**Example 1:** Multiply the following fractions and simplify your answers completely.

a. \(-\frac{17a}{9} \cdot \frac{45}{51}\)

b. \(\frac{12}{7x} \cdot \frac{y^2}{5} \cdot \frac{70}{27x^2}\)

\[
\frac{(12)(y^2)(70)}{(7x)(5)(27x^2)}
\]

\[
\frac{2 \cdot 2 \cdot 3 \cdot y \cdot y \cdot 2 \cdot 5 \cdot 7}{7 \cdot x \cdot 5 \cdot 3 \cdot 3 \cdot x \cdot x}
\]

\[
\frac{8y^2}{9x^3}
\]

**Steps for Multiplying Rational Expressions:**
1. write numerator times numerator and denominator times denominator, but do not actually multiply the polynomials (**leave in factored form**)
2. factor the numerator and denominator completely, then cancel common factors (if possible)
Example 2: Multiply the following rational expressions and simplify your answers completely.

\[
\begin{align*}
\text{a. } & \quad \frac{x^7 + 9x^5}{x^2 - 9} \cdot \frac{x^2 + 6x + 9}{x^3 + 3x^2 + 9x + 27} \\
\text{b. } & \quad \frac{(x+1)^2}{x^2 - 1} \cdot \frac{1-x^2}{x^2 + 1}
\end{align*}
\]
c. \[
\frac{5x^2-26x-24}{x^4+15x^3+54x^2} \cdot \frac{x^8-81x^6}{x^2-15x+54}
\]
\[
\frac{(5x+4)(x-6)}{x^2(x+6)(x+9)} \cdot \frac{x^6(x-9)(x+9)}{(x-9)(x-6)}
\]
\[
\frac{(5x+4)(x-6)x^6(x-9)(x+9)}{x^2(x+6)(x+9)(x-9)(x-6)}
\]
\[
\frac{x^4(5x+4)}{x+6}
\]

Once again, please keep in mind that the next lesson (Lesson 8) is very dependent on this lesson (Lesson 7) and the previous lesson (Lesson 6). If you do not understand how to factor polynomials, simplify rational expressions, and/or multiply rational expressions, it will be very difficult to complete Lesson 8. Therefore once again it is crucial that you go through the Lesson 7 homework problems as many times as necessary to be sure that you have a complete understanding of each of those topics so you can understand and complete the next lesson.

**Answers to Examples:**

1a. \(-\frac{5a}{3}\); 1b. \(\frac{8y^2}{9x^3}\); 2a. \(\frac{x^5}{x-3}\); 2b. \(\frac{-(x+1)^2}{x^2+1}\); 2c. \(\frac{x^4(5x^2+4)}{x+6}\);

2d. \(\frac{3xy}{(x^2-x+1)(y^2-2)}\).