

6-2 Multiplying Fractions

Objective: To multiply algebraic fractions.

Multiplication Rule for Fractions To multiply fractions, you multiply their numerators and multiply their denominators.

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd} \quad \text{For example, } \frac{3}{4} \cdot \frac{5}{8} = \frac{3 \cdot 5}{4 \cdot 8} = \frac{15}{32}$$

Example 1 Multiply: $\frac{5}{6} \cdot \frac{9}{10}$

Solution 1 $\frac{5}{6} \cdot \frac{9}{10} = \frac{5 \cdot 9}{6 \cdot 10} = \frac{45}{60} = \frac{3}{4}$ You can multiply first and then simplify.

Solution 2 $\frac{1\cancel{5}}{2\cancel{6}} \cdot \frac{\cancel{9}^3}{\cancel{10}_2} = \frac{3}{4}$ You can simplify first and then multiply.

Multiply. Express each product in simplest form.

1. $\frac{3}{7} \cdot \frac{35}{9}$

2. $\frac{5}{16} \cdot \frac{4}{15}$

3. $\frac{12}{7} \cdot \frac{14}{9}$

4. $-\frac{5}{2} \cdot \frac{16}{25}$

5. $\frac{2}{5} \cdot \frac{5}{9} \cdot \frac{9}{10}$

6. $\frac{8}{5} \cdot \frac{3}{4} \cdot \frac{15}{16}$

7. $\left(-\frac{3}{2}\right)^2 \cdot \frac{8}{9}$

8. $(-3)^2 \cdot \frac{25}{12}$

Example 2 a. $\frac{9x}{y^2} \cdot \frac{y^3}{24}$ b. $\frac{x^2 + x - 12}{x^2 + 5x} \cdot \frac{x^2 - 25}{x - 3}$

Solution a. $\frac{9x}{y^2} \cdot \frac{y^3}{24} = \frac{\cancel{9} \cdot 3x}{\cancel{y^2} \cdot 8} \cdot \frac{\cancel{y}^3}{\cancel{8} \cdot 1} \leftarrow \text{Multiply the numerators.}$
 $\leftarrow \text{Multiply the denominators.}$
 $= \frac{3xy}{8} \quad (y \neq 0)$

$$\text{b. } \frac{x^2 + x - 12}{x^2 + 5x} \cdot \frac{x^2 - 25}{x - 3} = \frac{(x+4)\cancel{(x-3)}}{x\cancel{(x+5)}} \cdot \frac{\cancel{(x+5)}(x-5)}{\cancel{(x-3)}} \\ = \frac{(x+4)(x-5)}{x} \quad (x \neq 0, x \neq -5, x \neq 3)$$

You can leave the answer in factored form.

CAUTION From now on, assume that no denominator equals zero. You won't need to show the excluded values, but know what they are.

Multiply. Express each product in simplest form.

9. $\frac{8}{x^2} \cdot \frac{x^3}{4}$

10. $\frac{7y}{5} \cdot \frac{10}{21y}$

11. $\frac{a}{c} \cdot \frac{c}{d} \cdot \frac{d}{e}$

12. $\frac{6}{x^2} \cdot \frac{5x}{12}$

13. $\frac{6w}{v} \cdot \frac{v^3}{3w^2}$

14. $\frac{8a}{11b^3} \cdot \frac{33b}{4a^2}$

15. $\frac{2de^2}{5e^2f} \cdot \frac{f^2}{4d}$

16. $\frac{3rs^2}{4t} \cdot \frac{8t^2}{9rs}$

6-2 Multiplying Fractions (continued)

Multiply. Express each product in simplest form.

17. $\frac{x-3}{x^2} \cdot \frac{2x}{x^2-9}$

18. $\frac{x^2-4}{8x} \cdot \frac{4x^2}{5x+10}$

19. $\frac{a^2-b^2}{a^2} \cdot \frac{a}{2(b-a)}$

20. $\frac{m}{3(n-m)} \cdot \frac{m^2-n^2}{m^2}$

Rule of Exponents for a Power of a QuotientFor every positive integer m , $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$. For example, $\left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3}$.**Example 3** Simplify: a. $\left(\frac{x}{2}\right)^4$ b. $\left(-\frac{x}{3}\right)^2 \cdot \frac{9}{5x}$

Solution

a. $\left(\frac{x}{2}\right)^4 = \frac{x^4}{2^4} = \frac{x^4}{16}$

b. $\left(-\frac{x}{3}\right)^2 \cdot \frac{9}{5x} = \frac{x^2}{9} \cdot \frac{9}{5x} = \frac{x \cdot \cancel{9}}{\cancel{9} \cdot 5 \cdot \cancel{x}} = \frac{x}{5}$

Multiply. Express each product in simplest form.

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

22. $\left(\frac{c}{3}\right)^3$

23. $\left(\frac{m}{5}\right)^3$

24. $\left(\frac{y}{4}\right)^3$

25. $\left(\frac{2n}{5}\right)^2$

26. $\left(\frac{3x}{4}\right)^2$

27. $\left(\frac{3w}{7}\right)^2$

28. $\left(\frac{7b}{2}\right)^2$

29. $\left(\frac{2a}{3b^3}\right)^2$

30. $\left(\frac{4m}{5n^2}\right)^2$

31. $\left(-\frac{x}{3y}\right)^2$

32. $-\left(\frac{4b^3}{5}\right)^2$

33. $\left(\frac{x}{y}\right)^2 \cdot \frac{y}{x}$

34. $\left(\frac{2x}{y}\right)^3 \cdot \frac{y^2}{4}$

35. $\left(-\frac{x}{2y}\right)^2 \left(-\frac{4y}{x}\right)$

36. $\left(\frac{2z}{y}\right)^3 \cdot \frac{3yz}{8}$

37. Find the area of a square if each side has length $\frac{3x}{4}$ in.38. Find the volume of a cube if each edge has length $\frac{2n}{3}$ in.**Mixed Review Exercises**

Factor completely.

1. $a^2 + 11a + 24$

2. $x^2 - 5x - 14$

3. $81x^4 - 16$

4. $2x^2 + 5x + 2$

5. $25y^2 - 9z^2$

6. $c^2 + 10c + 25$

7. $xy + 5y - 4xz - 20z$

8. $9x^2 - 6x + 1$

9. $3x^2 - 11x - 4$

10. $x^4 + 6x^2 - 5x^3$

11. $n^2 + 4n - 12$

12. $y^2 - 5y - 36$