## **Midterm Review: Exponents**

Parts of a power





### **Expanded Form and Evaluated Powers**

Power	Expanded Form	Evaluated
5 <sup>2</sup>	(5)(5)	25
$-3^{4}$	-(3)(3)(3)(3)	-81
(-3) <sup>4</sup>	(-3)(-3)(-3)(-3)	81
5x <sup>4</sup>	5(x)(x)(x)(x)	///////////////////////////////////////

### Like and Unlike Terms

For terms to be LIKE they must have the same base and the same exponent (the coefficient can be anything)

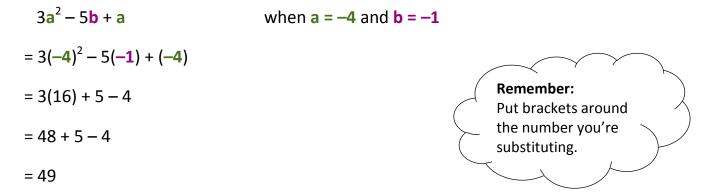
Examples:

Like terms:
$$5x^2$$
,  $\frac{1}{2}x^2$ ,  $-x^2$  and  $\pi x^2$  $x^2y$ ,  $yx^2$  and  $4x^2y$ Unlike terms:X and  $X^2$  $4x^2$  and  $4x^2y$  $5x^2y$  and  $5xy^2$ 

## Substituting

Replace the letters with the KNOWN values for the letters. Then, evaluate using correct order of operations.

Remember: put brackets around the number you're substituting.



### Exponent Laws:

Exponent laws only apply for exponents with the **SAME bases** 

## **Multiplication Rule**

ADD the exponents, MULTIPLY the coefficients, keep the bases the SAME

$(4x^2)(6x^3) = 24x^5$	$(x^{2})(x^{3}) = x^{5}$
$(4^{2})(4^{3}) = 4^{5}$	$(3x^4y)(5x^2y^6) = 15x^6y^7$

## **Division Rule**

SUBTRACT the exponents, DIVIDE the coefficients, keep the bases the SAME

$$\frac{12x^{7}}{3x^{2}} = 4x^{5}$$
$$\frac{x^{7}}{x^{2}} = x^{5}$$
$$\frac{4^{7}}{4^{2}} = 4^{5}$$
$$\frac{15x^{7}y^{5}}{5x y^{4}} = 3x^{6} y$$

## Power of a Power Rule

MULTIPLY the exponents, raise to the POWER for the coefficients, keep the bases the SAME

$(4x^2)^3 = 64x^6$	$(x^{2})^{3} = x^{6}$
$(4^2)^3 = 4^6$	$(3x^4y)^2 = 9x^8y^2$

## **Negative Exponents**

To make the exponent positive, take the **reciprocal**, then simplify

$$x^{-5} = \frac{1}{x^{5}}$$

$$3x^{-5} y^{2} = \frac{3y^{2}}{x^{5}}$$

$$(2x^{3}y^{4})^{-2} = \frac{1}{(2x^{3}y^{4})^{2}}$$

$$\frac{15x^{7}y^{5}}{5x y^{4}} = 3x^{6} y$$

## **Zero Exponents**

Anything to the power of 0 equals 1

$4x^0 = 4(1) = 4$	$(4xy^2)^0 = 1$
5x <sup>0</sup> y <sup>4</sup> = 5(1)y <sup>4</sup> = 5y <sup>4</sup>	$\frac{15x^7y^5}{(5xy^4)^0} = \frac{15x^7y^5}{1} = 15x^7y^5$

Combining the Exponent Laws Usually do brackets, then apply the power of a power rule, multiplication rule, and then the division rule – always follow proper order of operations. Use the negative exponents rule to make exponents positive.

$$\frac{[(4^{2})(4^{5})]^{3}(4)}{(4^{6})(4^{3})} = \frac{(4^{7})^{3}(4)}{4^{9}} = \frac{(4^{7})^{3}(4)}{4^{9}} = \frac{(15x^{3}y^{5})^{2}}{9x^{2}y^{16}} = \frac{(15x^{3}y^{5})^{2}}{9x^{2}y^{16}} = \frac{225x^{6}y^{10}}{9x^{2}y^{16}} = 25x^{4}y^{-6} = \frac{25x^{4}}{y^{6}}$$

## **Midterm Review: Polynomials**

## Simplifying

Add/subtract like terms only. You may collect like terms first (move the terms around so that the like ones are together).

Example #1:	4x - 5 + 3x - 1	
Collect like terms:	= 4x + 3x - 5 - 1	Remember: The sign in front of
Simplify:	= <b>7</b> x - 6	the term belongs to that term.
Example #2:	$-x^2 - 12x + 3y - 6xy - 3 - 5x^2 + 2xy$	
Collect like terms:	$= -x^2 - 5x^2 - 6xy + 2xy - 12x + 3y - 3$	
Simplify:	$=-6x^{2}-4xy-12x+3y-3$	

### **Distributive Property: Expanding**

Multiply the number outside of the brackets to ALL of the terms in the brackets.

$$-3(x^2 - 12x + 5)$$

$$= -3x^{2} + 36x - 15$$

You may need to apply the exponent laws:

$$-3x(x^2 - 12x + 5)$$

 $=-3x^{3}+36x^{2}-15x$ 

### **Expanding and Simplifying**

**Multiply** the number outside of the brackets **to ALL of the terms in the brackets**. Then, simplify by adding and subtracting any like terms.

$$3(4x + 7) + 5 - (4x - 9)$$
  
= 12x + 21 + 5 - 4x + 36  
= 12x - 4x + 21 + 5 + 36  
= 8x + 62

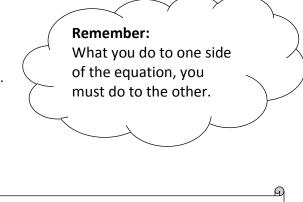
# **Midterm Review: Solving Equations**

Solving for an unknown

**Simplify** as much as you can first.

Using **opposite** operations, **isolate the variable** (Get x by itself).

4x + 3 = -x - 7 4x + x + 3 = -x + x - 7 5x + 3 = -7 5x + 3 - 3 = -7 - 3 5x = -10  $\frac{5x}{5} = \frac{-10}{5}$  x = -2



**Tip:** Keep equal signs lined up to stay organized

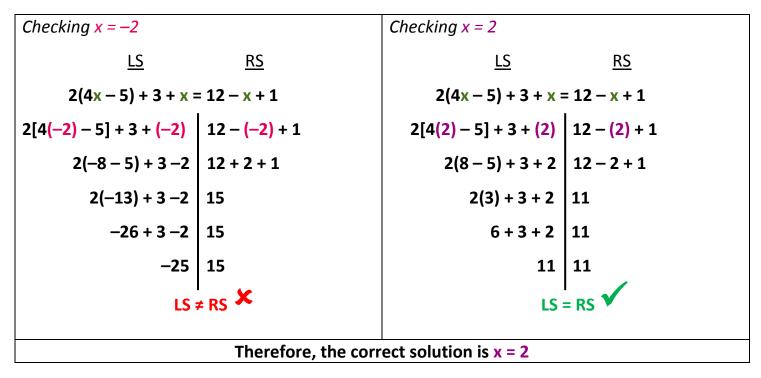
**Expand** first (distributive property) if needed, then continue solving.

3(- b + 7) - 5 = 9b + 12 - (4b + 8)	←Distribute (expand)	
- 3b + 21 - 5 = 9b + 12 - 4b - 8	←Simplify by adding/subtracting like terms	
-3b + 16 = 5b + 4		
<b>− 3b − 5b + 16 = 5b − 5b + 4</b>	$\leftarrow$ Decide which side you want your variable on	
-8b + 16 = 4		
-8b + 16 - 16 = 4 - 16	$\leftarrow$ Move numbers to the side opposite your variable	
-8b = -12		
$\frac{-8b}{-8} = \frac{-10}{-8}$ $b = \frac{5}{4} \text{ or } 1.25$	<b>Tip:</b> If the question doesn't specify, decimal answers can be rounded to two decimal points, or left as fractions in lowest terms	

#### **Checking your solution**

Without solving this equation, determine whether the correct solution is x = -2 or x = 2

## 2(4x-5) + 3 + x = 12 - x + 1



### **Rearranging Formulas**

Isolate the required variable using opposite operations, just like when solving equations.

Rearrange to isolate "t"  

$$P = \frac{E}{t}$$

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$$t(P) = \left(\frac{E}{t}\right)t$$

$$tP = E$$

$$\frac{tP}{P} = \frac{E}{P}$$

$$t = \frac{E}{p}$$

$$\frac{tP}{P} = \frac{E}{p}$$

$$\frac{y + 5}{3} = x^{2}$$

$$\frac{y + 5}{3} = \sqrt{x^{2}}$$

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## Option A: Clear fractions one at a time

Short way	Long way
3x - 2 - x + 4	3r - 2 - r + 4
$\frac{3x-2}{4} + 7 = \frac{-x+4}{5}$	$\frac{3x-2}{4} + 7 = \frac{-x+4}{5}$
$4\left(\frac{3x-2}{4}+7\right)=\left(\frac{-x+4}{5}\right)4$	$\frac{4}{1}\left(\frac{3x-2}{4}+7\right) = \left(\frac{-x+4}{5}\right)\frac{4}{1}$
$3x - 2 + 28 = \frac{-4x + 16}{5}$	$\frac{4(3x-2)}{1(4)} + 4(7) = \frac{4(-x+4)}{1(5)}$
$5(3x+26) = \left(\frac{-4x+16}{5}\right)5$	$\frac{3x-2}{1}+28=\frac{-4x+16}{5}$
15x + 130 = -4x + 16 $15x + 4x = 16 - 130$	$3x - 2 + 28 = \frac{-4x + 16}{5}$
19x = -114	$5(3x+26) = \left(\frac{-4x+16}{5}\right)\frac{5}{1}$
$\frac{19x}{19} = \frac{-114}{19}$	$5(3x+26) = \frac{5(-4x+16)}{1(5)}$
$x=\frac{-114}{19}$	$5(3x+26) = \frac{-4x+16}{1}$
	15x + 130 = -4x + 16
	15x + 4x = 16 - 130
	19x = -114
	$\frac{19x}{19} = \frac{-114}{19}$
	$x = \frac{-114}{19}$

Short way	Long way
$\frac{3x-2}{4} + 7 = \frac{-x+4}{5}$ $20\left(\frac{3x-2}{4} + 7\right) = \left(\frac{-x+4}{5}\right)20$ $5(3x-2) + 140 = 4(-x+4)$	$\frac{3x-2}{4} + 7 = \frac{-x+4}{5}$ $\frac{20}{1} \left(\frac{3x-2}{4} + 7\right) = \left(\frac{-x+4}{5}\right) \frac{20}{1}$ $\frac{20(3x-2)}{1(4)} + 140 = \frac{20(-x+4)}{1(5)}$
15x - 10 + 140 = -4x + 16 $15x + 130 = -4x + 16$ $15x + 4x = 16 - 130$ $19x = -114$	$1(4)  1(5)$ $\frac{20(3x-2)}{4} + 140 = \frac{20(-x+4)}{5}$ $5(3x-2) + 140 = 4(-x+4)$ $15x - 10 + 140 = -4x + 16$
$\frac{19x}{19} = \frac{-114}{19}$ $x = \frac{-114}{19}$	15x - 10 + 140 = -4x + 10 $15x + 130 = -4x + 16$ $15x + 4x = 16 - 130$ $19x = -114$
	$\frac{19x}{19} = \frac{-114}{19}$ $x = \frac{-114}{19}$

Option B: Clear all fractions at the same time (by finding the lowest common denominator)