Unit I
Problem Solving

At the conclusion of each class, create a cheat sheet here to summarize the material.

1 Proportions and Change

2 Geometry and Unit Conversions

Project

Scenario: Your aunt and uncle have decided to add a set of flower beds all around the border of their yard. They are considering whether you should have the mulch delivered and spread it themselves or hire someone else to do it. They know you worked a landscaping job one summer and ask you which option would really be cheaper.

Your task: Analyze the costs (in both money and time) of DIYing the mulch-spreading vs hiring someone to take care of it. "Hiring someone else" could mean anything from hiring a full-service professional landscaping company to ordering the mulch yourself and picking up an independent contractor on craigslist. Think about who these relatives are (make up any details you wish). Write an email to your relatives explaining the options and making a recommendation.

Product: This email should be typed and be mostly in paragraph form with the usual sections: a greeting with few introductory sentences to make it clear what the email is about; a body that shows the background information for the relevant costs (feel free to put this in bullet points if it feels natural to you); a short conclusion explaining how you think the two options compare, given their circumstances and priorities; an email signature with all group members' names. Do not include any explicit calculations in the email, just write the email the way you would an actual email: you need give your starting data along with its source (ex, a link), any results you calculated, and your reasoning and conclusions. You wouldn't type out the calculations in a situation like this, but you'd want to include enough information for your aunt and uncle to verify them if they wish. See attached sample for an example.

Submission Guidelines:

- Submit online under the named assignment.

- Include a separate page where you show your work for calculating the quantity of mulch required along with any other relevant calculations.

- Cite data for your sources. You must provide a source for each piece of information which is not common knowledge, and you should cite it wherever you first use that information.

- Use complete sentences and correct grammar and spelling. This product may be informal since it is an email, but it must be respectful and appropriate for older relatives.

Sample Project

Below is a sample assignment and a good submission. Note that the topic is different from your assigned Project 1 topic.

Scenario: Over the summer, you began to bake whole wheat bread at home. You enjoyed the process and love the product, but your parents have questioned whether this is a good idea - after all, the ingredients are expensive and the process takes time. You could just buy bread. Analyze the situation and write up your findings in an email to your parents. Make sure you include all the costs (ingredients, supplies, electricity, time, etc.).

Dear Mom and Dad,

I know you're worried about me, but I checked all the numbers, and it's actually cheaper for me to bake my own bread. It does take a lot of time, but I really like doing it, and it tastes wonderful. I'm using this recipe. The ingredients would cost about $1.61 if I purchased them at the Bakers on Saddlecreek today:

- 500g whole wheat flour: Hudson Cream is $2.99 for a 5lb bag, or $0.67

- 9g salt: $0.59 for 26oz, or under $0.01

- 8g instant yeast: Fleischmann's is $5.99 for 4oz, or $0.42

- 200g milk: $1.49 per gallon, or $0.08

- 1 tbsp honey (yeah, I edited the recipe): Nature Nate's is $7.49 for 16oz, or $0.33

- 1 tbsp butter: $3.29 for 2 cups, or $0.10

There is some cost to heat the oven, which is on for about 45 minutes. I don't know what my oven uses exactly, but one of the energy companies estimates that ovens average 3000 watts, and I pay OPPD $0.1012 per kilowatt-hour; that means my 45 minutes costs about $0.23. The energy cost from my mixer is negligible. It's only a few cents an hour, and I only use it for a few minutes. I won't count the dishwasher either because we would run it anyway. I also didn't have to buy any tools because I already had them.

I know you're going to tell me to check my time, too, even though I'm doing this to relax. I make bread once a week, and it takes a few minutes to mix the dough on Friday when I get home, then I stick it in the refrigerator. The next morning, I knead it while I wait for my coffee to brew, then I have to let it rise and cook it. I do have to be home for about three hours here because I'm doing things periodically. If you want to put a dollar value on it, I make $50,000, which means about $25/hr, so it's about $6 for maybe 15 minutes that I'm actually doing stuff. On the other hand, I wouldn't be at work on Saturday morning anyway, so I don't think it counts, and I kind of like hanging around the kitchen and eating breakfast or talking to my roommates while it cooks.

In total, my cost comes out to $1.84 and 15 minutes of work, which is less than Rotella's whole wheat (it's $3 on sale this week), and I like it better. Please don't worry so much about me! And come share my bread.
Love, Your Kid

Day 1 - Proportions and Change

1. A class has 27 students. 13 have dogs, 4 have cats, 1 has an axolotl, and 1 has a chinchilla. What percentage of students have dogs? What percentage of students don't have pets?

2. A TV originally priced at $799 is on sale for 30% off. Then there is a 9.2% sales tax. Find the price after including the discount and sales tax.

3. The US federal debt at the end of 2001 was $5.77 trillion and grew to $6.20 trillion by the end of 2002. At the end of 2005 it was $7.91 trillion and grew to $9.45 trillion by the end of 2006. Calculate the absolute and relative increase for 2001-2002 and 2005-2006. Which year saw a larger increase in federal debt?

The table gives the state percentages of high school graduates who took standardized tests (note: some students may have taken both exams).

	SAT		ACT	
	2001	2006	2001	2006
Alabama	9%	9%	69%	79%
Alaska	51%	51%	34%	25%
Arizona	34%	32%	28%	18%
Arkansas	6%	5%	75%	75%
California	51%	49%	12%	14%

Based only on the information in the table, determine whether each of the following statements is true (T), false (F), or cannot be determined (NA).

4. More students from Arizona took the ACT than the SAT in 2006.

5. In 2001, more Alaskan than Arizonan students took the ACT.

6. No more than 9% of the students from Alabama took both exams in 2001.

7. About 63% of California students took at least one of the exams in 2006.

Evaluate the following pairs of claims to determine whether they are equivalent (E), in conflict (C), or not comparable because they're talking about different things (NA).

8. "16.3% of Americans are without health insurance."
    "Only 55.9% of adults receive employer provided health insurance."

9. "Every year since 1950, the number of American kids gunned down has doubled."
    "The number of child gunshot deaths has doubled from 1950 to 1994."

10. "We mark up the wholesale price by 33% to come up with the retail price."
    "The store has a 25% profit margin."

Day 2 - Geometry and Unit Conversions

1. A 1000 foot spool of bare 12-gauge copper wire weighs 19.8 pounds. How much will 18 inches of the wire weigh, in ounces?

2. Google maps has told Juanita that her car trip will be 32 miles. Juanita has already gone 14 miles. How fast, in miles per hour, must Juanita drive to arrive in 16 more minutes?

3. Ibrahim owns a rectangular shaped property having a width of 1.9 miles and length of 3.6 miles. Once a week, Ibrahim walks around the perimeter of his property at a pace of 4.2 miles per hour. How many hours does it take Ibrahim to walk around the perimeter of his property once?

4. The Deepwater Horizon oil spill resulted in 4.9 million barrels of oil spilling into the Gulf of Mexico. Each barrel of oil can be processed into about 19 gallons of gasoline. How many cars could this have fueled for a year? Assume an average car gets 20 miles to the gallon and drives about 12,000 miles in a year.

5. A website says that you'll need 48 fifty-pound bags of sand to fill a sandbox that measures 8ft by 8ft by 1ft. How many bags would you need for a sandbox which has a circular base of radius 3ft and a depth of 2ft?

6. You'd like to make as many brownies as possible for a bake sale. You have two 8 oz unopened cans of unsweetened cocoa and plenty of all the other ingredients. Your recipe calls for 1 1/4 cups of cocoa for one pan of brownies. How many pans of brownies can you make?

Nutrition Facts

About 32 Servings Per Container

Serving Size	1 tbsp (6g)

Amount per serving

Calories 30

	% Daily Value*
Total Fat 1.5g	**2%**
Saturated Fat 1g	**4%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 0mg	**0%**
Total Carbohydrate 3g	**1%**
Dietary Fiber 2g	**7%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 1g	

Vitamin D 0mcg 0% • Calcium 10mg 0%
Iron 0.9mg 4% • Potas. 90mg 2%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

7. The grocery store has bulk pecans on sale, which is great since you're planning on making 10 pecan pies for a wedding. Your recipe calls for 1 3/4 cups of pecans per pie; however, in the bulk section, there's only a scale available, not a measuring cup. You run over to the baking aisle and find a bag of pecans. The nutrition label is at right. How many pounds of pecans should you buy?

Nutrition Facts

Serving Size: 1 cup, halves (99 g)
Servings per Container: about 2

Amount Per Serving

Calories 684	Calories from Fat 596
	% Daily Value*
Total Fat 71g	110%
Saturated Fat 6g	31%
Trans Fat	
Cholesterol 0mg	0%

Answers: 1. 0.475 oz.   2. 68 mph.   3. 2.6hrs.   4. 155,000 cars (note we had to make a choice about how many digits to round to).   5. 43 bags (note I decided to round up).   6. 3 pans (note we rounded down, although you could argue that you can just make 3.2 recipes and make three pans of really thick brownies or four pans of pretty thin brownies).   7. 1.6 lbs (note we rounded to the nearest integer).