiply the given fractions.

a. $\frac{2}{7} \cdot \frac{3}{5}$

b. $\frac{4}{5} \cdot \frac{6}{11}$

c. $-\frac{3}{10} \cdot \frac{7}{16}$

d. $-\frac{4}{19} \left(-\frac{5}{9} \right)$

2. Using the Commutative and Associative Properties of Multiplication with Fractions

When multiplying fractions, the commutative and associative properties of multiplication are often useful in simplifying.

Example: Multiply the given fractions.

$$\text{a. } 3\left(\frac{1}{3} \cdot \frac{4}{5}\right) = \left(3 \cdot \frac{1}{3}\right) \cdot \frac{4}{5} = \left(\frac{3}{1} \cdot \frac{1}{3}\right) \cdot \frac{4}{5} = \frac{4}{5}$$

$$\text{b. } \frac{2}{7}\left(\frac{3}{5}x\right)$$

$$\text{c. } 5\left(\frac{3}{4}x\right)$$

$$\text{d. } -\frac{3}{10}\left(\frac{7}{16}x\right)$$

$$\text{e. } -\frac{4}{19}\left(-\frac{5}{9}x\right)$$

3. Dividing out Common Factors Before Multiplying: When multiplying fractions factor the numerator and denominator and then divide out common factors **before** multiplying. Your answer will then always be in lowest form. This step, where you divide out common factors before you multiply, is worth points on every multiplication of fractions problem, and if you omit the step you will lose those points.

Example: Multiply the given fractions. Divide out any common factors before you multiply.

$$\text{a. } \frac{4}{9} \cdot \frac{21}{25}$$

$$b. \frac{14}{15} \cdot \frac{20}{49}$$

$$c. \frac{22}{35} \cdot \frac{28}{55}$$

$$d. \frac{14}{39} \cdot \frac{42}{63}$$

$$e. -\frac{3}{8} \cdot \frac{7}{9} \cdot \frac{22}{35}$$

$$f. \frac{2}{3} \cdot \frac{7}{20} \cdot \frac{9}{14}$$

$$g. -\frac{4}{5} \left(-\frac{11}{16} \right) \left(-\frac{25}{33} \right)$$

$$h. \frac{5}{9} \cdot \frac{22}{33} \cdot \frac{11}{15}$$

$$i. \frac{x}{y} \cdot \frac{y^2}{x}$$

$$j. \frac{2xy}{z^2} \cdot \frac{z}{4xy^2}$$

4. Multiplying with Fractions and Exponents: When simplifying expressions that contain fractions and exponents, use the order of operations agreement and the exponent rules.

Example: Simplify the following expressions.

$$a. \left(\frac{1}{4}\right)^2$$

$$b. \left(-\frac{2}{5}\right)^3$$

$$c. \left(\frac{1}{4}\right)\left(\frac{2}{3}\right)^2$$

$$d. -\left(\frac{1}{4}\right)^2\left(\frac{8}{11}\right)$$

5. Interpreting “of” When Used with Fractions: The word “of” when used in connection with fractions indicates multiplication.

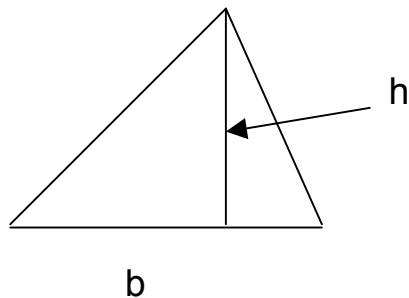
Example: Simplify

a. Find $\frac{1}{2}$ of $\frac{2}{5}$.

b. Find $\frac{2}{3}$ of $-\frac{3}{8}$.

c. What is $\frac{3}{7}$ of -21 .

6. Area of a Triangle:



The area of a triangle is given by the formula

$$A = \frac{1}{2}bh$$

Example: Find the area of a triangle that has a base of 13 inches and a height of 12 inches.