APES Math Review **NAME:**
Period:

The APES Examination 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 help to prepare you for the type of calculations you may encounter on the APES exam.

For each problem show every step of your work, and indicate the cancellation of all units…No Calculators!

Scientific Notation—All APES students should be able to work comfortably with numbers in scientific notation.
Place the following numbers into scientific notation. ***No Calculators!!***

1) one billion

2) twenty three thousand

3) 70 trillion

4) three hundred

5) 0.00025

6) 7,310,000

Perform the following calculations in scientific notation. ***No Calculators!!***

7) five hundred billion times thirty five thousand

8) six thousand divided by 300 billion

9) $\frac{3.4 \times 10^{-2}}{1.7 \times 10^{-5}}$

10) $\frac{1.0 \times 10^{5}}{2.0 \times 10^{3}}$

11) $(3.5 \times 10^{-2})(2.0 \times 10^{-5})$

12) $(1.11 \times 10^{-5})(6.0 \times 10^{9})$

Metric Conversions—All APES students should be comfortable converting between common metric prefixes. Below are common prefixes, and the number of base units each represents. For example: 1 terawatt = 10^9 Watts; 1 millimeter = 10^{-3} meters. Complete the conversions.

n = nano = 10^{-9} μ = micro = 10^{-6} m = milli = 10^{-3}
k = kilo = 10^3 M = mega= 10^6 T = tera = 10^9
G = Giga = 10^{12}

13) 2.8 mm = _____ m

14) 1.3 nm = _____ μm

15) 300 mg = _____g

16) 12 μg = _____ng

17) 250 mL = _____ L

18) 400 GW = _____W

19) 5 x 10^4 kg= _____Mg

Simple Fractions—All APES students should know the decimal values for common fractions & proportions, and vice versa. Indicate the correct decimal, or fraction, where appropriate. ***No Calculators!!***

20) 0.1 =

21) 0.5 =

22) 0.25 =

23) 0.33 =

24) 0.66 =

25) 0.75 =

26) 0.125 =

27) 0.625 =

28) 0.875 =

29) 1/4 =

30) 1/2 =

31) 1/10 =

32) 1/3 =

33) 1/8 =

34) 2/3 =

35) 3/4 =

36) 7/8 =

37) 5/8 =

Unit conversions—All APES students should be able to convert from one system of units to another.

Use the information below to complete the following. Show all of your work including the canceling of all units. ***No Calculators!!***

1 mi^2 = 640 acres
1 barrel oil = 42 gallons
1 kilowatt-hour = 3.4 x 10^4 BTU= 8.6 x 10^5 calories
1 metric ton (tonne) = 1 x 10^3 kg
1 acre = 0.405 hectares
1 L = 0.264 gallons

38) A 100 square mile area of national forest is how many acres? How many hectares?

39) A city that uses ten billion BTUs of energy each month is using how many kilowatt-hours of energy?

40) Fifty eight thousand kilograms of solid waste is equivalent to how many metric tons?

41). 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?

42) 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 the previous problem)

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

$$\%Change = \frac{Final - Initial}{Initial} x100 \qquad \%Difference = \frac{X1 - X2}{(X1 + X2/2)} x100$$

43) 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.

44) If the concentration of mercury in a water supply changes from 65 parts per million (ppm) to 7 ppm in a ten-year period, what is the percentage change of the mercury concentration? How much per year?

45) A natural gas power plant is 60% efficient. If one cubic meter of natural gas provides 1000 BTUs of electricity, how many BTUs of waste heat were produced?

46) If 35% of a natural area is to be developed, leaving 500 acres untouched, how many acres are to be developed?

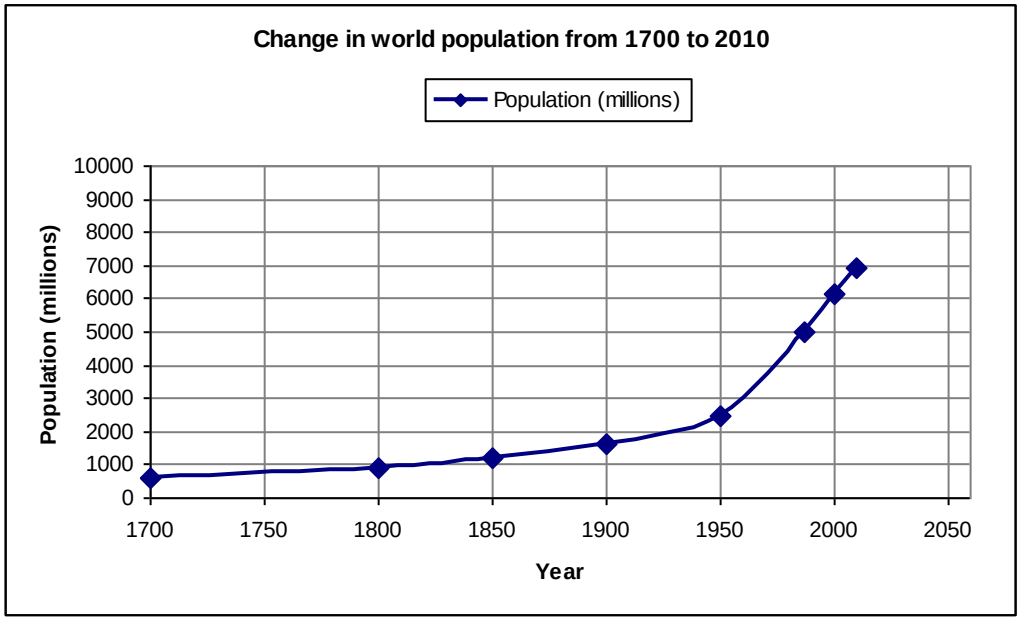
47) How many gallons are in 15 L of gasoline? What would that cost in 1987, when gas was $0.90/gal? In 2012, when gas is $3.60/gal?

48) What is the percent change in gasoline prices from 1987 to 2012?

49) A student measures a stream's water temperatures in degrees Celsius, each week for the month of July. Her data are as follows: week #1: 21; week #2: 23; week #3: 23; week #5: 25. Calculate the % difference between the first and last weeks.

Interpreting Data--APES students must be able to read and interpret the information presented in a variety of ways, including graphs and tables.

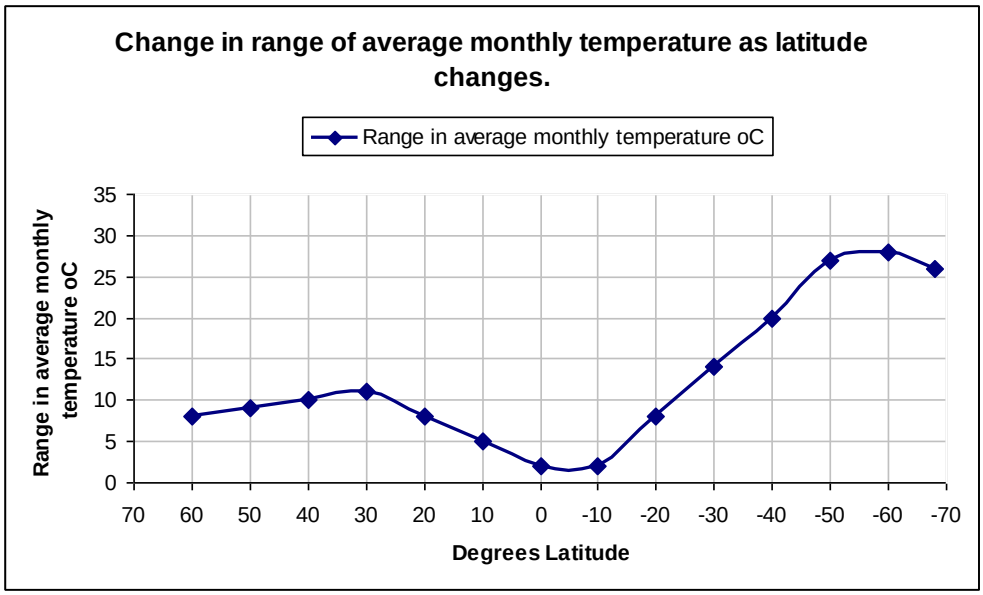
Once you understand how graphs are constructed, it is easier to get information from the graphs in your textbook as well as to interpret the results you obtain from experiments. Use the information presented in the graphs to answer the questions that follow them.



50) a. Describe what the graph shows. (Describing means to look at the overall picture presented or trend in the data. What's happening? Interpret the graph; don't just repeat the title.)

b. What was the world's population in 1900? 2010?

c. Assuming that the population trend continues, predict the world population in 2025. Do you think this is likely to occur? Defend your answer.



51) a. Describe what the graph shows. Don't just repeat the title!

b. At what latitude does the least variation occur?

c. Miami is at approximately 26° N latitude. From the information on the graph, what is the range in mean monthly temperature there?

d. Moorestown is at approximately 40° N latitude. From the information on the graph, what is the range in mean monthly temperature there?

e. Sydney, Australia is at approximately 33° S latitude (-33° on the graph). From the information on the graph, what is the range in mean monthly temperature there?

f. Which hemisphere, the northern or the southern, has the greatest range in monthly temperatures? Why does this occur?