Before we begin, are there any questions from last day's work?

pp. 360-363 #1ace, 2ace, 3ace, 4ace, 5ace, 6, 17

Today's Learning Goal(s):

Students will…

a) understand and follow the division pattern that leads to an exponent of zero, and then negative exponents.

b) simplify expressions using the laws of exponents.

What rules did we learn during the ZOMBIE APOCALYPSE activity?

Can you give an example?

$3^2 \times 3^4$

$= 3^{2+4}$

$= 3^6$

$4^{10} \div 4^2$

$= 4^{10-2}$

$= 4^8$

$(5^2)^3$

$= 5^{2\times 3}$

$= 5^6$

Warm-up

Evaluate each Power: (Be Careful!!)

a) 5^2 b) $(-3)^2$ c) -3^2 d) $\left(\frac{-3}{4}\right)^2$

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

$= 25$ $= 9$ $= -9$ $= \left(\frac{-3}{4}\right)\left(\frac{-3}{4}\right)$

$= \frac{9}{16}$ $= \frac{9}{16}$

e) $(-3)^3$ f) $(-3)^4$ g) $(-3)^5$ h) $\left(\frac{-2}{3}\right)^3$

$= (-3)(-3)(-3)$ $= (-3)(-3)(-3)(-3)$ $= (-3)(-3)(-3)(-3)(-3)$ $= \frac{(-2)^3}{(3)^3}$

$= -27$ $= +81$ $= -243$ $= \frac{-8}{27}$

i) $(-1)^{30}$ j) $(-1)^{273}$

$= +1$ $= -1$

MBF 3CI 7.2 Zero and Negative Exponents Date: May 11/17

What is the pattern?

$2^5 = 32$
$2^4 = 16$
$2^3 = 8$
$2^2 = 4$
$2^1 = 2$

Now, continue the pattern:

$2^0 = 1$
$2^{-1} = \frac{1}{2}$
$2^{-2} = \frac{1}{4}$
$2^{-3} = \frac{1}{8} = \frac{1}{2^3}$

What is the pattern?

$3^5 = 243$
$3^4 = 81$
$3^3 = 27$
$3^2 = 9$
$3^1 = 3$

Now, continue the pattern:

$3^0 = 1$
$3^{-1} = \frac{1}{3} = \frac{1}{3^1}$
$3^{-2} = \frac{1}{9} = \frac{1}{3^2}$
$3^{-3} = \frac{1}{27} = \frac{1}{3^3}$

Conclusion 1:
Any base raised to an exponent of zero equals 1 (one)

Ex. 1 **Simplify.**

a) $(476)^0$ b) $(-32)^0$ c) $(10xy^5 \div 2y^3)^0$

$= 1$ $= 1$ $= 1$

Conclusion 2:
Any based raised to a negative exponent is equal to the reciprocal of the base raised to a positive exponent.

Ex. 2 **Express with a positive exponent.**

a) $\left(\frac{5}{7}\right)^{-2}$ b) 3^{-1} c) $\left(\frac{2}{3}\right)^{-2}$ d) $(-2)^{-3}$ e) $\frac{1}{4^{-2}}$

$= \left(\frac{7}{5}\right)^2$ $= \left(\frac{1}{3}\right)^1$ $= \left(\frac{3}{2}\right)^2$ $= \left(\frac{1}{-2}\right)^3$ $= 4^2$ $= \left(\frac{1}{4}\right)^{-2} = \left(\frac{4}{1}\right)^2 = 4^2$

Summary

a^0	a^{-m}	$\frac{1}{a^{-m}}$
$=1$	$=\left(\frac{1}{a}\right)^m$	$=a^m$

Ex.3 Rewrite as a single power (which means simplify), then evaluate. Express your answers as fractions.

a) $4^3 \times 4^{-5}$

$= 4^{3+(-5)}$

$= 4^{-2}$

$= \left(\frac{1}{4}\right)^2$

$= \frac{(1)^2}{(4)^2}$

$= \frac{1}{16}$

b) $\frac{3^0(-2)^2}{(-2)^{-5}}$

$= 1(-2)^{2-(-5)}$

$= 1(-2)^{2+5}$

$= (-2)^7$

$= -128$

c) $\frac{\left(3^{-2}\right)^3}{(3)^{-1}}$

$= 3^{-2\times 3} \div 3^{-1}$

$= 3^{-6} \div 3^{-1}$

$= 3^{-6-(-1)}$

$= 3^{-6+1}$

$= 3^{-5}$

$= \left(\frac{1}{3}\right)^5$

$= \frac{1}{3^5}$

$= \frac{1}{243}$

Entertainment: pp. 368-371 #2ace, 3ace, 7ace, 8acegik, 12, 17a

p.368 2a) $5^2, 5^{-2}$

$= 25$ $= \left(\frac{1}{5}\right)^2$

$= \frac{1}{25}$