

MeTEOR Performance Task

Algebra II

Mathematics

Rational Exponents with Pool Dimensions



Performance Task Item: Rational Exponents with Pool Dimensions

Task/Question 1:

- A.** What is the value under the radical symbol called?
- B.** Write the rational exponent rule also known as the exponent property of n^{th} roots:

- C.** Fill in the blank below:

The _____ gives the degree of the root.

- D.** Simplify each of the following expressions:

$$216^{1/3} = \underline{\hspace{2cm}} \quad 36^{1/2} = \underline{\hspace{2cm}} \quad 64^{4/3} = \underline{\hspace{2cm}} \quad 32^{4/5} = \underline{\hspace{2cm}}$$

$$(-343)^{1/3} = \underline{\hspace{2cm}} \quad (-243)^{1/5} = \underline{\hspace{2cm}} \quad 9^{1.5} = \underline{\hspace{2cm}} \quad 4^{5/2} = \underline{\hspace{2cm}}$$

- E.** Write each expression in radical form:

$$x^{2/5} = \underline{\hspace{2cm}} \quad 27^{2/3} = \underline{\hspace{2cm}} \quad 81^{3/4} = \underline{\hspace{2cm}} \quad 4^{1.5} = \underline{\hspace{2cm}}$$

- F.** Scientists use the expression $0.036m^{3/4}$ when they are studying fluids. To the closest whole number, what is the value of the expression if $m = 50,000$?

Task/Question 2:

A. Multiply and simplify each :

$$7^{1/2} \cdot 7^{1/2} = \underline{\hspace{2cm}} \quad 8^{1/3} \cdot 8^{2/3} = \underline{\hspace{2cm}} \quad 2\sqrt[4]{81^3} = \underline{\hspace{2cm}}$$

B. Solve for x:

$$27^x = 9^{x+3} \quad \underline{\hspace{2cm}} \qquad 32^x = 8^{x+2} \quad \underline{\hspace{2cm}}$$

C. Explain how you got your answers in Part B:

D. Anthony's Transport Company uses a kind of container that has the dimensions $64^{1/3}$ inches by $4^{3/2}$ inches by $27^{2/3}$ inches. What is the volume of the container?

E. Anthony needs a larger container and doubles the simplified dimensions in Part D. How does that change the volume? Explain.

Task/Question 3:

Fatima, a zoo veterinarian, has been asked to study the brains of several animals at the zoo. By studying the brain mass, she can detect certain illnesses and diseases should they arise within the animal. She has been told that the brain mass for each animal can be found using the formula, $b = 0.01m^{2/3}$, where **b** is the brain mass and **m** is the body mass of the animal.

A. Find the estimated brain masses for the following animals by their weight:

Moose: 512 Kg _____

Elephant: 5832 Kg _____

Lion: 343 Kg _____

Llama: 216 Kg _____

B. A blue whale, not at its heaviest, may have a brain mass of 33.64Kg. What would the body mass be of the whale?

C. Explain how you got your answer in Part B:

Task/Question 4:

Gina decided to have a swimming pool built in her backyard. She had two rectangular shape pools she could choose from that would fit nicely in the area she selected. Pool A measured $1024^{2/5}$ feet by $625^{1/2}$ feet. Pool B measured $256^{1/2}$ feet by $961^{1/2}$ feet. Both pools are considered wading pools and have the same depth of $64^{1/3}$ feet.

A. What is the Perimeter of each pool?

(Pool A) $P =$ _____

(Pool B) $P =$ _____

B. What is the volume of each pool?

(Pool A) $V =$ _____

(Pool B) $V =$ _____

C. What is the difference in the volume of the two pools in Part B?

D. Gina decides she wants a square pool, not a rectangular one. What would be the dimensions of the smaller pool if the volume is the same as your answer in Part B?

E. Explain how you got your answer to Part D. Then, check to see if there are any other dimensions that will allow the volume to remain the same if you change the depth of the pool. Justify and defend how your process is the **most efficient** way of determining the side lengths.



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