1. A rectangular box with a square base has holding capacity given by the equation:

\[ C = x^2 \cdot y \]

where \( C \) is the holding capacity of the box, \( x \) is the bottom side length, and \( y \) is the height of the box.

(a) Write an equation for \( y \) in terms of \( x \) and \( C \).

(b) Use your equation from 1a to answer the question: If the holding capacity of a box is 160 cubic feet and the bottom side length of the box is 4 feet, what is the height of the box?

2. Consider the following equation:

\[ V = \frac{n \cdot R \cdot T}{P} \]

(a) Write an equation for \( P \) in terms of the other variables.

(b) Write an equation for \( n \) in terms of the other variables.
3. Simplify the following so that they appear as a single exponential expression:

(a) \(22^3 \cdot 22^3\)  
(b) \(\frac{6}{6^{-2}}\)  
(c) \(5^{-2} \cdot 5^4\)  
(d) \(\frac{4^3 \cdot 4^2}{4^{-1}}\)

4. For each of the following, complete the calculation and express your answer (i) in scientific notation and (ii) in standard notation.

(a) \(\frac{2.2 \times 10^{-11}}{1.1 \times 10^{-10}}\)  
(b) \(\frac{5.0 \times 10^2 \cdot 9.9 \times 10^{12}}{2.1 \times 10^{11}}\)

5. (a) Rewrite the following logarithmic equation as an exponential equation:

\[
\log(\sqrt{10}) = 0.5
\]

(b) Rewrite the following exponential equation as a logarithmic equation:

\[
10^x = 10000
\]
6. Find the following quantities. Express each as a number.

(a) \( \log(300) \)  
(b) \( \frac{\log(10)}{\log(0.001)} \)

7. The equation used to calculate the decibel level of a sound with intensity level \( I \) is:

\[
\text{dB} = 10 \log \left( \frac{I}{10^{-12}} \right)
\]

Suppose that the intensity of a certain sound is \( 5.02 \times 10^{-9} \) watts per square meter. How many decibels are created by the sound?

8. An iron sculpture installation is steadily corroding due to rain. The sculpture was originally constructed out of 750 kg of iron, but each year, the sculpture’s mass is reduced by 7%. What is the mass of the sculpture remaining after 20 years of this corrosion?
9. A lab researcher deposits a sample of 500 bacteria into a petri dish, where these bacteria proceed to triple in size every 10 minutes.

(a) How many bacteria are in the dish after 30 minutes?

(b) How many bacteria are in the dish after 35 minutes?

10. A trivia enthusiast is trying to learn the meaning of all the words in the English dictionary. She studies for six weeks, and during that time, the number of words in her vocabulary after \( t \) days is given by the equation \( W = 5000 - 1000 \cdot (0.8)^{t/7} \).

(a) How many words does she know after the six weeks?

(b) How many words did she know before she began studying?