APES Summer Assignment 2018-2019

Welcome to APES! The purpose of the summer assignment is to introduce you to some of the major themes that will be covered in AP Environmental Science. We will draw upon the concepts presented here throughout the year, so it is important that you complete this work before school begins. The more you engage with this material over summer, the more prepared you will be for the class.

Your summer assignment has **4 components** and will be **due Friday, September 7, 2018.**

READ	In your textbook, read Chapter 1 and take notes for an open note quiz at the beginning of the year. A PDF of the chapter can be found on FirstClass in the summer reading e-mail.
WATCH	ONE environmental documentary from the list of nine options below. Full descriptions and links are on the following page. The movies fall into three general categories that will be fundamental in our studies this year: Food, Energy, and Water. Choose which movie interests you, grab some popcorn, and enjoy! You will write a two-paged essay (see below) on this documentary so take notes where you see fit. Many of the documentaries can be found at a local library, on Netflix, or simply on YouTube.
WRITE	Compose a paper (about 2-3 pages double-spaced) on the movie you chose that includes:
MATH	Complete the summer math packet (no calculators allowed!). Understanding the basics in this packet is a prerequisite for the course. **Important**: Answer all questions on the provided answer sheet. You will hand in a hard copy of your answers on September 7.

Within the WATCH section:

Food	Energy	Water
Food, Inc	Gasland	Last Call at the Oasis
The Vanishing of the Bees	Pump	Damnation
GMO OMG	The Great Invisible	FLOW: For Love of Water

Within the WRITE section:

Part I - Summary: Summarize the environmental documentary you watched. Your summary should also include your own personal reflection and opinion of the film.

Part II - Environmental Issue: Describe, with detail, one environmental issue discussed in the movie. Does the film do a good job presenting the issue? Is a viable solution for the issue presented in the movie? If not, explain why you think a solution was not presented and suggest a possible solution based on what you learned while watching.

Part III – Anecdotes: Documentaries frequently use anecdotes or a story to illuminate a major point, and these can be powerfully illustrative. Describe one story from the movie that you would share if you were discussing this movie with friends. Explain why you feel this example best illustrates or effectively communicates what the documentary is trying to say.

Below are more specifics on each section of your assignment.
I look forward to working with you next year!

PART ONE: READ
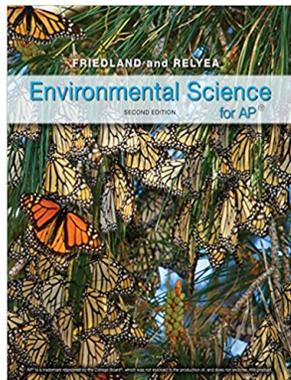
Read Chapter 1 of our textbook, Friedland and Reylea's *Environmental Science for AP* (2nd Edition), which is attached to the summer work e-mail on First Class. Please be sure to order the textbook for all other readings this year.
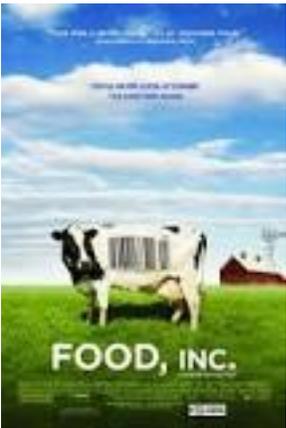
Take notes as you read, as we will have an open note quiz in the beginning of the year on the chapter.

PART TWO: WATCH

You only need to watch ONE movie from the list of nine options. Below are the descriptions (adapted from various internet sources) to help you decide. At the beginning of the year we will meet in groups to discuss the documentaries.

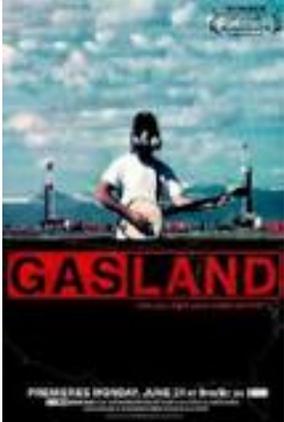| Food	Energy	Water
Food, Inc	Gasland	Last Call at the Oasis
The Vanishing of the Bees	Pump	Damnation
GMO OMG	The Great Invisible	FLOW: For Love of Water

Theme: FOOD

Food, Inc. (2008; 94 minutes)	**Trailer**: http://www.takepart.com/foodinc/film
	Synopsis: In *Food, Inc.,* filmmaker Robert Kenner lifts the veil on our nation's food industry, exposing the highly mechanized underbelly that has been hidden from the American consumer with the consent of our government's regulatory agencies, USDA and FDA. Our nation's food supply is now controlled by a handful of corporations that often put profit ahead of consumer health, the livelihood of the American farmer, the safety of workers and our own environment. We have bigger-breasted chickens, the perfect pork chop, herbicide-resistant soybean seeds, even tomatoes that won't go bad, but we also have new strains of E. coli— the harmful bacteria that causes illness for an estimated 73,000 Americans annually. We are riddled with widespread obesity, particularly among children, and an epidemic level of diabetes among adults. Available on Netflix

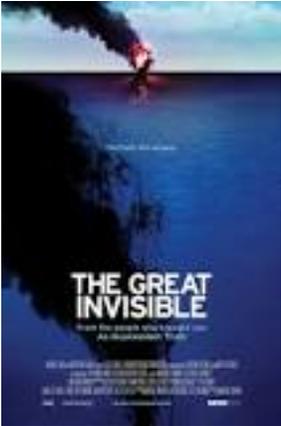| Vanishing of the Bees (2009, 88 minutes)	Trailer: http://www.vanishingbees.com
	Synopsis: Honeybees have been mysteriously disappearing across the planet, literally vanishing from their hives. Known as Colony Collapse Disorder, this phenomenon has brought beekeepers to crisis in an industry responsible for producing apples, broccoli, watermelon, onions, cherries and a hundred other fruits and vegetables. Commercial honeybee operations pollinate crops that make up one out of every three bites of food on our tables. Vanishing of the Bees follows commercial beekeepers David Hackenberg and Dave Mendes as they strive to keep their bees healthy and fulfill pollination contracts across the U.S. The film explores the struggles they face as the two friends plead their case on Capital Hill and travel across the Pacific Ocean in the quest to protect their honeybees. Filming across the US, in Europe, Australia and Asia, this documentary examines the alarming disappearance of honeybees and the greater meaning it holds about the relationship between mankind and mother earth. As scientists puzzle over the cause, organic beekeepers indicate alternative reasons for this tragic loss. Conflicting options abound and after years of research, a definitive answer has not been found to this harrowing mystery. Narrated by Ellen Page. Available on Netflix

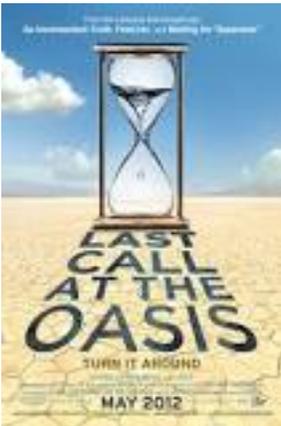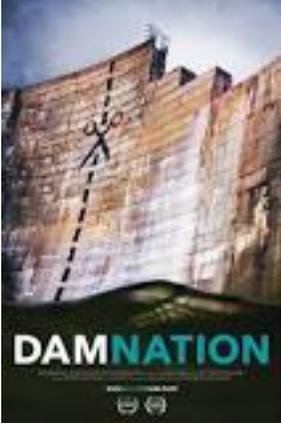| GMO OMG (2013, 85 minutes)	Trailer: http://www.gmofilm.com/official-trailer.aspx
	Synopsis: Today in the United States, by the simple acts of feeding ourselves, we are unwittingly participating in the largest experiment ever conducted on human beings. Each of us unknowingly consumes genetically engineered food on a daily basis. The risks and effects to our health and the environment are largely unknown. Yet more and more studies are being conducted around the world, which only provide even more reason for concern. We are the oblivious guinea pigs for wide-scale experimentation of modern biotechnology. GMO OMG tells the story of a fathers discovery of GMOs in relationship to his 3 young children and the world around him. We still have time to heal the planet, feed the world, and live sustainably. But we have to start now! Available on Netflix

Theme: ENERGY

Gasland (2010, 103 minutes)	**Trailer**: http://one.gaslandthemovie.com/trailer
	Synopsis: It is happening all across America-rural landowners wake up one day to find a lucrative offer from an energy company wanting to lease their property. Reason? The company hopes to tap into a reservoir dubbed the "Saudi Arabia of natural gas." Halliburton developed a way to get the gas out of the ground-a hydraulic drilling process called "fracking"-and suddenly America finds itself on the precipice of becoming an energy superpower. Available on Netflix

Pump (2014, 88 minutes)	**Trailer**: http://www.pumpthemovie.com
	Synopsis: Filmmakers expose the reasons behind America's addiction to oil and investigates replacement fuels that are cheaper, cleaner and made in the U.S.A. Today oil is our only option of transportation fuel at the pump. Our exclusive use of it has drained our wallets, increased air pollution and sent our sons and daughters to war in faraway lands. PUMP shows us how through the use of a variety of replacement fuels, we will be able to fill up our cars - cheaper, cleaner and American made - and in the process, create more jobs for a stronger, healthier economy. The film features notable experts such as John Hofmeister, former President of Shell Oil US; Elon Musk, CEO of Tesla Motors; Peter Goldmark, former president of the Rockefeller Foundation; and other noteworthy figures who share their passionate views and knowledge. Right now we have the ability to change our country's future, but we never knew it. Aren't we tired of being taken for a ride? PUMP is the movie that could change that. **Full Movie on YouTube**: https://www.youtube.com/watch?v=c0T9Jz3Uiyc Also available on Netflix

The Great Invisible (2014, 93 minutes)	Trailer: http://www.takepart.com/great-invisible
	Synopsis: On April 20, 2010, the Deepwater Horizon oil rig exploded in the Gulf of Mexico in a blaze of fire that could be seen 35 miles away, killing 11 workers and causing the worst oil spill in American history. This is a documentary on the Deepwater Horizon oil rig explosion as seen through the eyes of oil executives, survivors and Gulf Coast residents who experienced it first-hand and then were left to pick up the pieces while the world moved on. Available on Netflix

Theme: WATER

Last Call at the Oasis (2011, 100 minutes)	Trailer: http://www.takepart.com/lastcall
	Synopsis: The global water crisis will be the central issue facing our world this century. We can manage this problem, but only if we are willing to act now. *Last Call at the Oasis* is a powerful new documentary that shatters myths behind our most precious resource. This film exposes defects in the current system, shows communities already struggling with its ill-effects and highlights individuals championing revolutionary solutions during the global water crisis. Firmly establishing the global water crisis as the central issue facing our world this century, the film posits that we can manage this problem if we act now. Available on Netflix

DamNation (2014, 94 minutes)	Trailer: http://damnationfilm.com/trailer
	Synopsis: This powerful film odyssey across America explores the sea change in our national attitude from pride in big dams as engineering wonders to the growing awareness that our own future is bound to the life and health of our rivers. Dam removal has moved beyond the fictional Monkey Wrench Gang to go mainstream. Where obsolete dams come down, rivers bound back to life, giving salmon and other wild fish the right of return to primeval spawning grounds, after decades without access. DamNation's majestic cinematography and unexpected discoveries move through rivers and landscapes altered by dams, but also through a metamorphosis in values, from conquest of the natural world to knowing ourselves as part of nature. Available on Netflix

FLOW: For Love of Water (2008, 93 minutes)	Trailer: http://www.flowthefilm.com/trailer
	Synopsis: Water is the very essence of life, sustaining every being on the planet. 'Flow' confronts the disturbing reality that our crucial resource is dwindling and greed just may be the cause. Interviews with scientists and activists examine the rapidly building crisis regarding the growing privatization of the world's dwindling fresh water supply. Full Movie on YouTube: https://www.youtube.com/watch?v=_QhOR0Gxw38
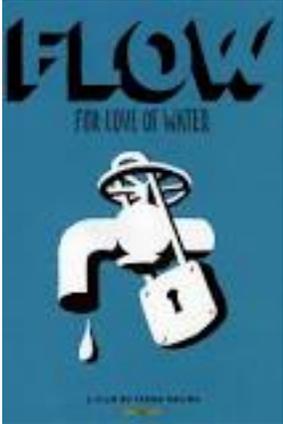
PART THREE: WRITE

Please see page 1 which includes what you need to include in the three parts of your paper (Part I – Summary, Part II - Environmental Issue, Part III – Anecdotes). The essay should be 2-3 pages double spaced.

This essay will be due on September 9, 2016 posted to our class Haiku Dropbox.

PART FOUR: MATH

This year in APES you will hear two words most dreaded by high school students…**NO CALCULATORS!** That's right, you cannot use a calculator on the AP Environmental Science exam. Since the regular tests you will take are meant to help prepare you for the APES exam, you will not be able to use calculators on regular tests all year either. The good news is that most calculations on the tests and exams are written to be fairly easy calculations and to come out in whole numbers or to only a few decimal places. The challenge is in setting up the problems correctly and knowing enough basic math to solve the problems. With practice, you will be better prepared to tackle math problems this year and on the AP exam. So bid your calculator a fond farewell, tuck it away so you won't be tempted, and start sharpening your math skills! **You will be tested on the math skills in this packet in the first couple weeks of school. Answer all questions on the answer sheet at the bottom of this packet!**

Contents

1. Decimals
2. Averages
3. Percentages and Percent change
4. Metric Units

5. Scientific Notation
6. Dimensional Analysis
7. Graph Analysis
8. Making a Graph

Reminders

1. Write out all your work, even if it's something really simple. This is required on the APES exam so it will be required on all your assignments, labs, quizzes, and tests as well.
2. Include units in each step. Your answers always need units and it's easier to keep track of them if you write them in every step.
3. Check your work. Go back through each step to make sure you didn't make any mistakes in your calculations. Also check to see if your answer makes sense. For example, a person probably will not eat 13 million pounds of meat in a year. If you get an answer that seems unlikely, it probably is. Go back and check your work.

Directions

Read each section below for review. Look over the examples and use them for help on the practice problems. When you get to the practice problems (in blue text), write out all your work and be sure to include units on each step the answer sheet below. Check your work.

Decimals

Part I: The Basics

Decimals are used to show fractional numbers. The first number behind the decimal is the tenths place, the next is the hundredths place, the next is the thousandths place. Anything beyond that should be changed into scientific notation (which is addressed in another section.)
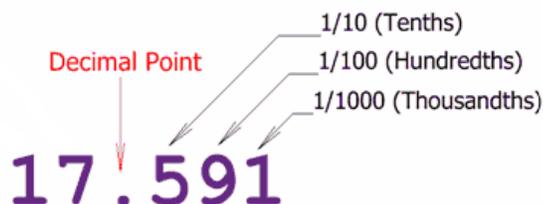
Part II: Adding or Subtracting Decimals

To add or subtract decimals, make sure you line up the decimals and then fill in any extra spots with zeros. Add or subtract just like usual. Be sure to put a decimal in the answer that is lined up with the ones in the problem.

$$
\begin{array}{r}
123.0000 \\
0.0079 \\
+43.5000 \\
\hline
166.5079
\end{array}
\qquad
\begin{array}{r}
27.583 \\
-\ 0.200 \\
\hline
27.383
\end{array}
$$

Part III: Multiplying Decimals

Line up the numbers just as you would if there were no decimals. DO NOT line up the decimals. Write the decimals in the numbers but then ignore them while you are solving the multiplication problem just as you would if there were no decimals at all. After you have your answer, count up all the numbers behind the decimal point(s). Count the same number of places over in your answer and write in the decimal.

$$3.77 \times 2.8 = ?$$

$$
\begin{array}{r}
3.77 \quad (2\ decimal\ places) \\
\times \quad 2.8 \quad (1\ decimal\ place) \\
\hline
3016 \\
+754 \quad\ \ \\
\hline
10.556 \quad (3\ decimal\ places)
\end{array}
$$

Part IV: Dividing Decimals

Scenario One: If the divisor (the number after the / or before the $\overline{)\ \ \ }$) does not have a decimal, set up the problems just like a regular division problem. Solve the problem just like a regular division problem. When you have your answer, put a decimal in the same place as the decimal in the dividend (the number before the / or under the $\overline{)\ \ \ }$).

$$
\begin{array}{r}
424.9 \\
38\ \overline{)\ 16146.2} \\
152\quad\quad\quad\ \\
\hline
94\quad\quad\ \\
76\quad\quad\ \\
\hline
186\quad\ \\
152\quad\ \\
\hline
342 \\
342 \\
\hline
0
\end{array}
$$

Scenario Two: If the divisor does have a decimal, make it a whole number before you start. Move the decimal to the end of the number, then move the decimal in the dividend the same number of places.

$$3.8\ \overline{)\ 1614.62}$$

Then solve the problem just like a regular division problem. Put the decimal above the decimal in the dividend. (See Scenario One problem).

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Decimals Practice: Remember to show all your work, include units if given, and NO CALCULATORS!

All work and answers go on your answer sheet.

1. 1.678 + 2.456 =
2. 344.598 + 276.9 =
3. 45.937 – 13.43 =
4. 199.007 – 124.553 =

5. 28.4 x 9.78 =
6. 1256.93 x 12.38 =
7. 64.5 / 5 =
8. 3300.584 / 34.67 =

Averages

To find an average, add all the quantities given and divide the total by the number of quantities.

Example: Find the average of 10, 20, 35, 45, and 105.

Step 1: Add all the quantities. 10 + 20 + 35 + 45 + 105 = 215

Step 2: Divide the total by the number of given quantities. 215 / 5 = 43

Averages Practice: Remember to show all your work, include units if given, and NO CALCULATORS!

All work and answers go on your answer sheet.

9. Find the average of the following numbers: 11, 12, 13, 14, 15, 23, and 29
10. Find the average of the following numbers: 4.56, .0078, 23.45, and .9872

Percentages

Introduction:

Percents show fractions or decimals with a denominator of 100. Always move the decimal TWO places to the right go from a decimal to a percentage or TWO places to the left to go from a percent to a decimal.

Examples: .85 = 85%.   .008 = .8%

Part I: Finding the Percent of a Given Number

To find the percent of a given number, change the percent to a decimal and MULTIPLY.

Example: **30% of 400**

Step 1: 30% = .30

Step 2:   400

        x .30

      12000

Step 3: Count the digits behind the decimal in the problem and add decimal to the answer.

12000 → 120.00 → 120

Part II: Finding the Percentage of a Number

To find what percentage one number is of another, divide the first number by the second, then convert the decimal answer to a percentage.

Example: What percentage is 12 of 25?

Step 1: 12/25 = .48

Step 2: .48 = 48% (12 is 48% of 25)

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Part III: Finding Percentage Change & Increase or Decrease

To find percent change: (New - old)/ Old x 100

Example: The iPhone has decreased from $650 to $515. What is the percent change in the price?

      Step 1: 515 - 650 = - 135 We use absolute value in this class. You can ignore the negative.

      Step 2: 135 / 650 = .208

      Step 3: .208 X 100 =20.1%

To find a percentage increase or decrease, first find the percent change, then add or subtract the change to the original number.

    Example: Kindles have dropped in price 18% from $139. What is the new price of a Kindle?

      Step 1: $139 x .18 = $25

      Step 2: $139 - $25 = $114

Part IV: Finding a Total Value

To find a total value, given a percentage of the value, DIVIDE the given number by the given percentage.

    Example: If taxes on a new car are 8% and the taxes add up to $1600, how much is the new car?

      Step 1: 8% = .08

      Step 2: $1600 / .08 = $160,000 / 8 = $20,000 *(Remember when the divisor has a decimal, move it to the end to make it a whole number and move the decimal in the dividend the same number of places. .08 becomes 8, 1600 becomes 160000.)*

Percentage Practice: Remember to show all your work, include units if given, and NO

CALCULATORS! All work and answers go on your answer sheet.

11. What is 45% of 900?

12. Thirteen percent of a 12,000 acre forest is being logged. How many acres will be logged?

13. A water heater tank holds 280 gallons. Two percent of the water is lost as steam. How many gallons remain to be used?

14. What percentage is 25 of 162.5?

15. 14,000 acres of a 40,000 acre forest burned in a forest fire. What percentage of the forest was damaged?

16. Home prices have dropped 5% in the past three years. An average home in Indianapolis three years ago was $130,000. What's the average home price now?

17. Approximately 30 million mobile devices were sold in 1998 in the United States. The number sold increased to 180 million devices in 2007. Calculate the percent increase of mobile device sales from 1998 to 2007.

Metric Units

Kilo-, centi-, and milli- are the most frequently used prefixes of the metric system. You need to be able to go from one to another without a calculator. You can remember the order of the prefixes by using the following sentence: *King Henry Died By Drinking Chocolate Milk*. Since the multiples and divisions of the base units are all factors of ten, you just need to move the decimal to convert from one to another.

| Kilo - 1000 units | Hecto - 100 units | Deka - 10 units | **Basic Unit** | Deci - 0.1 units | Centi - 0.01 units | Milli - 0.001 units |

To convert to a smaller unit, move decimal point to the right or multiply. →

To convert to a larger unit, move decimal point to the left or divide. ←

Example: 55 centimeters = ? kilometers

Step 1: *Figure out how many places to move the decimal. King Henry Died By Drinking… – that's six places. (Count the one you are going to, but not the one you are on.)*

Step 2: *Move the decimal five places to the left since you are going from smaller to larger.*

55 centimeters = .00055 kilometers

Example: 19.5 kilograms = ? milligrams

Step 1: *Figure out how many places to move the decimal. … Henry Died By Drinking Chocolate Milk – that's six places. (Remember to count the one you are going to, but not the one you are on.)*

Step 2: *Move the decimal six places to the right since you are going from larger to smaller. In this case you need to add zeros.*
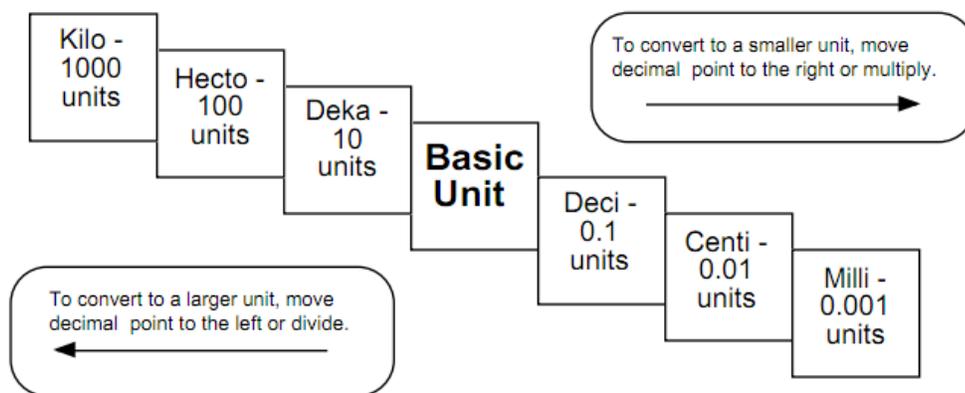
19.5 kilograms = 19,500,000 milligrams

Metric Conversions Practice: Remember to show all your work, include units if given, and NO CALCULATORS! All work and answers go on your answer sheet.

18. 1200 kilograms = ? milligrams

19. 14000 millimeters = ? meters

20. 6544 liters = ? milliliters

21. .078 kilometers = ? meters

Scientific Notation

Introduction:

Scientific notation is a shorthand way to express large or tiny numbers. Since you will need to do calculations throughout the year WITHOUT A CALCULATOR, we will consider anything over 1000 to be a large number. Writing these numbers in scientific notation will help you do your calculations much quicker and easier and will help prevent mistakes in conversions from one unit to another. Like the metric system, scientific notation is based on factors of 10. A large number written in scientific notation looks like this:

$$1.23 \times 10^{11}$$

The number before the x (1.23) is called the coefficient. The coefficient must be greater than 1 and less than 10. The number after the x is the base number and is always 10. The number in superscript (11) is the exponent.

Part I: Writing Numbers in Scientific Notation

To write a large number in scientific notation, put a decimal after the first digit. Count the number of digits after the decimal you just wrote in. This will be the exponent. Drop any zeros so that the coefficient contains as few digits as possible.

Example: 123,000,000,000

      Step 1: Place a decimal after the first digit. 1.23000000000

      Step 2: Count the digits after the decimal…there are 11.

      Step 3: Drop the zeros and write in the exponent. 1.23×10^{11}

Writing tiny numbers in scientific notation is similar. The only difference is the decimal is moved to the left and the exponent is a negative. A tiny number written in scientific notation looks like this:

$$4.26 \times 10^{-8}$$

To write a tiny number in scientific notation, move the decimal after the first digit that is not a zero. Count the number of digits before the decimal you just wrote in. This will be the exponent as a negative. Drop any zeros before or after the decimal.

Example: .0000000426

      Step 1: 00000004.26

      Step 2: Count the digits before the decimal…there are 8.

      Step 3: Drop the zeros and write in the exponent as a negative. 4.26×10^{-8}

Part II: Adding and Subtracting Numbers in Scientific Notation

To <u>add</u> or <u>subtract</u> two numbers with exponents, the exponents must be the same. You can do this by moving the decimal one way or another to get the exponents the same. Once the exponents are the same, add (if it's an addition problem) or subtract (if it's a subtraction problem) the coefficients just as you would any regular addition problem (review the previous section about decimals if you need to). The exponent will stay the same. Make sure your answer has only one digit before the decimal – you may need to change the exponent of the answer.

Example: $1.35 \times 10^{6} + 3.72 \times 10^{5} = ?$

      Step 1: Make sure both exponents are the same. It's usually easier to go with the larger exponent so you don't have to change the exponent in your answer, so let's make both exponents 6 for this problem.

$$3.72 \times 10^{5} \rightarrow .372 \times 10^{6}$$

      Step 2: Add the coefficients just as you would regular decimals. Remember to line up the decimals.

$$1.35$$
$$+ \ .372$$
$$\overline{1.722}$$

      Step 3: Write your answer including the exponent, which is the same as what you started with.

$$1.722 \times 10^{6}$$

Part III: Multiplying and Dividing Numbers in Scientific Notation

To multiply exponents, multiply the coefficients just as you would regular decimals. Then add the exponents to each other. The exponents DO NOT have to be the same.

Example: 1.35×10^6 X $3.72 \times 10^5 = ?$

  Step 1: Multiply the coefficients.

$$1.35$$
$$\underline{\times\ 3.72}$$
$$270$$
$$9450$$
$$\underline{40500}$$
$$50220 \rightarrow 5.022$$

  Step 2: Add the exponents.

$$5 + 6 = 11$$

  Step 3: *Write your final answer.*

$$5.022 \times 10^{11}$$

To divide exponents, divide the coefficients just as you would regular decimals, then subtract the exponents. In some cases, you may end up with a negative exponent.

Example: 5.635×10^3 / $2.45 \times 10^6 = ?$

  Step 1: Divide the coefficients.

$$5.635 / 3.45 = 2.3$$

  Step 2: Subtract the exponents.

$$3 - 6 = -3$$

  Step 3: Write your final answer.

$$2.3 \times 10^{-3}$$

Scientific Notation Practice: Remember to show all your work, include units if given, and NO

CALCULATORS! All work and answers go on your answer sheet.

Write the following numbers in scientific notation:
22. 145,000,000,000
23. 13 million
24. 135 trillion

Complete the following calculations:

25. $3 \times 10^3 + 4 \times 10^3$
26. $4.67 \times 10^4 + 323 \times 10^3$
27. $9.85 \times 10^4 - 6.35 \times 10^4$
28. $1.278 \times 10^{-13} - 1.021 \times 10^{-10}$

29. three hundred thousand
       plus forty-seven thousand
30. 1.32×10^8 X 2.34×10^4
31. 3.78×10^3 X 2.9×10^2

32. 1.98×10^{-4} / 1.72×10^{-6}
33. 3.45×10^9 / 2.6×10^3

Dimensional Analysis

Introduction

Dimensional analysis is a way to convert a quantity given in one unit to an equal quantity of another unit by lining up all the known values and multiplying. The best way to start a factor-labeling problem is by using what you already know. In some cases you may use more steps than a classmate to find the same answer, but it doesn't matter. Use what you know, even if the problem goes all the way across the page!

In a dimensional analysis problem, start with your given value and unit and then work toward your desired unit by writing equal values side by side. Remember you want to cancel each of the intermediate units. To cancel a unit on the top part of the problem, you have to get the unit on the bottom. Likewise, to cancel a unit that appears on the bottom part of the problem, you have to write it in on the top.

Once you have the problem written out, multiply across the top and bottom and then divide the top by the bottom.

Example: 3 years = ? seconds

Step 1: Start with the value and unit you are given. There may or may not be a number on the bottom.

$$\boxed{3 \text{ years}}$$

Step 2: Start writing in all the values you know, making sure you can cancel top and bottom. Since you have years on top right now, you need to put years on the bottom in the next segment. Keep going, canceling units as you go, until you end up with the unit you want (in this case seconds) on the top.

$$\boxed{3 \text{ years}} \quad \boxed{\frac{365 \text{ days}}{1 \text{ year}}} \quad \boxed{\frac{24 \text{ hours}}{1 \text{ day}}} \quad \boxed{\frac{60 \text{ minutes}}{1 \text{ hour}}} \quad \boxed{\frac{60 \text{ seconds}}{1 \text{ minute}}}$$

Step 3: Multiply all the values across the top. Write in scientific notation if it's a large number. Write units on your answer.

$$3 \times 365 \times 24 \times 60 \times 60 = 9.46 \times 10^{7} \text{ seconds}$$

Step 4: Multiply all the values across the bottom. Write in scientific notation if it's a large number. Write units on your answer if there are any. In this case everything was cancelled so there are no units.

$$1 \times 1 \times 1 \times 1 = 1$$

Step 5: Divide the top number by the bottom number. Remember to include units.

$$9.46 \times 10^{7} \text{ seconds} / 1 = 9.46 \times 10^{7} \text{ seconds}$$

Step 6: Review your answer to see if it makes sense. 9.46 x 10^{7} is a really big number. Does it make sense for there to be a lot of seconds in three years? YES! If you had gotten a tiny number, then you would need to go back and check for mistakes.

In lots of APES problems, you will need to convert both the top and bottom unit. Don't panic! Just convert the top one first and then the bottom.

Example: 50 miles per hour = ? feet per second

Step 1: Start with the value and units you are given. In this case there is a unit on top and on bottom.

$$\left[\frac{50 \text{ miles}}{1 \text{ hour}}\right]$$

Step 2: Convert miles to feet first.

$$\left[\frac{50 \text{ miles}}{1 \text{ hour}}\right] \left[\frac{5280 \text{ feet}}{1 \text{ mile}}\right]$$

Step 3: Continue the problem by converting hours to seconds.

$$\left[\frac{50 \text{ miles}}{1 \text{ hour}}\right] \left[\frac{5280 \text{ feet}}{1 \text{ mile}}\right] \left[\frac{1 \text{ hour}}{60 \text{ minutes}}\right] \left[\frac{1 \text{ minute}}{60 \text{ seconds}}\right]$$

Step 4: Multiply across the top and bottom. Divide the top by the bottom. Be sure to include units on each step. Use scientific notation for large numbers.

50 x 5280 feet x 1 x 1 = 264000 feet

1 x 1 x 60 x 60 seconds = 3600 seconds

264000 feet / 3600 seconds = 73.33 feet/second

Dimensional Analysis Practice: Remember to show all your work, include units if given, and NO CALCULATORS! All work and answers go on your answer sheet. Use scientific notation when appropriate.

Non-metric Conversions:
1 hectare (Ha) = 10000 square meters
1 barrel of oil = 159 liters

34. 1200 cm per hour = ? km per week
35. The U.S. consumes approximately 20 million barrels of oil per day. How many liters of oil does the U.S. consume in one year?
36. A 340 million square meters of forest is how many hectares?

37. Termites live in the tropical rainforest breaking down dead and decaying plant material. As they break down the plant material they release methane, a greenhouse gas. Annually, 1,000 termites release approximately 500 grams of methane. Given a density of 3.5 X 10^6 termites per hectare, what is the annual amount of methane released, in kilograms, by the termites inhabiting a 3,000 hectare of tropical rain forest?

Interpreting Data Practice:

The following questions are to help you practice reading information shown on a graph. Answer each question on the separate answer sheet.

38. Identify the graph that matches each of the following stories:
    a. I had just left home when I realized I had forgotten my books so I went back to pick them up.
    b. Things went fine until I had a flat tire.
    c. I started out calmly, but sped up when I realized I was going to be late.
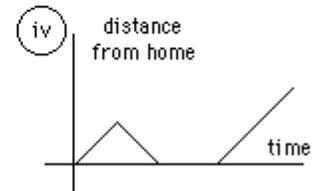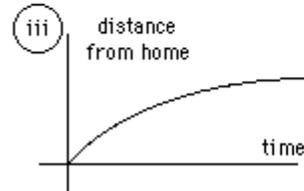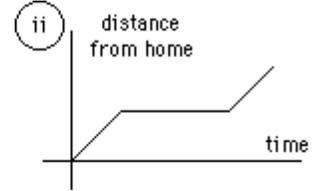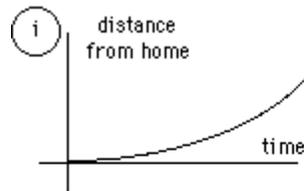
39. The graph at the right represents the typical day of a teenager. Answer these questions:
    a. What percent of the day is spent watching TV?
    b. How many hours are spent sleeping?
    c. What activity takes up the least amount of time?
    d. What activity takes up a quarter of the day?
    e. What two activities take up 50% of the day?
    f. What two activities take up 25% of the day?

40. Answer these questions about the graph below:
    a. How much rain fell in Mar of 1989?
    b. How much more rain fell in Feb of 1990 than in Feb of 1989?
    c. Which year had the most rainfall?
    d. What is the wettest month on the graph?
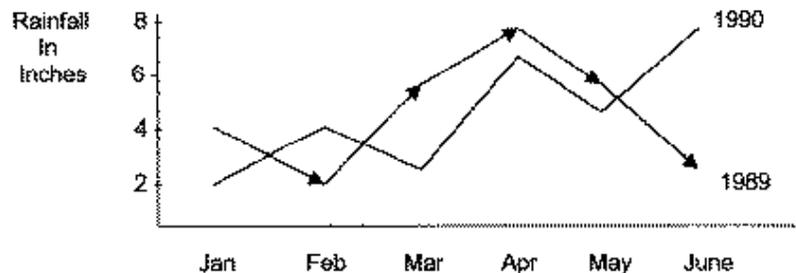
41. Answer these questions about the graph at the right:
    a. What is the dependent variable on this graph?
    b. Does the price per bushel always increase with demand?
    c. What is the demand when the price is 5$ per bushel?
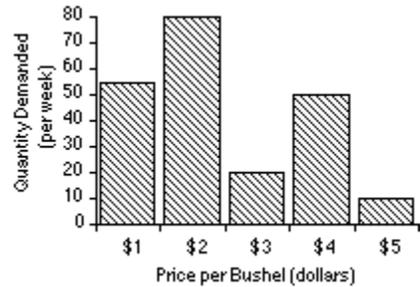
42. The bar graph below represents the declared majors of freshman enrolling at a university. Answer the following questions:
    a. What is the total freshman enrollment of the college?
    b. What percent of the students are majoring in physics?
    c. How many students are majoring in economics?
    d. How many more students major in poly sci than in psych?
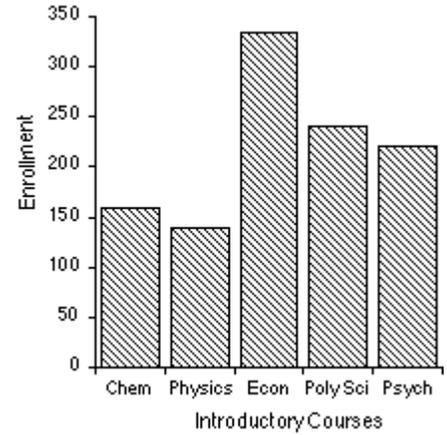
43. This graph represents the number of A's earned in a particular college algebra class. Answer the following questions:
    a. How many A's were earned during the fall and spring of 2009?
    b. How many more A's were earned in the fall of 2010 than in the spring of 2010?
    c. In which year were the most A's earned?
    d. In which semester were the most A's earned?
    e. In which semester and year were the fewest A's earned?

2009
2010
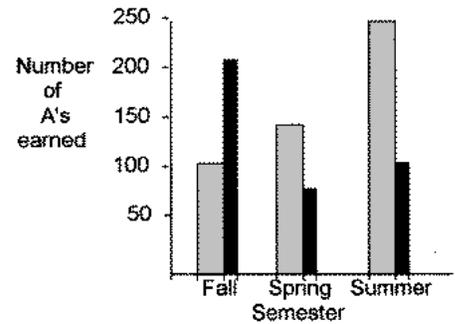
Graph Making Practice:

Use the following steps to create graphs and answer questions for the problem below. All your work will go on the separate answer sheet.

1. *Identify the variables. The independent variable is controlled by the experimenter. The dependent variable changes as the independent variable changes. The independent variable will go on the X axis and the dependent on the Y axis.*
2. *Determine the variable range. Subtract the lowest data value from the highest data value.*
3. *Determine the scale of the graph. The graph should use as much of the available space as possible. Each line of the scale must go up in equal increments. For example, you can go 0, 5, 10, 15, 20, etc. but you cannot go 1, 3, 9, 34, 50, etc. Increments of 1, 2, 5, 10, or 100 are commonly used but you should use what works best for the given data.*
4. *Number and label each axis.*
5. *Plot the data. If there are multiple sets of data on one graph, use a different color for each.*
6. *Draw a smooth, best-fit line for each data set.*
7. *Title the graph. Titles should explain exactly what the graph is showing and are sometimes long. Don't be afraid of a long title!*
8. *Create a key to the graph if there is more than one set of data.*

Age of the tree in years	Average thickness of the annual rings in cm. Forest A	Average thickness of the annual rings in cm. Forest B
10	2.0	2.2
20	2.2	2.5
30	3.5	3.6
35	3.0	3.8
50	4.5	4.0
60	4.3	4.5

44. The thickness of the annual rings indicate what type of environmental situation was occurring at the time of its development. A thin ring, usually indicates a rough period of development. Lack of water, forest fires, or a major insect infestation. On the other hand, a thick ring indicates just the opposite.

A. Make a line graph of the data.
B. What is the dependent variable?
C. What is the independent variable?
D. What was the average thickness of the annual rings of 40 year old trees in Forest A?
E. Based on this data, what can you conclude about Forest A and Forest B?

18

Name: _____   **APES Math Prep Answer Sheet**

Remember to show all work, include units on each step & clearly identify your final answer. **NO CALCULATORS!!!!**

DECIMALS

1.
 	
        Answer: _____
	2.
	
	        Answer: _____

3.
 	
        Answer: _____
	4.
	
	        Answer: _____

5.
 	
        Answer: _____
	6.
	
	        Answer: _____

7.
 	
        Answer: _____
	8.
	
	        Answer: _____

AVERAGES

9.
 	
        Answer: _____
	10.
	
	        Answer: _____

PERCENTAGES

11.	12.
Answer: _____	Answer: _____
13.	**14.**
Answer: _____	Answer: _____
15.	**16.**
Answer: _____	Answer: _____
17.	
Answer: _____	

METRIC SYSTEM

18.	19.
Answer: _____	Answer: _____
20.	**21.**
Answer: _____	Answer: _____

SCIENTIFIC NOTATION

22. Answer: _____	**23.** Answer: _____
24. Answer: _____	**25.** Answer: _____
26. Answer: _____	**27.** Answer: _____
28. Answer: _____	**29.** Answer: _____
30. Answer: _____	**31.** Answer: _____
32. Answer: _____	**33.** Answer: _____

DIMENSIONAL ANALYSIS

34.

Answer: _____

35.

Answer: _____

36.

Answer: _____

37.

Answer: _____

INTERPRETING DATA

38.

a. _____

b. _____

c. _____

39.

a. _____   d. _____

b. _____   e. _____

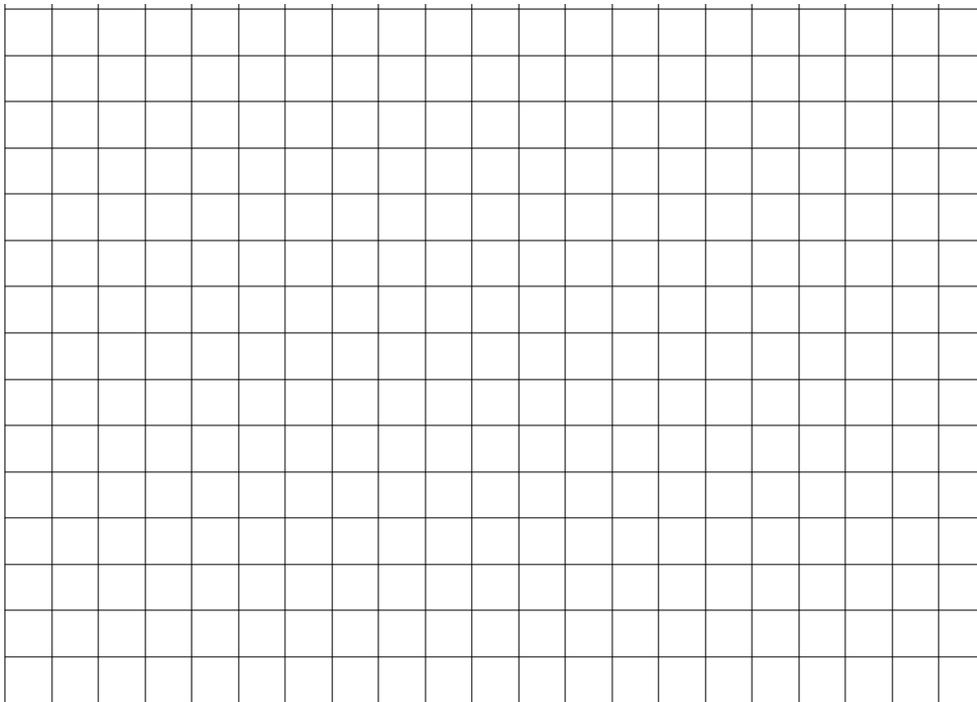c. _____   f. _____

40.
    a. _____

    b. _____

    c. _____

    d. _____

41.
    a. _____

    b. _____

    c. _____

42.
    a. _____   c. _____

    b. _____   d. _____

43.
    a. _____   d. _____

    b. _____   e. _____

    c. _____

GRAPHING PRACTICE

44a.

44b.

44c.

44d.

44e.