

# Exponents & Polynomials Study Guide

Key

## Topics to review:

- Exponent rules
- Solving exponential equations (same base and different base)
- Polynomial vocabulary
- Add/subtract polynomials
- Multiplying polynomials
- Special case "patterns" for multiplying
- Application problems

## Practice Problems:

Simplify the following.

1.  $(8a^6b^3)(-\frac{1}{2}ab^7)$

$$\boxed{-4a^7b^{10}}$$

2.  $(4^{3x+7})(4^{2x-9})$

$$\boxed{4^{5x-2}}$$

3.  $(8x^{-6/5})^{-2/3}$

$$(2^3)^{-2/3} (x^{-6/5})^{-2/3}$$

$$\frac{1}{4} \cdot x^{4/5}$$

$$\boxed{\frac{x^{4/5}}{4}}$$

4.  $(3c)^6 + (-2c^2)^3$

$$729c^6 + 8c^6$$

$$\boxed{721c^6}$$

5.  $\frac{r^{-5}s^0}{r^{-8}s^3}$

$$\frac{r^{-8}s^0}{r^{-5}s^3}$$

$$\boxed{\frac{r^3}{s^3}}$$

6.  $\frac{(2x^3y^5)^3}{(-2x^2y^7)^2}$

$$\frac{8x^9y^{15}}{4x^4y^{14}}$$

$$\boxed{2x^5y}$$

7.  $((ab^3)^{1/7})^{2/9}$

$$(a^{1/7} b^{3/7})^{2/9}$$

$$\boxed{a^{2/63} b^{2/21}}$$

8.  $\frac{x^{1/2}y^{-1/7}z^{-5/3}}{x^{3/4}y^{1/3}z^{-1/2}}$

$$\boxed{\frac{1}{x^{1/4}y^{10/21}z^{7/6}}}$$

9.  $(-3j^{7/2}k^{-3/5})(5j^{-3/4}k^2m^0)$

$$\boxed{-15j^{11/4}k^{7/5}}$$

10.  $\frac{4^{3x+7}}{2^{x+5}}$

$$\frac{(2^2)^{3x+7}}{2^{x+5}}$$

$$\frac{2^{6x+14}}{2^{x+5}}$$

$$\boxed{2^{5x+9}}$$

11. Find the degree of  $12x^2y^3 - 5x^6$

Degree: 6

12. Is the expression above a monomial, binomial, or neither?

13. Arrange  $x^2y^3 + 4xy^2 - 3x^3y + 6$  so the powers of x are in descending order

$-3x^3y + x^2y^3 + 4xy^2 + 6$

Simplify the following.

14.  $(\frac{2}{3}x^2 + \frac{1}{4}x - \frac{1}{5}) - (-\frac{1}{3}x^2 - \frac{3}{4}x - \frac{2}{5})$

Subtract  
Like  
Terms

$x^2 + x + \frac{1}{5}$

15.  $10x^2y(4x^2 - 7x - 6)$

$40x^4y - 70x^3y - 60x^2y$

16.  $5x(-4x - 2y) - 2x(11x + 3y)$

$-20x^2 - 10xy - 22x^2 - 6xy$

$-42x^2 - 16xy$

17.  $(3x^2 + 9)(6x^2 - 8)$

$18x^4 - 24x^2 + 54x^2 - 72$

$18x^4 + 30x^2 - 72$

18.  $(5x + 3y)(5x - 3y)$

$25x^2 + 15xy - 15xy - 9y^2$

$25x^2 - 9y^2$

19.  $(x - 3)(4x^2 - 5x - 3)$

$4x^3 - 5x^2 - 3x - 12x^2 + 15x + 9$

$4x^3 - 17x^2 + 12x + 9$

20.  $(6a - 2b)^2$

$(6a - 2b)(6a - 2b)$

$36a^2 - 12ab - 12ab + 4b^2$

$36a^2 - 24ab + 4b^2$

21.  $(x + 3)^2 - (2x - 1)(2x + 1)$

$(x + 3)(x + 3) - (2x - 1)(2x + 1)$

$x^2 + 3x + 3x + 9 - 4x^2 + 2x - 2x - 1$

$x^2 + 6x + 9 - 4x^2 - 1$

$-3x^2 + 6x + 10$

Solve the following:

$$22. \overbrace{(x+3)(x+5)} - \overbrace{(x+1)^2} = 2(x+1)$$

$$(x^2 + 5x + 3x + 15) - (x^2 + x + x + 1) = 2x + 2$$

$$x^2 + 8x + 15 - (x^2 + 2x + 1) = 2x + 2$$

$$\underline{x^2 + 8x + 15} - \underline{x^2 - 2x - 1} = 2x + 2$$

$$6x + 14 = 2x + 2$$

$$-2x \quad -14 \quad -2x \quad -14$$

$$\frac{4x}{4} = \frac{-12}{4}$$

$$\boxed{x = -3}$$

$$24. 8^{2x-3} = \left(\frac{1}{16}\right)^{x-2}$$

$$(2^3)^{2x-3} = (2^{-4})^{x-2}$$

$$2^{6x-9} = 2^{-4x+8}$$

$$6x - 9 = -4x + 8$$

$$+4x + 9 \quad +4x + 9$$

$$\frac{10x}{10} = \frac{17}{10}$$

$$\boxed{x = \frac{17}{10}}$$

$$23. 7^{x-12} \cdot 7^{x-8} = (7^{2x})^3$$

$$7^{2x-20} = 7^{6x}$$

$$2x - 20 = 6x$$

$$-2x \quad -20 = 4x$$

$$\frac{-20}{4} = \frac{4x}{4}$$

$$\boxed{x = -5}$$

$$25. 4^{3x} \cdot 4^{-x+3} = 1$$

$$4^{3x} \cdot 4^{-x+3} = 4^0$$

$$2x + 3 = 0$$

$$2x + 3 = 0$$

$$2x = -3$$

$$\boxed{x = -\frac{3}{2}}$$

$$26. \frac{9^{5x-3}}{9^{3x-2}} = 27^{x+4}$$

$$\frac{(3^2)^{5x-3}}{(3^2)^{3x-2}} = (3^3)^{x+4}$$

$$\frac{3^{10x-6}}{3^{6x-4}} = 3^{3x+12}$$

$$3^{4x-2} = 3^{3x+12}$$

$$4x - 2 = 3x + 12$$

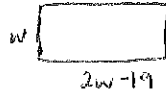
$$-3x + 2 \quad -3x + 2$$

$$\boxed{x = 14}$$

**Application Problems:**

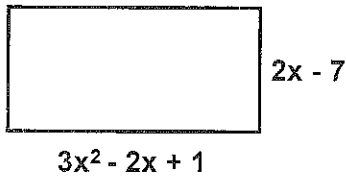
27. The length of a rectangular classroom floor is 19 feet less than twice the width. Write a polynomial for the area of the classroom.

$w = \text{width}$   
 $l = 2w - 19$



$w(2w - 19)$   
 $2w^2 - 19w$

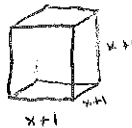
28. What is the area of the rectangle below? What is the perimeter?



Area  
 $(2x - 7)(3x^2 - 2x + 1)$   
 $6x^3 - 4x^2 + 2x - 21x^2 + 14x - 7$   
 $6x^3 - 25x^2 + 16x - 7$

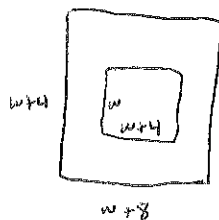
Perimeter  
 $(3x^2 - 2x + 1) + (2x - 7) + (2x - 7) + (3x^2 - 2x + 1)$   
 $6x^2 + -12$   
 $6x^2 - 12$

29. The side of a cube is represented by  $x + 1$ . What polynomial represents the volume of the cube?



$(x + 1)^3$   
 $(x + 1)(x + 1)(x + 1)$   
 $(x^2 + x + x + 1)(x + 1)$   
 $(x^2 + 2x + 1)(x + 1)$   
 $x^3 + x^2 + 2x^2 + 2x + x + 1$   
 $x^3 + 3x^2 + 3x + 1$

30. A picture is 4 inches longer than it is wide. It is surrounded by a frame that is 2 inches wide. The total area of the picture and frame is 112 square inches. Find the dimensions of the picture.



Big  $\square$  - Small  $\square$  =  $112 \text{ in}^2$   
 $(w + 4)(w + 8) - (w)(w + 4) = 112$   
 $w^2 + 8w + 4w + 32 - w^2 - 4w = 112$   
 $w^2 + 12w + 32 - (w^2 + 4w) = 112$

$w + 4 = (10) + 4$   
 $14$

$8w + 32 = 112$   
 $-32 \quad -32$   
 $8w = 80$   
 $w = 10$

$10 \text{ in} \times 14 \text{ in}$