1-2-3 Go!
STEM Nova Award

Presenter: Zachary

Requirement 1. Homework

I. Complete ALL the requirements.
   A. Watch an episode/episodes or movies (about one hour total) of a show that involves math or physics. Then do the following:
      1. Make a list of at least two questions or ideas from what you watched.
      2. Discuss two of the questions or ideas with your counselor.

Examples: Discovery Channel, PBS, Elementary math and physics on youtube, and Movies that involve math(Ex. National Treasure, Hidden Figures, ect)

Requirement 2. Homework

I. Complete ONE adventure from the following list for your current rank
   - A. Wolf Cub Scouts — Code of the Wolf: Working with numbers, logic, and math
   - B. Bear Cub Scouts — Robotics: Working with logic
   - C. Webelos Scouts — Game Design: Working with logic

This won’t be covered in class

Requirement 3.

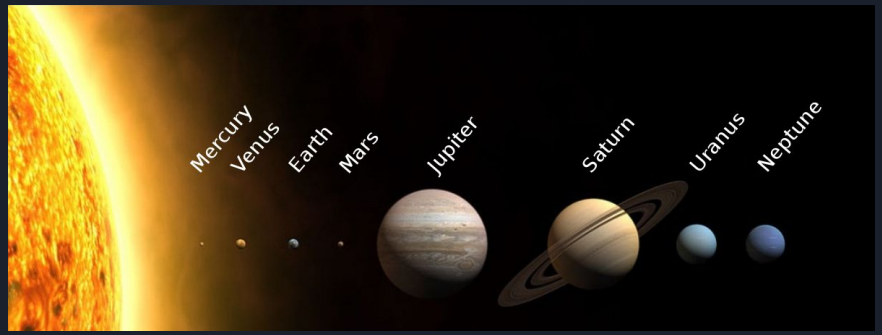
A. Calculate how much you would weigh on Different Planets

On the sun or the moon

Earth Weight (in pounds) x 28 = Sun Weight

Earth Weight (in pounds) x 0.17 = Moon Weight

Homework



On a planet that you choose

Earth Weight (in pounds) x 0.38= Mercury Weight

Earth Weight (in pounds) x 0.91 = Venus Weight

Earth Weight (in pounds) x 0.38 = Mars Weight

Earth Weight (in pounds) x 2.36 = Jupiter Weight

Earth Weight (in pounds) x 0.92 = Saturn Weight

Earth Weight (in pounds) x 0.89 = Uranus Weight

Earth Weight (in pounds) x 1.12 = Neptune Weight

Earth weight: 114 pounds

X 28

Sun weight: = 3164 pounds

Earth weight: 114 pounds

X 0.38

Mars weight: = 43.32 pounds

Earth weight: 114 pounds

X 0.17

Moon weight: = 19.38 pounds

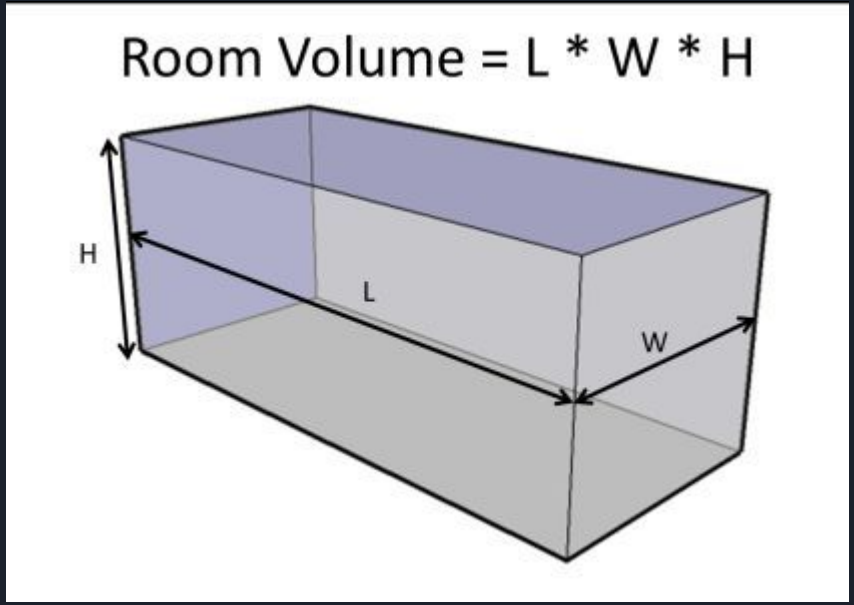
C. Calculate the volume of air in your bedroom. Make sure your measurements have the same units (feet or inches)

Length (Wall to Wall) x Width (Wall to Wall) x Height (Floor to Ceiling) = Volume of air in room

Homework

Tape measure, calculator, and

you can get help from parents



Length	X	Width	X	Height	=	Volume
14 ft.	X	10.5 ft.	X	8 ft.	=	1176 cubic feet

Requirement 4.

A. Look up, then discuss with your counselor each of the following:

(1) Cryptography

One of the earliest recorded uses of cryptography, the practice of hiding information, was when Roman leader Julius Caesar used substituted letter to hide information. Cryptography has been useful during wars for transmitting information without the enemy knowing. The major use of cryptography today is with computers, especially in finance and electronic data transmissions. ATM cards, passwords, and ID numbers depend on cryptography.

A. Look up, then discuss with your counselor each of the following:

(2) At least three ways secret codes or ciphers are made.

Transposition ciphers: Rearrange the letters in a word.

Letter shifts: Shift every letter in the alphabet a set number of places.

Number substitutions: Assign every letter a number. This can be combined with letter shifts.

Stacked ciphers: Combine two or more codes and/or ciphers

A. Look up, then discuss with your counselor each of the following:

(3) How secret codes and ciphers relate to mathematics.

Many ciphers can be broken by using what is called frequency analysis. For example, the letter “e” is the most frequently used letter in the English language. Ciphers are pairs of algorithms, rules or a set of rules to solve a problem, used to encrypt and decrypt information (make information unreadable or readable). Since the early 20th century, cryptography has made a much more extensive use of mathematics, including information theory, computational complexity, statistics, number theory, and abstract algebra.

Practice code

Number Substitution Cypher

A	B	C	D	E	F	G	H	I	J
1	2	3	4	5	6	7	8	9	10

K	L	M	N	O	P	Q	R	S	T
11	12	13	14	15	16	17	18	19	20

U	V	W	X	Y	Z
21	22	23	24	25	26

4,15 25,15,21,18 2,5,19,20

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Requirement 5.
Discuss how math affects your everyday life?