Watch the following YouTube Dimensional Analysis Reviews: Note the one video mentions that you cannot use a calculator on the Exam – that has now been changed and you will be able to use a calculator.

https://www.youtube.com/watch?v=d_WfCwJW0Og

https://www.youtube.com/watch?v=aZ3J60GYo6U

https://www.youtube.com/watch?v=1vcfLGWNtLU

https://www.youtube.com/watch?v=DZupGEJBxBI

The BEST APES Math Review EVER! (20pts)

The APES Exam will require you to do mathematical calculations. Occasionally, these calculations may be somewhat esoteric, and you may find it possible to do them in your head; nonetheless, it is _**mandatory**_ to show all work for all calculations on the free-response section of the APES exam. This worksheet is designed to help prepare you for the types of calculations you may encounter on this year's APES exam.
Use a separate piece of paper, and for each problem, show EVERY STEP of your work, and indicate the cancellation of all units….You May Use A Calculator!!

**Scientific Notation**-- All APES students should be able to work comfortably in scientific notation.
- Place the following numbers into scientific notation:
    1. One billion
    2. Twenty-three thousand
    3. 70 trillion
    4. One one-hundredth

- Do the following calculations in scientific notation:
    5. Five hundred billion times thirty-five thousand
    6. Six thousand divided by 300 billion
    7. One ten thousandth of three million
    8. 6 billion divided by 35 trillion

**Unit Conversions**—All APES students should be able to convert from one system of units to another.
- Use Table 1 to complete the following. Show all of your work, including the cancelling of units.

1 square mile = 640 acres	1 hectare = 2.5 acres
1 barrel = 42 gallons	1 liter = 0.3 gallons
1 metric ton = 2000 pounds	1 kilogram = 2.2 pounds
1 kWh = 3400 BTU	1 BTU = 250 calories
1 BTU = amount of energy to raise temp of 1 lb water 1°F	
Density of water = 1g/ml = 8 lbs/gallon	

9. A 100 square mile area of national forest is how many acres? How many hectares?
10. A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of electricity?

11. Fifty-eight thousand kilograms of solid waste is equivalent to how many metric tons?
12. If one barrel of crude oil provides six million BTUs of energy, how many BTUs of energy will one liter of crude oil provide? How many calories of energy will one gallon of crude oil provide?
13. For crude oil, if 150 pounds of CO_2 is released per million BTUs of energy, how much CO_2 is produced by each barrel of crude oil? (use information from previous problem)

Percentages—All APES students should be able to work comfortably with percentages.

14. A natural gas power plant is 60% efficient. If one cubic meter of natural gas provides 1000 BTUs of electricity, how many BUTs of waste heat are produced?
15. If 35% of a natural area is to be developed, leaving 500 acres untouched, how many acres are to be developed?
16. Calculate the percentage growth rate for a country with a population of 6 million: in a year in which it had 100,000 births, 70,000 deaths, 30,000 immigrants and 50,000 emigrants.
17. If the concentration of mercury in a water supply changes from 65 ppm to 7 ppm in a ten-year period, what is the percentage change of the mercury concentration?

Energy—The APES exam always has questions about energy use. Be prepared!
- Use Table 1 to help you with the conversions.
18. How much energy is required to raise the temperature of 1000 gallons of water by 25°F?
19. By how many degrees Fahrenheit can the temperature of one metric ton of water be raised with the addition of 110thousand BTUs of heat?
20. If 500 thousand BTUs of energy are available to raise the temperature of a water boiler from 20°F to 100°F, how many gallons of water can be added to the boiler?

Complete these 5-Dimensional Analysis Practice Problems for extra credit added to the first quarter! (5 pts)

1. Dwight was told by his mystic guru that a special medicine would help him gain superhuman strength to fight bears. The instructions say "Take 2 drops per 10 pounds of body weight per day, in 4 doses a day." Dwight weighs 175 lbs. How many drops should he be taking per dose?
2. Michael wants to throw a pizza party so his 15 coworkers will think he's the best boss ever. Each pizza will cost $19.50 and has 12 slices. He wants each person to be able to have at least 3 slices. He has $90 to spend after returning a George Foreman grill. Can he afford enough pizza?
3. Kelly has driven by Ryan's house 3 times a day for the past 6 weeks. Every time she drives by, she leaves 2 love letters on his porch. Ryan has thrown out 90% of the letters and a dog ran away with 5% of them. Ryan secretly keeps the rest in his Memories Box. How many letters does he have in his box?

4. Pam just got a shipment of pens and told Erin to hand them out and put in the computer how much the shipment cost. Erin is nervous about this and wants to make sure she gets it right. There are 15 coworkers and they each received 5 pens. There are 8 pens per package, at $2.65 per package. What was the total cost of the pen shipment?

5. Dwight found a buried treasure with 4,023,743 pennies in it. (He counted twice to make sure.) Each penny weighs 3 grams. Dwight can carry up to 75 lbs. (even though he tells people he can carry much more). His 8 cousins can each carry 75 lbs as well. How many trips will he and his cousins need to make to carry all his money home?