www.MathWorksheetsGo.com
On Twitter: twitter.com/mathprintables

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Web Resources

YouTube Monomials
www.mathwarehouse.com/algebra/polynomial/monomials/how-to-multiply-monomials.php

Polynomials
http://www.mathwarehouse.com/algebra/polynomial/

www.mathwarehouse.com/algebra/polynomial/how-to-multiply-polynomials.php

Online Graphing Calculator(free): www.mathworksheetsgo.com/calculator/

I. Model Problems

A **monomial** is an expression that is a number, variable or product of a number and variables. Examples of monomials: -3, $4x$, $5xy$, y^2

To multiply monomials, multiply all the coefficients and all the variables.

Example 1 Simplify $2x^3(7x^5)$.

$= 14x^3x^5$ Multiply the coefficients.

$= 14x^8$ Multiply variables.

The answer is $14x^8$.

To divide monomials, divide the coefficients and the variables.

Example 2 Simplify $\dfrac{20x^7y^6}{4x^2y^5}$.

$= \dfrac{5x^7y^6}{x^3y^5}$ Divide the coefficients.

$= 5x^4y$ Divide variables.

The answer is $5x^4y$.

When you have power of a power, everything inside the parentheses gets raised to the power. You multiply exponents.

Example 3 Simplify $(5x^2y^4)^3$.

$= 5^3x^{2\cdot3}y^{4\cdot3}$ Raise everything to the 3rd power.

$= 125x^6y^{12}$ Simplify.

The answer is $125x^6y^{12}$.

To multiply rational expressions with monomials, in the numerator and the denominator, follow the rules of simplifying monomials.

Example 4 Multiply $\frac{15x^7y^6}{2x^2y^5} \cdot \frac{xy^6}{5y^3}$.

$= \frac{15x^7y^6 \cdot xy^6}{2x^2y^5 \cdot 5y^3}$ Multiply the numerators and the denominators.

$= \frac{15x^7y^6 \cdot xy^6}{10x^2y^5 \cdot y^3}$ Multiply the coefficients.

$= \frac{15x^8y^{12}}{10x^2y^8}$ Multiply the variables (add exponents).

$= \frac{3x^8y^{12}}{2x^2y^8}$ Simplify coefficients.

$= \frac{3}{2}x^6y^4$ Divide variables (subtract exponents).

The answer is $\frac{3}{2}x^6y^4$.

Example 5 Multiply $\frac{(3x^2y^3)^3}{2x^2y^5} \cdot \frac{4x^2y^5}{18y^3}$.

$= \frac{27x^6y^9}{2x^2y^5} \cdot \frac{4x^2y^5}{18y^3}$ Simplify power to a power.

$= \frac{108x^8y^{14}}{36x^2y^8}$ Multiply the coefficients and variables.

$= \frac{3x^8y^{14}}{x^2y^8}$ Simplify coefficients.

$= 3x^6y^6$ Divide variables (subtract exponents).

The answer is $3x^6y^6$.

II. Practice

Simplify.

1. $4x^5(9x^3)$

2. $-9x^5(7x^7)$

3. $-7x^5(3x^2)$

4. $20x^4(3x^9)$

5. $8x^7y^5(10x^2y)$

6. $-4x^9y^{15}(3x^9y^5)$

7. $\dfrac{20x^{14}}{10x^3}$

8. $\dfrac{30x^{13}}{15x^8}$

9. $\dfrac{120x^{10}}{10x^5}$

10. $\dfrac{45y^{16}}{9y^8}$

11. $\dfrac{65x^{19}y^{17}}{13x^5y^5}$

12. $\dfrac{-30x^{27}y^{39}}{5x^{10}y^8}$

13. $(4x^2y^5)^3$

14. $(2x^3y^2)^5$

15. $(-2x^3y^7)^3$

16. $(7x^2yz^4)^2$

17. $(10x^{24}y^{20})^2$

18. $(-3x^5y^{10})^3$

19. $\dfrac{3x^6y^{11}}{10x^2y^5} \cdot \dfrac{20x^5y^8}{12x^4y^3}$

20. $\dfrac{24x^{12}y^{23}}{4x^7y^{20}} \cdot \dfrac{15x^3y^3}{25x^2y^2}$

21. $\dfrac{24x^{19}y^{20}}{12x^{17}y^{14}} \cdot \dfrac{15x^{12}y^{19}}{3x^9y^{15}}$

22. $\dfrac{14x^8y^6}{7x^3y^3} \cdot \dfrac{(2x^3y^3)^2}{2x^2y}$

III. Challenge Problems

23. What is the area of a rectangle with length $6xy^7$ inches and width $(5x^2y)$ inches? Write your answer as an expression in terms of x and y.

24. Simplify $\frac{20x^{19}y^{20}}{8x^{17}y^{14}} \cdot \frac{4x^{54}y^{19}z^{20}}{(2x^9y^{15})^3} \cdot \frac{(4x^{12}y^{19}z)^3}{3x^4y^{15}z^2}$.

25. Correct the Error
There is an error in the student work shown below:

Question: $(3x^4y^9)^5$.
Solution:

$$= (3x^4y^9)^5$$
$$= 15x^{20}y^{45}$$

What is the error? Explain how to solve the problem.

_____

_____

IV. Answer Key

1. $36x^8$
2. $-63x^{12}$
3. $-21x^7$
4. $60x^{13}$
5. $80x^9y^6$
6. $-12x^{18}y^{20}$
7. $2x^{11}$
8. $2x^5$
9. $12x^5$
10. $5y^8$
11. $5x^{14}y^{12}$
12. $-6x^{17}y^{31}$
13. $64x^6y^{15}$
14. $32x^{15}y^{10}$
15. $-8x^9y^{21}$
16. $49x^4y^2z^8$
17. $100x^{48}y^{40}$
18. $-27x^{15}y^{30}$
19. $(1/2)x^6y^{11}$
20. $(18/5)x^6y^4$
21. $10x^5y^{10}$
22. $4x^9y^8$
23. $30x^2y^8$ in^2
24. $(80/3)x^{61}y^{22}z^{21}$
25. The student multiplied the coefficient by the exponent instead of raising the coefficient to the power. The correct answer is $243x^{20}y^{45}$.