Unit 6
Day 1

Key

The Laws of Exponents

Warm It Up!

$2^2 = 4$
$2^4 = 16$
$2^5 = 32$
$3^2 = 9$
$3^3 = 27$
$3^4 = 81$
$4^3 = 64$

HOLD UP! Do you know the difference?!?!

$x + x = 2x$ $\qquad$ $x \cdot x = x^2$
$x + x + x = 3x$ $\qquad$ $x \cdot x \cdot x = x^3$
$x + x + x + x + x = 5x$ $\qquad$ $x \cdot x \cdot x \cdot x \cdot x = x^5$

So what is an EXPONENT?? repeated multiplication

RULE 1:

Expression to be Simplified	Work it Out!	End Result
$7^2 \cdot 7^3$	$(7 \cdot 7) \cdot (7 \cdot 7 \cdot 7)$	7^5
$(-4)^2 \cdot (-4)^3$	$(-4)(-4) \cdot (-4)(-4)(-4)$	$(-4)^5$
$\bigstar^2 \cdot \bigstar^5$	$(\bigstar \cdot \bigstar) \cdot (\bigstar \cdot \bigstar \cdot \bigstar \cdot \bigstar \cdot \bigstar)$	$\bigstar^7$
$(\Delta)^7 \cdot (\Delta)^2$	$(\Delta \cdot \Delta \cdot \Delta \cdot \Delta \cdot \Delta \cdot \Delta \cdot \Delta) \cdot (\Delta \cdot \Delta)$	Δ^9
$x^5 \cdot x^3$	$(x \cdot x \cdot x \cdot x \cdot x) \cdot (x \cdot x \cdot x)$	x^8
$x^m \cdot x^n$	⟶	**RULE** x^{m+n}

CHECKPOINT! Does this rule work for $5^2 \cdot 4^3$? Explain. no! need COMMON BASES $5 \neq 4$

RULE 2:

Expression to be Simplified	Work it Out!	End Result
$(7^2)^3$	$7^2 \cdot 7^2 \cdot 7^2 = 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$	7^6
$(4^3)^4$	$4^3 \cdot 4^3 \cdot 4^3 \cdot 4^3 = (4 \cdot 4 \cdot 4) \cdot (4 \cdot 4 \cdot 4) \cdot (4 \cdot 4 \cdot 4) \cdot (4 \cdot 4 \cdot 4)$	4^{12}
$(5^4)^5$	$5^4 \cdot 5^4 \cdot 5^4 \cdot 5^4 \cdot 5^4 = 5 \cdot 5 \cdot 5 \cdot 5 \bullet 5 \cdot 5 \cdot 5 \cdot 5 \bullet 5 \cdot 5 \cdot 5 \cdot 5 \bullet 5 \cdot 5 \cdot 5 \cdot 5 \bullet 5 \cdot 5 \cdot 5 \cdot 5$	5^{20}
$(\pi^2)^5$	$\pi^2 \cdot \pi^2 \cdot \pi^2 \cdot \pi^2 \cdot \pi^2 = \pi \cdot \pi \cdot \pi \cdot \pi \cdot \pi \cdot \pi \cdot \pi \cdot \pi \cdot \pi \cdot \pi$	π^{10}
$(\$^3)^3$	$\$^3 \bullet \$^3 \bullet \$^3 = \$\$\$ \bullet \$\$\$ \bullet \$\$\$$	$\$^9$
$(x^m)^n$	⟶	**RULE** x^{mn}

CHECKPOINT! Does this rule for $(3^2)^5$? Explain. If so, what do you get as the end result? yes! 3^{10}

RULE 3

Expression to be Simplified	Work it Out!	End Result
$(7ab)^3$	$7ab \cdot 7ab \cdot 7ab$	$7^3a^3b^3$
$(2\cdot3)^4$	$(2\cdot3)\cdot(2\cdot3)\cdot(2\cdot3)\cdot(2\cdot3)$	$2^4\cdot3^4$
$(4suv)^3$	$4suv \cdot 4suv \cdot 4suv$	$4^3s^3u^3v^3$
$(-5p)^2$	$(-5p)\cdot(-5p)$	$(-5)^2p^2$
$(6kw)^4$	$6kw \cdot 6kw \cdot 6kw \cdot 6kw$	$6^4k^4w^4$
$(x\cdot y)^n$	⟶	**RULE** $x^n y^n$

CHECKPOINT! Does this rule for $(2\cdot13)^3$? Explain. If so, what do you get as the end result? yes! $2^3\cdot13^{13}$

Let's Summarize Together!!

$a^m \bullet a^n =$ a^{m+n} $\quad (a^m)^n =$ a^{mn} $\quad (ab)^n =$ $a^n b^n$

Negative #'s rule: $(-\#)^{even} =$ # $\quad (-\#)^{Odd} =$ $-\#$

Practice Makes Perfect! Using the rules you discovered, simplify the following exponent expressions:

1. $x^4 \cdot x^4 = x^8$

2. $(x^4)^4 = x^{16}$

3. $(-6y^4)^2 = (-6)^2y^8$ *most of these could be simplified further w/ a calc :)

4. $2^24^2\cdot2^34^8 = 2^54^{10}$

5. $3(x^5)^6 = 3^6x^{30}$

6. $(2\heartsuit^2c^5)^7 = 2^7\heartsuit^{14}c^{35}$

7. $(3^4)^3\cdot3^9 = 3^{12}\cdot3^9$ $\quad 3^{21}$

8. $(\odot^2)(\odot)^7 =$ $\odot^9$

9. $(2x^4)^4(2x^2)^2 = 2^4x^{16}\cdot2^2x^4$ $\quad 2^6x^{20}$

10. $(-5)^4(-5)^6 = (-5)^{10}$ $\quad = 5^{10}$

11. $(-5^4)^7 = (-5)^{28}$ $\quad = 5^{28}$

12. $(4\boxtimes^3\odot^2)^5 = 4^5\boxtimes^{15}\odot^{10}$