

(12 points total)

Name: KEY

Story Problems: Exponents & Scientific Notation

Complete each problem below. The most important thing is figuring out how to set up the problem. Once you have figured that out, all you have to do is remember your rules and you're set! Don't forget – show ALL of your work!

1) The Marine Club at Westview Middle School purchased an aquarium. The aquarium is in the shape of a perfect cube – each side has a length of 2^4 inches.



2^4

a. How much water, in cubic inches, will the aquarium hold? Write your answer as a power of 2:

(Think: how do you find volume?)

$(2^4)^3$ or $2^4 \cdot 2^4 \cdot 2^4$

$V = l \cdot w \cdot h$

b. Use a calculator to find out exactly how many cubic inches the aquarium will hold.

4096 in^3

$2^{12} = 4096$

c. If one gallon is equal to 231 cubic inches, how many gallons will the aquarium hold?

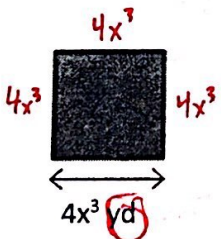
$\approx 17.7 \text{ gal}$

(Calculator allowed; show what you type in)

$4096 \text{ in}^3 \cdot \frac{1 \text{ gal}}{231 \text{ in}^3}$

$4096 \div 231$

2) If the side length of this square-shaped room is $4x^3$ yards, find the area and perimeter of the room.



Area = $4x^3 \cdot 4x^3$
Area = $16x^6 \text{ yd}^2$

Perimeter = $4(4x^3)$
Perimeter = $16x^3 \text{ yd}$

(2 points)

$4x^3 + 4x^3 + 4x^3 + 4x^3$

3) In 2005, (8.1×10^{10}) text messages were sent in the United States. In 2010, the number of annual text messages had risen to 1,810,000,000,000. About how many times as great was the number of text messages in 2010 than in 2005? Write your answer in scientific notation. (Calculator allowed; show what you type in)

$2010 \div 2005$

$\frac{1,810,000,000,000}{(8.1 \times 10^{10})} \approx 22.3$

About 22 times as great

$\approx 2.23 \times 10^1$

4) The diameter of a human hair is (9×10^{-5}) meters. The diameter of a spider's silk is (3×10^{-6}) meters.

a. Which diameter is greater, and how much greater is it? (No calculator – show work)

Subtract

$$\begin{array}{r} .00009 \\ - .000003 \\ \hline .000087 \end{array}$$

Human hair diameter is greater by $.000087$

or 8.7×10^{-5} meters

b. How many times greater is it? (No calculator – show work)

Divide

$$\frac{9 \times 10^{-5}}{3 \times 10^{-6}}$$

3×10^1 or 30 times greater

$\frac{9}{3} = 3$

$-5 - (-6) = -5 + 6 = 1$

(more on back!!!)

5) Susie's house contains 6 billion dust particles. (Do you remember how many zeroes a billion has?) Each dust particle has a weight of (7.5×10^{-10}) gram. What is the total weight of all the dust particles in Susie's house? Write your answer in standard notation. (No calculator – show work) multiply

billion = 10^9

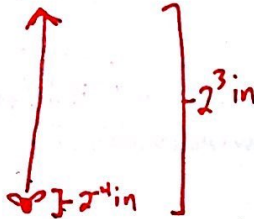
$$\begin{array}{r} 7.5 \\ \times 6 \\ \hline 45.0 \end{array}$$

Weight of each \times number of particles

$$(7.5 \times 10^{-10}) \cdot (6 \times 10^9) = 45 \times 10^{-1} = 4.5 \times 10^0 \text{ or } \boxed{4.5 \text{ grams}}$$

6 billion

6) A common flea that is 2^4 inch long can jump about 2^3 inches high. Draw a picture of this situation. Then use it to answer the question: about how many times its body size can the flea jump? (In other words, how many fleas would have to stand on top of each other to be as tall as one flea jump?) Write your answer as a power of 2 AND as a regular number. (No calculator – show work)



divide jump \div body size

$$\frac{2^3}{2^4} = 2^{3-4} = 2^{-1} = \frac{1}{2}$$

2	1
4	2
8	3
16	4
32	5
64	6
128	7

2^7 or 128 times its body size

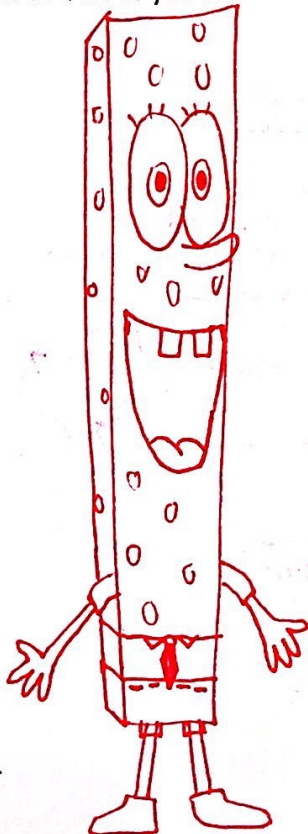
7) Bob and Patrick both like to brag about how tall they are. Bob is (6×10^{84}) feet tall. Patrick is (3×10^{82}) feet tall. Patrick says "I know you are taller than me, but I have almost caught up to you!" Bob says "No way! I am waaaaaaay taller than you!"

a. Who do you agree with more? Why?

$$\frac{6 \times 10^{84}}{3 \times 10^{82}} = 2 \times 10^2 = 200$$

Bob; he is 200 times taller than Patrick. It takes 200 Patricks to equal one Bob.

b. Draw a picture of Bob and Patrick standing next to each other. Your picture should accurately compare their heights as best as you can.



(2 points)



200 Patricks = 1 Bob