Name: ____ **Unit 7 Class Work**

EXPONENTS & POWER PROPERTIES!

Directions: **Each problem in this table uses a property of exponents. You will encounter these properties often!**
Simplify as many of the examples as you can, and try to write a general rule and reason for each before we review them together!

Multiplication Property	**"Power to a Power" Property**
Example: $(x^2)(x^4)$ $(x\cdot x)\cdot(x\cdot x\cdot x\cdot x) = x^6$ "If multiplying same bases, add exponents" Generalization: $x^m * x^n = x^{m+n}$	Example: $(3xy^2)^3$ $3xy^2\cdot 3xy^2\cdot 3xy^2 = 27x^3y^6$ "When the power is applied to a monomial, multiply in exponents" Generalization: $(x^m)^n = x^{mn}$
"Fraction to a Power" Property	**Division Property**
Example: $\left(\frac{x}{7}\right)^2$ $\frac{x}{7}\cdot\frac{x}{7} = \frac{x^2}{49}$ "When the power is applied to a fraction, apply it to both parts" Generalization: $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$	Example: $\frac{r^7}{r^4}$ $= \frac{r\cdot r\cdot r\cdot r\cdot r\cdot r\cdot r}{r\cdot r\cdot r\cdot r} = r^3$ "If dividing same bases, subtract exponents" Generalization: $\frac{x^m}{x^n} = x^{m-n}$

Zero Power Property & Negative Power Properties

$3^4 = 81$ $3^3 = 27$ $3^2 = 9$ $3^1 = 3$ (÷3 each step)

***Pause!** Do you notice any patterns?! divides by 3

Based on the pattern you noticed, try to complete the following:

$3^0 = 1$ $3^{-1} = 1/3$ $3^{-2} = 1/9$ (÷3 each step)

Zero Power Property	**Negative Power Property**
"When the power is zero, it evaluates to 1." Generalization: $x^0 = 1$	"When the power is negative, take reciprocal; make it pos." Generalization: $x^{-m} = 1/x^m$

1. $(c^{1/2}d^3)^{1/4}$ — multiply: $c^{1/2\cdot 1/4}d^{3\cdot 1/4} = c^{1/8}d^{3/4}$

2. $s^{-2}t^{-3}p^5s^{-3}t$ — add: $= s^{-5}t^{-2}p^5 = \frac{p^5}{s^5t^2}$

3. $\frac{k^{-7}k^3}{R^{-2}}$ $= \frac{k^{-4}}{R^{-2}} = \frac{R^2}{k^4}$

4. $\left(\frac{b^{1/4}}{b^{1/2}}\right)^{-1}$ $= \frac{b^{-1/4}}{b^{-1/2}} = b^{\frac{1}{4}}$; $-\frac{1}{4}-\frac{1}{2}$, $-\frac{1}{4}+\frac{1}{2}=\frac{1}{4}$; or $\frac{b^{1/2}}{b^{1/4}} = b^{1/4}$, $\frac{1}{2}-\frac{1}{4}=\frac{2}{4}-\frac{1}{4}=\frac{1}{4}$

5. $(4y)^{2}\cdot y^{1/2}$ — $16y^2y^{1/2} = 16y^{5/2}$; $\frac{2}{1}+\frac{1}{2}$, $\frac{4}{2}+\frac{1}{2}=\frac{5}{2}$

6. $\frac{(2x^2y^2)(3xy)^2}{6x^3y^2}$ — $\frac{(2x^2y^2)(9x^2y^2)}{6x^3y^2} = \frac{18x^4y^4}{6x^3y^2} = 3xy^2$

7. $\frac{4^{-3}a^{3/4}b^{-2}a^{7/8}}{b^{-7}}$ — $\frac{a^{13/8}b^{-2}b^7}{64} = \frac{a^{13/8}b^5}{64}$

8. $\frac{6a^{-2}(bc)^3}{b^{-5}(5xc)^0}$ $= \frac{6a^{-2}b^3c^3}{b^{-5}} = \frac{6b^8c^3}{a^2}$

9. $\left(\frac{x^{1/2}y^{1/4}}{x y^{1/2}}\right)^{-2}$ $= \frac{y}{xy^{1/2}} = \frac{y^{1/2}}{x}$; $\frac{1}{4}\cdot\frac{-2}{1} = \frac{-2}{4} = \frac{-1}{2}$

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EXPONENTS & POWER PROPERTIES!

Directions: **Each problem in this table uses a property of exponents. You will encounter these properties often!**
Simplify as many of the examples as you can, and try to write a general rule and reason for each before we review them together!

Multiplication Property	**"Power to a Power" Property**
Example: $(x^2)(x^4)$	Example: $(3xy^2)^3$
"If multiplying same bases, ______________________"	"When the power is applied to a monomial, ______________________"
Generalization: $x^m * x^n =$ __________	Generalization: $(x^m)^n =$ __________
"Fraction to a Power" Property	**Division Property**
Example: $\left(\frac{x}{7}\right)^2$	Example: $\frac{r^7}{r^4}$
"When the power is applied to a fraction, ______________________"	"If dividing same bases, ______________________"
Generalization: $\left(\frac{x}{y}\right)^m =$ __________	Generalization: $\frac{x^m}{x^n} =$ __________

Zero Power Property & Negative Power Properties

$3^4 =$ ____ $3^3 =$ ____ $3^2 =$ ____ $3^1 =$ ____ ***Pause!*** Do you notice any patterns?!

Based on the pattern you noticed, try to complete the following:

$3^0 =$ ____ $3^{-1} =$ ____ $3^{-2} =$ ____

Zero Power Property	**Negative Power Property**
"When the power is zero, ______________________."	"When the power is negative, ______________________."
Generalization: $x^0 =$ _____	Generalization: $x^{-m} =$ _____

1. $(c^{1/2}d^3)^{1/4}$

2. $s^{-2}t^{-3}p^5s^{-3}t$

3. $\frac{K^{-1}K^3}{R^{-2}}$

4. $\left(\frac{b^{1/4}}{b^{1/2}}\right)^{-1}$

5. $(4y)^2 \cdot y^{1/2}$

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

7. $\frac{4^{-3} \cdot a^{3/4}b^{-2}a^{7/8}}{b^{-7}}$

8. $\frac{6a^{-2}(bc)^3}{b^{-5}(5xc)^0}$

9. $\left(\frac{x^{1/2}y^{1/4}}{x^0y^{1/2}}\right)^{-2}$

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RADICAL POWER RELATIONSHIPS!

$\sqrt{25} =$ ...but we want to write this radical using only powers

We can write "25" using powers as ________

Now (____)$^{\text{what power?!}}$ Would give us the same result as $\sqrt{25}$?

*LET'S TRY THIS AGAIN WITH $\sqrt{49}$

*LET'S TRY AGAIN WITH $\sqrt[3]{8}$

GENERAL RULE: $\sqrt[n]{x^m} =$	**EXAMPLE A:** $\sqrt{36x^8y^{40}}$	**EXAMPLE B:** $\sqrt[4]{16^5}$
	EXAMPLE C: $\sqrt[3]{8y^2}$	**EXAMPLE D:** $\sqrt{\sqrt[3]{(m+n)^2}}$

PRACTICE! REWRITE EACH IN EXPONENTIAL FORM. (NO RADICALS, BUT FRACTIONAL EXPONENTS ARE OKAY!)

1. $\sqrt[3]{64b^3c^{90}}$
2. $\sqrt[4]{16x^3}$
3. $\sqrt[3]{27^4}$
4. $\sqrt{\sqrt[5]{(x-y)^4}}$
5. $\sqrt[5]{32^3}$
6. $\sqrt{\sqrt[4]{(p+q)}}$

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GENERAL RULE: $x^{m/n} =$	**EXAMPLE E:** $125^{\frac{2}{3}}$	**EXAMPLE F:** $(8p^{12}q^7)^{2/3}$
	EXAMPLE G: $2^{-\frac{2}{5}}$	**EXAMPLE H:** $\left((b^3c^5)^{\frac{2}{3}}\right)^{-1/2}$

PRACTICE! SIMPLIFY EXPRESSION USING RADICALS AS MUCH AS POSSIBLE. (NO FRACTIONAL EXPONENTS IN FINAL ANSWERS)

7. $8^{-\frac{2}{3}}$
8. $4^{1/2} * 64^{2/3}$
9. $x^{2/7} * y^{-1/2} * (z^{13})^{1/5}$
10. $100^{\frac{3}{2}}$
11. $(-64y^{12})^{\frac{5}{3}}$
12. $\dfrac{(8z)}{(8z)^{\frac{3}{2}}}$

13. $(27b^6c^{11})^{2/3}$

14. $t^{-\frac{9}{8}} * t^{\frac{1}{4}}$

15. $(32q^{20}r^{23}s^{13})^{2/5}$

16. $\left(\frac{2w^{\frac{3}{4}}y^{\frac{1}{2}}}{w^{\frac{1}{2}}}\right)^{-2}$

17. $(16g^{15}h^3)^{\frac{1}{4}}$

18. $\left(\frac{27r^3s}{r^6s^{\frac{1}{5}}}\right)^{-1/3}$

WRITE ANY IMPORTANT HINTS, TIPS, REMINDERS, ETC. FOR CONVERTING BETWEEN RADICAL AND EXPONENTIAL FORM BELOW ☺