

Warm Up

A population of two headed turtles has a decay factor of 0.82 each year. If there are 74 turtles remaining after 5 years, how many did we start with?

Basic Equation: $y = ab^x$
initial amount factor



$$74 = a(0.82)^5$$
$$\frac{74}{0.82^5} = \frac{a(0.82)^5}{0.82^5}$$
$$200 = a$$

| x | y |
|---|----------|
| 0 | |
| 1 | |
| 2 | |
| 3 | ↪ ÷ 0.82 |
| 4 | ↪ ÷ 0.82 |
| 5 | 74 |

It is much more efficient to use an equation than to count back on a table.

What is the decay rate?

18%

Write the equation that relates the turtle population to the number of years.

$$y = 200(0.82)^x$$

Growth and Decay Unit Test Topics

- Create a table and a graph of an exponential growth or decay relationship given a description or equation
- Write an exponential growth or decay equation given text, a graph, table, or two points
- Write numbers in scientific notation and standard form
- Write an exponential equation with a y-intercept other than 1
- Write the equation of a linear or exponential relationship given text, a table, graph, ~~or equation~~
- Identify whether a table is linear, exponential, or neither and write the equation
- Estimate when an exponential relationship will reach a certain number
- Calculate a growth or decay factor from text, a table, graph, or two points

Homework Questions?

$$(4uv)(-1u)(2u^4v) = -8u^6v^2$$

Part B

When a number is raised to a power and then raised to a power again, the result follows a consistent pattern. Copy and complete the table below in your notebook. Expand each expression into factored form and then rewrite it with new exponents as shown in the example.

| Original Form | Factored Form | Simplified Exponent Form |
|---------------|---|--------------------------|
| $(5^2)^5$ | $(5 \cdot 5)(5 \cdot 5)(5 \cdot 5)(5 \cdot 5)(5 \cdot 5)$ | 5^{10} |
| $(2^2)^4$ | | |
| $(3^7)^2$ | | |
| $(x^3)^5$ | | |
| $(x^3y^2)^2$ | | |

1. Work with your group to describe the pattern between the exponents in the original form and the exponent(s) in the simplified exponent form. **Write a statement to describe the relationship you see.**

2. Visualize $(20^{12})^8$ written in factored form.

- What is multiplied (what is the base)? 20
 - How many times is it multiplied? 96
 - Use the expression you visualized to help you rewrite the expression in simplified exponent form.
 - Describe in detail how you figured out what exponent to use in the simplified exponent form.
- e. In Part A, #2 you visualized the factored form of the expression $20^{12} \cdot 20^8$. Compare the **factored** form of that expression to the **factored** form of $(20^{12})^8$ from above. How are the two expressions different?

$$20^{12} \cdot 20^8 \stackrel{?}{=} (20^{12})^8$$

$$20^{20} \stackrel{?}{=} 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12}$$

$$20^{20} \neq 20^{96}$$

$$(x^2)^3 = x^6$$

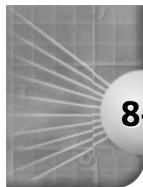
$$(xy^2)^4 = x^4 y^8$$

$$(2x^3y)^3 = 8x^9 y^3$$

$$(x^2)^5 \cdot (x^3) = x^{10} \cdot x^3 = x^{13}$$

$$(4x^2b)^2 = 16x^4 b^2 = 16b^2 x^4$$

$$(-3ab^4)^3 = -27a^3 b^{12}$$

**8-1 Study Guide and Intervention** *(continued)***Multiplying Monomials**

Powers of Monomials An expression of the form $(x^m)^n$ is called a **power of a power** and represents the product you obtain when x^m is used as a factor n times. To find the power of a power, multiply exponents.

| | |
|---------------------------|--|
| Power of a Power | For any number a and all integers m and n , $(a^m)^n = a^{mn}$. |
| Power of a Product | For any number a and all integers m and n , $(ab)^m = a^m b^m$. |

Example Simplify $(-2ab^2)^3(a^2)^4$.

$$\begin{aligned}
 (-2ab^2)^3(a^2)^4 &= (-2ab^2)^3(a^8) && \text{Power of a Power} \\
 &= (-2)^3(a^3)(b^2)^3(a^8) && \text{Power of a Product} \\
 &= (-2)^3(a^3)(a^8)(b^2)^3 && \text{Commutative Property} \\
 &= (-2)^3(a^{11})(b^2)^3 && \text{Product of Powers} \\
 &= -8a^{11}b^6 && \text{Power of a Power}
 \end{aligned}$$

The product is $-8a^{11}b^6$.

Exercises

Simplify.

1. $(y^5)^2$

2. $(n^7)^4$

3. $(x^2)^5(x^3)$

4. $-3(ab^4)^3$

5. $(-3ab^4)^3$

6. $(4x^2b)^3$

7. $(4a^2)^2(b^3)$

8. $(4x)^2(b^3)$

9. $(x^2y^4)^5$

10. $(2a^3b^2)(b^3)^2$

11. $(-4xy)^3(-2x^2)^3$

12. $(-3j^2k^3)^2(2j^2k)^3$

13. $(25a^2b)^3\left(\frac{1}{5}abc\right)^2$

14. $(2xy)^2(-3x^2)(4y^4)$

15. $(2x^3y^2z^2)^3(x^2z)^4$

16. $(-2n^6y^5)(-6n^3y^2)(ny)^3$

17. $(-3a^3n^4)(-3a^3n)^4$

18. $-3(2x)^4(4x^5y)^2$

Homework

Finish Classwork