

3.5 Equation Solving & Modeling

Target 3B: Know and understand the inverse relationships of exponential and logarithmic equations

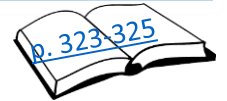
**SAT Connection****Problem Solving and Data Analysis****4.** Create an equivalent form of an algebraic expression

Example:

$$9a^4 + 12a^2b^2 + 4b^4$$

Which of the following is equivalent to the expression shown above?

- A) $(3a^2 + 2b^2)^2$
- B) $(3a + 2b)^4$
- C) $(9a^2 + 4b^2)^2$
- D) $(9a + 4b)^4$

Solution**Orders of Magnitude and Logarithmic Models**Explain in your own words what **Order of Magnitude** means and give an example.Read through *Example 5*, then find the answer to the following problem:

In January of 2010, the country of Haiti was hit by a disastrous 7.0 magnitude earthquake. In February of 2010, a 3.8 magnitude earthquake was recorded 45 miles northwest of Chicago. How many times stronger was the Haiti earthquake than the Illinois earthquake?

Properties of Logarithms Extra Practice

1. Expand using all properties of logarithms:

a) $\log_3 rt$

d) $\ln \frac{u}{7}$

b) $\log_f k^3$

e) $\log_4 \frac{3y}{gh}$

c) $\log_5 2f^3h^4$

f) $\log_9 \frac{2d}{5w^3}$

2. Write as a single logarithm using properties of logarithms:

a) $\log_2 t + \log_2 6 + \log_2 k$

d) $\log_3 y - \log_3 6 - 2\log_3 t$

b) $2\log_4 m + 5\log_4 n + \log_4 k$

e) $2\log_6 t + 3\log_6 t + 5\log_6 t$

c) $\frac{1}{2}\log_8 a + \frac{1}{3}\log_8 b$

f) $\ln x - 3\ln x + 2\ln x$

More Practice**Orders of Magnitude**

<https://www.khanacademy.org/math/pre-algebra/pre-algebra-exponents-radicals/pre-algebra-orders-of-magnitude/v/orders-of-magnitude-exercise-example-1>

Properties of Logarithms

<https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/properties-of-logarithms/v/introduction-to-logarithm-properties>

http://www.algebra-lab.org/lessons/lesson.aspx?file=algebra_logarithmproperties.xml

<http://www.regentsprep.org/regents/math/algtrig/ate9/LogPrac.htm>

<http://www.mathguide.com/lessons2/Logs.html>

<https://www.youtube.com/watch?v=SxF44oIWTyk>

<https://www.youtube.com/watch?v=eLapHtvQbFo>

Homework Assignment

p.331 # 39,41,45,47,55,57

SAT Connection**Solution**

Choice A is correct. If a polynomial expression is in the form $(x)^2 + 2(x)(y) + (y)^2$, then it is equivalent to $(x + y)^2$. Because $9a^4 + 12a^2b^2 + 4b^4 = (3a^2)^2 + 2(3a^2)(2b^2) + (2b^2)^2$, it can be rewritten as $(3a^2 + 2b^2)^2$.

Choice B is incorrect. The expression $(3a + 2b)^4$ is equivalent to the product $(3a + 2b)(3a + 2b)(3a + 2b)(3a + 2b)$. This product will contain the term $4(3a)^3(2b) = 216a^3b$. However, the given polynomial, $9a^4 + 12a^2b^2 + 4b^4$, does not contain the term $216a^3b$. Therefore, $9a^4 + 12a^2b^2 + 4b^4 \neq (3a + 2b)^4$.

Choice C is incorrect. The expression $(9a^2 + 4b^2)^2$ is equivalent to the product $(9a^2 + 4b^2)(9a^2 + 4b^2)$. This product will contain the term $(9a^2)(9a^2) = 81a^4$. However, the given polynomial, $9a^4 + 12a^2b^2 + 4b^4$, does not contain the term $81a^4$. Therefore, $9a^4 + 12a^2b^2 + 4b^4 \neq (9a^2 + 4b^2)^2$.

Choice D is incorrect. The expression $(9a + 4b)^4$ is equivalent to the product $(9a + 4b)(9a + 4b)(9a + 4b)(9a + 4b)$. This product will contain the term $(9a)(9a)(9a)(9a) = 6,561a^4$. However, the given polynomial, $9a^4 + 12a^2b^2 + 4b^4$, does not contain the term $6,561a^4$. Therefore, $9a^4 + 12a^2b^2 + 4b^4 \neq (9a + 4b)^4$.