NAME

Module 11 Simplifying Algebraic Expressions with Polynomials
Lesson 6 Dividing Polynomials by Monomials

Simplify.

1. $\frac{8x^2}{4}$ **$2x^2$**
2. $\frac{15a^2}{21}$ **$\frac{5a^2}{7}$**
3. $\frac{-10c^3}{4}$ **$\frac{-5c^3}{2}$**
4. $\frac{7p^3}{p}$ **$7p^2$**
5. $\frac{32n^5}{8n^3}$ **$4n^2$**
6. $\frac{-45z^8}{27z^3}$ **$\frac{-5z^5}{3}$**
7. $\frac{-14a^2b}{2ab}$ **$-7a$**
8. $\frac{28x^2y^2z}{35xz}$ **$\frac{4xy^2}{5}$**
9. $\frac{17p^2qr^2}{3m^2n^3}$ **In simplest form**
10. $\frac{8c + 4}{2}$ **$4c + 2$**
11. $\frac{18m + 3}{3}$ **$6m + 1$**
12. $\frac{21f^2 + 7}{28}$ **$\frac{3f^2}{4} + \frac{1}{4}$ or $\frac{3f^2 + 1}{4}$**
13. $\frac{15d + 9}{6}$ **$\frac{5d}{2} + \frac{3}{2}$ or $\frac{5d + 3}{2}$**
14. $\frac{18x^3 + 12x^2}{6x}$ **$3x^2 + 2x$**
15. $\frac{3a^7 - 9a^4 + 6a^2}{3a}$ **$a^6 - 3a^3 + 2a$**
16. $\frac{25n^6 - 15n^5 + 10n^4}{5n^3}$ **$5n^3 - 3n^2 + 2n$**
17. $\frac{4f^9 - 16f^5 + 8f^3}{8f}$ **$\frac{f^8}{2} - 2f^4 + f^2$**
18. $\frac{m^6n^3 + m^5n^4 - m^3n^2}{m^2n}$ **$m^4n^2 + m^3n^3 - mn$**
19. $\frac{4p^7q^5 + 8p^5q^6 - 2p^4q^2}{2p^3q^2}$ **$2p^4q^3 + 4p^2q^4 - p$**
20. $\frac{5a^9c^2 + 20a^5c^5 - 15a^4c^2}{10a^4c^2}$ **$\frac{a^5}{2} + 2ac^3 - \frac{3}{2}$**

Journal

1. Pablo believes the simplest form of $\frac{8a^2b - 4a^2b^3}{2ab^2}$ is $\frac{4a^2b - 2a^2b^3}{ab^2}$. Monique believes the simplest form is $\frac{8a}{2b} - \frac{4ab}{2}$. Is either student correct? Explain why or why not.
2. In the case of a monomial divided by a monomial, what is the process for assuring the expression is in simplest form? Use an example to explain the reasoning.
3. In some detail, explain why the expression $\frac{3m^2x - 7n^3p^5}{2q^4z^2}$ is already in simplest form.
4. In your own words, explain how to simplify the expression $\frac{12x^2y - 3xy^2}{6xy}$.
5. When dividing a polynomial by a monomial, explain why it is okay to divide each term in the polynomial by the monomial.

Cumulative Review

Simplify.

1. $3x^2 + 5x^2$

$8x^2$

2. $3x^2 \cdot 5x^2$

$15x^4$

3. $4a^2b^3 \cdot 5b^2c^5$

$20a^2b^5c^5$

4. $(14y^3 + 12x^2) - (7y^3 + 14x^2)$

$7y^3 - 2x^2$

5. $(3pq)(p^2q + 2q^2)$

$3p^3q^2 + 6pq^3$

6. $(3qr)(qr - 4)$

$3q^2r^2 - 12qr$

7. $(m - 3)(m - 2)$

$m^2 - 5m + 6$

8. $(2g^2 - 3)(4g + 1)$

$8g^3 + 2g^2 - 12g - 3$

9.
$$\begin{array}{r} 17d^2 + 22f^5 - 3g^3 - 5 \\ +\ 4d^2 - 21f^5 + 3g^3 \\ \hline \end{array}$$

$21d^2 + f^5 - 5$

10.
$$\begin{array}{r} 4p^2q^3 + 2p^3q^2 - 7pq + 3 \\ -\ (4p^2q^3 + 2p^3q^2 + 7pq - 3) \\ \hline \end{array}$$

$-14pq + 6$

Possible Journal Answers

1. Both Pablo and Monique are incorrect. Pablo properly factored out a two from the numerator and denominator, but he did not remember to factor out the variables. Monique remembered to divide the monomial into each expression in the binomial. She also remembered to reduce the variables, but she did not factor out the two. By both factoring out the constant, two, and taking the approach Monique took, the simplified expression is $\frac{4a}{b} - 2ab$.
2. As an example, in the expression $\frac{4ab^2}{2b^3c}$, first divide the coefficients of the monomial terms by canceling any common factors. The coefficients four and two each have a common factor of two. These common factors cancel, and the expression becomes $\frac{2ab^2}{b^3c}$. Next, divide variables that have the same base. In the example, b^2 and b^3 have the same base, b. The variables a and c have no common base. After subtracting the exponents of the common base, b, the simplified expression is $\frac{2a}{bc}$.
3. This expression has no common factors except the constant, one. There is no common term that can be factored from the coefficients, and there are no variables with the same base in the numerator and the denominator.
4. To simplify, divide each term in the numerator by the denominator. Write the expression as $\frac{12x^2y}{6xy} - \frac{3xy^2}{6xy}$. In the expression $\frac{12x^2y}{6xy}$, the 12 and six reduce to two; the x^2 and x reduce to x; and the y's cancel. So, $\frac{12x^2y}{6xy}$ equals $2x$. In the expression $\frac{3xy^2}{6xy}$, the three and the six reduce to $\frac{1}{2}$; the x's cancel; and the y^2 and y reduce to y. So, $\frac{3xy^2}{6xy}$ equals $\frac{y}{2}$. Overall, the simplified form is $2x - \frac{y}{2}$.
5. As an example, consider the expression $\frac{x^2 + x + 1}{5xy}$. Division is equivalent to multiplication by the denominator's reciprocal. So, this equals $(x^2 + x + 1)\left(\frac{1}{5xy}\right)$. Now, use the Distributive Property. This gives $(x^2)\left(\frac{1}{5xy}\right) + (x)\left(\frac{1}{5xy}\right) + (1)\left(\frac{1}{5xy}\right)$ or $\frac{x^2}{5xy} + \frac{x}{5xy} + \frac{1}{5xy}$, which is each term of the numerator divided by the monomial denominator.