

## Exponents Test 2 Study Guide

### Exponential Form and Simplifying Powers

- What is the base? →  $a$
- What is the exponent? →  $3$
- What is the coefficient? →  $x$
- Simplify  $-2^4 = -2 \cdot 2 \cdot 2 \cdot 2$
- Simplify  $3^2 u^6 = 3 \cdot 3 \cdot u \cdot u \cdot u \cdot u \cdot u \cdot u = 9u^6$

### Evaluating Expressions

- Find  $x - y(z \cdot y^z)$  for  $x = 20, y = 4, z = 2$   $20 - 4(2 \cdot 4^2) = 20 - 4(2 \cdot 16) = 20 - 4(32) = 20 - 128 = -108$
- Find  $x \div y^z$  for  $x = 9, y = 3, z = 2$   $9 \div 3^2 = 9 \div 9 = 1$

### Zero and Negative Exponents

- Any number raised to the zero power always equals:  $1$
- $(-5)^0 = 1$
- $-3^0 = -1$
- $3b^0 = 3$
- Simplest form only has (circle one Positive or Negative?) exponents.
- For any nonzero number  $a$  and integer  $n$ ,  $a^{-n} = \frac{1}{a^n}$  ✓
- $a^{-2} b^4 = \frac{b^4}{a^2}$
- $\frac{a^3 b^{-1}}{d^{-4}} = \frac{a^3 d^4}{b}$
- Additional negative exponent practice - click [HERE](#)
- Additional zero and negative exponent help and practice problems - click [HERE](#)

### Multiplying and Dividing Powers

- Multiplying powers with the same base → add the exponents
- Dividing powers with the same base → subtract the exponents
- $5^4 \cdot 5^3 = 5^7$
- $5hy^{-3} 7h^{-5} y^3 = 35h^{-4} y^0 = \frac{35}{h^4}$
- $\frac{6^9}{6^4} = 6^5$
- $\frac{4d^{-2} g^5}{2d^6 g^{-4}} = 2d^{-8} g^9 = \frac{2g^9}{d^8}$

### Power of a Power

- Power to a power you multiply the exponents
- $(9^4)^5 = 9^{20}$
- $(3m^4)^3 = 27m^{12}$
- $(\frac{3a^{-2}}{4b^2})^{-3} = \frac{3^{-3} a^6}{4^{-3} b^{-6}} = \frac{4^3 a^6 b^6}{3^3} = \frac{64a^6 b^6}{27}$

### Transforming Exponential Functions

- Basic Exponential Function:  $y = ab^x$
- Transformations:  $y = ab^{c(x-h)}+k$
- What happens if  $a$  is negative? Reflect over the  $x$ -axis
- What happens if  $k$  is positive? What if it is negative?  $+k$  moves up,  $-k$  moves down
- What happens if  $|a| > 1$ ? What if  $|a| < 1$ ?  $|a| > 1$  vertical stretch,  $|a| < 1$  vertical shrink
- What happens if  $h$  is added? What if it is subtracted?  $+h$  shift left,  $-h$  shift right
- What happens if  $c$  is negative? Reflect over the  $y$ -axis
- What happens if  $|b| < 1$ ? exponential decay
- What happens if  $|c| > 1$ ? What if  $|c| < 1$ ?  $|c| > 1$  horizontal shrink,  $|c| < 1$  horizontal stretch
- If  $y = 2^x$  is the parent function, how will  $y = -2^x - 2$  compare? (What translations will you need to do? Be sure to put them in order!) Flip over  $x$ -axis, Shift down 2
- Practice transforming exponential functions - click [HERE](#)

### Exponential Growth and Decay

- When  $y = ab^x$  and  $b > 1$ , the equation represents Exponential Growth or Exponential Decay)
- When  $y = ab^x$  and  $b < 1$ , the equation represents (Exponential Growth or Exponential Decay)
- Does  $y = 2(\frac{1}{3})^x$  represent growth or decay? What is the (growth/decay) factor? What is the rate of (growth/decay)?  
Decay Factor:  $\frac{1}{3}$
- Compound Interest Formula:  $A = A_0(\frac{1}{2})^{t/n}$  switch Rate of Decay: 60%
- Half-Life Formula:  $A = P(1 + \frac{k}{n})^{nt}$
- Compound Interest Practice - click [HERE](#)
- Half-Life Practice - click [HERE](#)

### Scientific Notation

- A number written is in scientific notation if it is in the form  $c \times 10^n$  where  $c$  is  $1 \leq |c| < 10$  and  $n$  is a(n) integer.
- Is  $.32 \times 10^3$  written in scientific notation? NO!
- In order to add or subtract numbers in scientific notation, the exponents must be the same.
- In order to multiply or divide numbers in scientific notation, you use the commutative property and the associative property to group the decimal part and apply exponent rules.
- Practice converting between scientific notation and standard form - click [HERE](#)
- Practice multiplying and dividing scientific notation - click [HERE](#)
- Practice adding and subtracting scientific notation - click [HERE](#)