Name: _____ Per: _____

Simplifying Exponents

Exponents are relatively simple to deal with, assuming that you know the rules. Here are a few of them:

1) **If your exponent is 0, then the base (the number or variable that has an exponent on it) becomes 1.**
   (example: $4{,}719^0 = 1$)
2) **If your exponent is 1, then the exponent disappears, and you're left with the base as is.**
   (example: $329^1 = 329$)

Example		Your Turn	Still Your Turn
$4^0 = 1$	*Any number to the power of 0 = 1.*	1. 7^0	2. 9^0
$a^0 = 1$	*Any number to the power of 0 = 1.*	3. g^0	4. h^0
$5^1 = 5$	*Any number to the power of 1 = base number.*	5. 3^1	6. 18^1
$r^1 = r$	*Any number to the power of 1 = base number.*	7. b^1	8. q^1
$\frac{a^0b^1c^1d^1}{b^1d^0} = \frac{(1)bcd}{b(1)}$ $= \frac{bcd}{b}$ $= cd$	*Start with numbers to exponent of 0- those become 1.* *^{x}b cancels ÷b*	9. $\frac{p^1r^0t^1}{t^1y^0}$	10. $\frac{s^0w^1e^1}{e^1t^0}$

3) **If your exponent is negative, then the base flips from the top to the bottom of a fraction or from the bottom to the top. The exponent becomes positive and moves with its base.**

(examples: $6^{-3} = \frac{1}{6^{+3}}$ or $\frac{1}{7^{-2}} = 7^2$)

Tip: *Before you deal with any other part of the exponent problem, getting rid of the negative by flipping the base.*

$4^{-1} = \frac{1}{4^1} = \frac{1}{4}$	*The negative exponent flips the base (4^1) from the top to the bottom. $4^1 = 4$*	11. 3^{-1}	12. 8^{-1}
$\frac{1}{5^{-1}} = 5^1 = 5$	*The negative exponent flips the base (5^1) from the bottom to the top. $5^1 = 5$*	13. $\frac{1}{9^{-1}}$	14. $\frac{1}{6^{-1}}$
$2^{-2} = \frac{1}{2^2} = \frac{1}{4}$	*The negative exponent flips the base (2^2) from the top to the bottom. $2^2 = 4$*	15. 5^{-3}	16. 3^{-5}
$a^{-5} = \frac{1}{a^5}$	*The negative exponent flips the base (a^5) from the top to the bottom.*	17. c^{-8}	18. x^{-20}
$\frac{1}{a^4p^{-2}} = \frac{p^2}{a^4}$	*The negative exponent flips the base (p^2) from the bottom to the top.*	19. $\frac{1}{s^{-9}t^2}$	20. $\frac{1}{q^{-7}r^3}$
$\frac{a^{-4}}{b^{-2}c^3} = \frac{b^2}{a^4c^3}$	*The negative exponent flips the top base (a^4) from the top to the bottom, and the bottom base (b^2) from the bottom to the top.*	21. $\frac{m^{-2}}{r^3s^{-5}}$	22. $\frac{x^5y^{-2}}{z^8}$

Name: _____ Per: _____

4) **If you have bases with exponents being <u>multiplied</u> together, <u>and the bases are the same</u>, then you leave the base as it is and add the exponents.**
(example: $5^7 5^3 = 5^{7+3}$)

5) **If you have bases with exponents being <u>divided</u>, <u>and the bases are the same</u>, then subtract the exponents (bigger – smaller) and leave the base (with its new exponent) where the bigger exponent started.**
(examples: $\frac{4^2}{4^5} = \frac{1}{4^{5-2}}$ or $\frac{9^7}{9^6} = \frac{9^{7-6}}{1}$)

6) **If you have an exponent on the outside of a set of parentheses, then you share that exponent with every base in the parentheses. To do this, you multiply each exponent inside by the shared exponent. Don't forget, though: just because you don't see an exponent doesn't mean it isn't there. The invisible exponent is always 1.**

add exponents	$4^2 4^3 = 4^{2+3}$ $= 4^5$ $= 4 \times 4 \times 4 \times 4 \times 4$ $= 16 \times 16 \times 4$ $= 256 \times 4$ $= 1024$	23. $9^2 9^1$	24. $2^3 2^2$
	$b^2 b^{19} c^3 = b^{2+19} c^3$ $= b^{21} c^3$	25. $d^2 a^3 d^8$	26. $h^3 p^2 h^3 t$
subtract exponents	$\frac{x^2 y^5}{xz^5} = \frac{xy^5}{z^5}$	27. $\frac{a^3 b^7}{b^5 c^2}$	28. $\frac{g^2 h^5}{fh^3}$
multiply exponents	$(a^3 b^2)^5 = a^{3(5)} b^{2(5)}$ $= a^{15} b^{10}$	29. $(x^2 y^4)^8$	30. $(m^7 n^2 p^4)^3$
multiply exponents	$\left(\frac{a^3 d}{b^2 d^2}\right)^7 = \left(\frac{a^3}{b^2 d}\right)^7$ $= \frac{a^{3(7)}}{b^{2(7)} d^{1(7)}}$ $= \frac{a^{21}}{b^{14} d^7}$	31. $\left(\frac{x^3 y^5 z^2}{xy^3 z^4}\right)^3$	32. $\left(\frac{m^2 n^7 p^3}{n^5 p^4}\right)^4$

Now, you are going to apply everything we've just learned, on your own.
Tip: *Deal with negative exponents first, then with exponents of 0 or 1. Next, simplify inside the parentheses before dealing with the outside exponent.*

33. $\left(\frac{a^0 b^5 b^2 c^1}{b^6 d^{-3}}\right)^2$	34. $\left(\frac{x^3 y^{-5}}{x^{-2} y}\right)^2$	35. $\left(\frac{p^0 r^{-2} s^5 s^6}{s^3}\right)^2$
36. $(a^4 b^{-3} c^2 a^5 d^0)^3$	37. $(m^3 n^2 p^3 m^5)^0$	38. $(x^6 x^{-2} y^5 z^1 y^0)^5$