

4.1 Where does your electricity come from?

(Word Processor, internet)

10 points

Name _____

Due Date _____

1. Where do you live? (City, Zip code)
2. Who is your electricity supplier?
 - Go to <http://www.cted.wa.gov/>
 - Click on the tab marked “energy policy”
 - Select “programs and services” from the left hand side menu and then select “Fuel Mix Disclosure” from the sub-menu.
 - Click on [2007 Electric Utility Fuel Mix Reports \(2006 actual electricity production data\)](#) (It is in the second set of reports.)
 - Find your electric company.
3. . List all the sources of electricity that your electric company has and what percentage. You can omit any that have 0%.
4. Which of the above sources are renewable?
5. What percentage of your electricity comes from renewable resources?
6. Which of the sources produce CO₂?
7. What percentage of your electricity produces CO₂?
8. Write a one paragraph summary of the source of your electricity. Then write 2-3 paragraphs about the environmental impacts of the electricity you use. Focus on the

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sources that provide at least 10% of your electricity. For instance, if 90% of your electricity is hydroelectric, you will focus on the impacts of hydroelectric. If your electricity comes from 30% hydro, 30% coal and 30% nuclear, you will need to address the impacts of all three of those, but not in as much detail as if you had a single source.

9. Include a correctly formatted list of all your sources.

4.2 How much gas do you use?

10 points

Name _____

Due Date _____

What kind and year of car do you drive?

1. The next time you fill up your car with gas, write down how many miles are on the odometer. DO NOT TOP OFF. _____
2. Record all of your trips for 2 days, and the number of miles you drive for each

| Destination | Miles |
|-------------|-------|
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| Destination | Miles |
|-------------|-------|
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3. The next time you fill up your car, note the mileage and the number of gallons of gasoline you used. (Note, you can fill your tank up at any time, it does not need to be empty.) DO NOT TOP OFF
4. Mileage: _____
5. Gallons of gasoline _____
6. How much did you pay per gallon? _____
7. Subtract #1 from # 4 to get the total miles driven between fill-ups _____
8. Divide the number of miles (#7) by the gallons to get your fuel mileage
9. How much do you pay per mile for gasoline?
10. How much did you pay for the gasoline over the 2 days you kept track of your miles?
How much do you pay per year (multiply the 2 days total by 183)
11. If you don't use a car, how much do you pay for bus fare in a week? How far is your trip to school?

4.3 The True Cost of Your Car

15 points

Name _____

Due Date _____

Most people only think of gasoline when they think of the cost of their car. However, this is often a small portion of the cost of having a vehicle.

The true cost includes:

- Gas
- Maintenance
- The cost of the car
- Insurance
- Licensing
- Interest
- Tolls, taxes, tickets, parking

(of course this does not count the cost to the environment or your time or many other things!)

First of all, the easy part - the cost of gas.

1. What is your car's gas mileage (get it from 4.2)
2. How much do you pay for a gallon of gasoline?
3. What is your cost per mile for gas? (divide #1 by #2)

The car's cost:

4. How much did you pay for your car?
5. How many miles did it have when you bought it?
6. How many miles will it have when you stop using it?
7. How many miles will you drive your car? (Subtract 5 from 6)
8. How much will you pay for your car per mile? (divide 4 by 7)

Maintenance

9. One of the hardest things to judge is how much a car is to maintain. On average, most cars cost about 5-10 cents per mile to maintain. If your car is relatively cheap (i.e. a newer small sedan) use 5 cents per mile. If you have a larger car, an older car, a luxury

4.3 The True Cost of Your Car

15 points

brand (i.e. Volvo, Lexus, etc) or 4 wheel drive, use the 8-9 cents mark. This includes oil changes and tires.

10. Estimated cost per mile of maintenance: _____

Annual costs:

Insurance and fees

11. How many miles do you drive per year (average is 10,000)? _____

12. How much do you pay for insurance a year?

13. How much do you pay for license, smog test, fees, taxes etc. per year?

Financing: Most people take out a loan to purchase a vehicle. Even if you didn't, the money you spent on getting a car could have been put into a savings account and earned interest every year.

14. If you took out a loan for your car, multiply #4 by 10% to get you annual finance costs.
If you own your car and didn't take a loan, multiply by 5% (the amount of interest you could have earned on that money if you did not buy your car with it)

Other costs:

15. Do you pay any tolls when you drive? Parking? How much per day?
_____ (note: Highline charges about \$0.50 per day to park)

Multiply by 300 or so to get the amount you pay per year) _____

16. Total Annual costs: Add up # 12, 13, 14, and 15. This is your annual cost:

17. Divide 16 by the number of miles you drive in a year (#11) to get your per mile costs.

Now, add up:

Gas cost per mile:(#3) _____

Car cost per mile(#8) _____

Maintenance (#10) _____

Annual costs(#17) _____

18. TOTAL COSTS PER MILE: _____

4.3 The True Cost of Your Car

15 points

19. Multiply the answer to #18 by #11 to get your total car costs per year _____
20. If you work, what is your estimated hourly wage? _____
21. Subtract the amount taken out for taxes (typically ~20%) to get your actual take-home pay per hour _____ (take #20 and subtract $0.20 \times \#20$)
22. In a year, how many hours do you work to pay for driving your car (divide #19 by #21)
23. How many hours a week do you drive to support your car? (Divide #22 by 52)
24. Write a paragraph about your reaction to this information. What were you surprised by? Will knowing the actual expenses of your car change the amount you drive? How much would you save by not driving once a week?

4.4 Your car vs. public transport

5 points

Name _____

Due Date _____

1. What kind and year of car do you drive?
2. Where do you live? Give the closest major intersection, city and zip code
3. How many miles is it from your house to campus? Either measure with your car's odometer or use mapquest.com or maps.google.com to get the actual distance.
4. Using the amount you looked determined from assignment 4.3, how much does it cost for you to drive, round trip from your abode to campus?
5. Again from assignment 4.3, how many hours do you work per week to support your car?
6. Go to <http://tripplanner.metrokc.gov/> (note- even though this is a King county website, it will work for Pierce County as well).
7. Enter your home and school addresses and when you normally come to school and print off the results.
8. How much money would it cost you to take pubic transportation each day?
9. How much time would it take you to take public transport to and from school?
10. Compare the costs of public transport vs. your car. (Using the costs from 4.3) How much would you save/spend each day if you used public transport?

4.4 Your car vs. public transport

5 points

11. Compare the time costs of public transport vs. your car. How much more time would it take you to take the bus than to drive? What about if you include the amount you work to support your car? (i.e. if you work 20 hours per week to support your car, and it would take 10 hours more per week to take the bus, you would SAVE 10 hours per week by taking the bus)

4.5 You're in Hot Water!

10 points

Name _____

Due Date _____

1. How do you heat your water? (i.e. what kind of hot water heater do you have?)
2. Water comes in to your house at about 50 degrees. (If you want, you can measure this with thermometer put into cold water.) The water you use in the shower typically is at about 100 degrees. What is the temperature change?
3. How much water do you use when you shower? You can either take this number from your homework on water use or recalculate it by measuring the amount of water that comes out of your shower in 10 seconds, multiply it by 6 and then multiply it by the typical duration of your shower in minutes. Be sure to let me know how you got your answer!

To warm one pound (16 oz) of water 1 degree, you need 1 BTU of energy.

4. How many pounds of water are you heating in your shower? (You will need to find out how many pounds a gallon of water weighs).
5. How many BTUs will it take to raise the temperature of your shower water by 1 degree? 2 degrees? 10 degrees?
6. How many BTUS do you need to raise your shower water temperature from 50 degrees to that nice 100 degrees you enjoy?

Different types of hot water heaters heat the water with different efficiency. If a heater were 100% efficient, then it would transfer all of the energy it consumes to the water. Unfortunately, this is not the case in the real world.

Typical efficiencies:

| | |
|--|------------|
| Hot water heater | Efficiency |
| Typical gas hot water heater with a tank | 60% |

4.5 You're in Hot Water!

10 points

| | |
|--|-----|
| High efficiency gas hot water heater with tank | 65% |
| Typical efficiency electrical with tank | 90% |
| High efficiency electric with tank | 95% |

A water heater that is 50% efficient transfers half of the energy to the water and loses half. A hot water heater that is 75% efficient transfers three-quarters of its energy to the water but loses a quarter.

7. How much energy does your hot water heater take to heat the water for your shower (this should be a higher number than #6)

Now you will convert this number of BTUs into a more understandable number. If your hot water heater is electric, then you will need to know the energy in kilowatt hours (kwh). 1 BTU = 0.000 293 kwh. If you use gas, you need to know how many therms this amount of energy is. 1 therm = 100,000 BTUS.

8. How many therms or kilowatt-hours of energy does heating the water for your shower take?
9. Look on your gas or electric bill for how much one therm or one kilowatt-hour (kwh) costs. (This is also available from your utility's website). What is the cost?
10. How much does your shower cost?
11. How many showers do you take in a month? How much per month do you spend on hot water for your shower?
12. How much could you save by reducing your amount of time in the shower by 5 minutes?

4.6 There's a light bulb on over your head

10 points

Name _____

Due Date _____

1. Look at your home electricity bill. How much electricity does your household use in a month? How much does this cost? What is the cost of each kilowatt-hour?
2. How much electricity do you use in a day? What is this cost?
3. List what you think are your primary electricity uses (i.e. What do you think you use the most electricity on?) Number them from most important (#1) to least important.
4. How many incandescent light bulbs are in your house?
5. Typically, these bulbs are ~60 watts (some will be more and some less). How many watts would be used if you turned on all the light bulbs in your house? (you may assume an average wattage of 60, or if you are really ambitious, add up all the wattage of these individual bulbs).
6. Convert this to kilowatts by dividing by 1000
7. If you turned on all these bulbs for one hour how many kilowatt-hours of power would you use?
8. How much would this cost?

4.6 There's a light bulb on over your head

10 points

9. How many hours a day are your lights on? (estimate)
10. What percentage of your lights are on at any given time? (estimate)
11. Take the number of hours (#9) , multiply by the percentage of bulbs on (#10), multiply by the total wattage of light bulbs in your house (#6) to get an estimate of the power you use for lighting incandescent bulbs in a day.
12. What percentage of your total electrical (#2) use is lighting (#11)?
13. How much do you spend for lighting your house each day? per month?
14. Switching to fluorescent bulbs would reduce your electrical for lighting by about 80%.
How much electricity would this save in a month? How much money would you save on your monthly electrical bill? How much in a year?
15. Does it make financial sense to buy compact fluorescent bulbs for your household?

4.7 Conserving power

10 points

Name _____

Due Date _____

1. Find your last electrical bill. How much electricity do you use and how much does it cost per kilowatt-hour (kwh)?
2. How much electricity does your household use per day? (divide the amount of electricity used per billing cycle by the number of days)
3. Go look at your electric meter read where it is now. (See the attached instructions). Record the date and time.
4. 2-3 days later, (at least 48 hours) look at your electric meter again. Record the reading, date and time.
5. How much electricity did you use?
6. How many hours were there between each meter reading?
7. How many kilowatt-hours per day did you average (divide #5 by #6 and multiply by 24)?

4.7 Conserving power

10 points

You will now see how much electricity you can conserve over the next 2 days... Your goal is to reduce the amount of energy you use as much as you can. Try to get other members of your household to do this too.

8. What did you/will you do to save electrical use over the 2 day period?

9. After 2 days, record the reading on your electric meter again. How much electricity did you use?

10. How many hours were there between meter reading #2 and #3 meter reading?

11. How many kilowatt-hours per day did you average (divide #9 by #10 and multiply by 24)?

12. How much did your usage change?

13. If you would continue this for a year, how much energy would you conserve?

14. How much money would you save?

4.8 Your Home Heating Energy Use and Costs

15 points

Name _____
Due Date _____

1. How is your home heated? Natural Gas, Oil, Electric, Baseboard Electric, Wood Stove, Electric Heat Pump, Space Heaters, Hydronic Heating, Other : _____

If you use wood or space heaters, you will need to consult with your instructor on how to proceed.

2. Where do you live?
3. What kind of home do you live in (i.e. single-family detached house, apartment, condominium, etc)
4. How many square feet is your home? (You can get this by looking up your address on www.zillow.com) or you can get it from your landlord if you live in an apartment. Of course you can always measure it too!)
5. How many stories is the heated part of your home (i.e. do not include attic if it is not heated, but do include a heated basement)
6. If you live in a building with more than one residence, how many walls do you share with someone else? Include the floor and ceiling if appropriate. For instance, if you live in a condo with someone on both sides, and someone below you but not someone above you, you share 3 walls.

Determining your yearly heating costs and use.

Chose the method appropriate for your case

If your home is oil heated:

7. How much oil did you use last winter and how much did it cost?

If your home is heated with electricity or gas:

Look at your July or August bill from last year (*whichever is lower*) to estimate what your gas/electrical use is when NOT heating your house. This will be your base use. (*If you are a Puget Sound Energy Customer, you can go online and get your information at www.pse.com. If you are a Seattle City Light Customer, you can just use their Home Resource Profile instead*)

8. Base electrical or gas use: _____ (Now enter it in the 3rd column in the table – it should be the same in each month.)
9. For each month in the past year, enter the amount of energy used in the second column.

4.8 Your Home Heating Energy Use and Costs

15 points

10. Calculate the amount of energy you use to heat your house each month by subtracting the base amount (Column 3) from the monthly amount (Column 2). Enter it in the fourth column

| Month | Use (KWH or Therms) | Base Month Use | Difference (amount used to heat your home) |
|-----------|---------------------|----------------|--|
| April | | | |
| March | | | |
| February | | | |
| January | | | |
| December | | | |
| November | | | |
| October | | | |
| September | | | |
| August | | | |
| July | | | |
| June | | | |
| May | | | |

11. Add up all of the monthly use (last column) above to get your home heating energy use (either in KWH if your home is heated electrically or in therms if you use gas.)
12. How much do you pay for your energy (per therm or per KWH)?
13. How much do you pay to heat your home in a year?
14. Look at how much energy you used to heat during January vs. February of this year. How much more energy did you use in January than February to heat your home?
15. The average temperature in these two months was 3 degrees apart (39 vs. 42 degrees), so this difference is basically the cost of heating your home those extra 3 degrees. What is the cost per degree?
16. If you turned your thermostat down 3 degrees for 9 months a year, how much energy would you save? How much money would you save?

4.9 Your energy use

5 points

Name _____

Due Date _____

1. What are the major ways you use energy? List as many MAJOR uses. For each, list what kind of energy is used (i.e. gas, electricity, etc.)
2. Estimate how much you think you spend on each of these areas per year? Do you think you spend more or less than the average Washingtonian on each of these? For each, include a brief explanation. For instance, you might say *“I believe I spend \$1000 on gasoline per year, because I fill-up my tank once a week, and it costs me about \$20. Since there are 52 weeks in the year, that is about \$1000. I think this is above the typical amount because I commute 15 miles each way each day, and I think that is more than most people do.”*

4.10A Home electricity use

5 points

Name _____

Due Date _____

1. Look at your home electricity bill. How much electricity does your household use in a month? How much does this cost? What is the cost of each kilowatt-hour?
2. How much electricity do you use in a day? What is this cost?
3. List what you think are your primary electricity uses (i.e. What do you think you use the most electricity on?) Number them from most important (#1) to least important. Also record these somewhere else for future reference.
4. Go through your house/apartment and list all the appliances or other things in your house that use electricity. Include everything that is plugged in as well as any other appliances (e.g. a hot water heater or baseboard heating) that are connected directly to the house electrical system.

4.10B Home electricity use

(Kill-a-watt)

10 points

Name: _____

Due Date: _____

1. Use the Kill-a-Watt to measure the electricity use from any appliance that you plug in and is always on. Record your results. For your refrigerator, please plug it in for at least an hour. You may want to do more. Other things that you might have in this section are your computer, clocks, electric toothbrush or other chargers

| Appliance | Watts used | Kilowatts used | Time measured | Amount of energy (Kilowatts) used per hour | Cost of electricity per kilowatt hour | Kilowatt hours used per day | Kilowatt hours used per month | Cost of the appliance per month |
|--------------|------------|----------------|---------------|--|---------------------------------------|-----------------------------|-------------------------------|---------------------------------|
| Refrigerator | | | | | | | | |
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2. Now we will measure the electrical use of anything else that you have that is plugged in but that is not normally on. Turn it on to measure the electricity consumed.

| Appliance | Watts used | Time measured | Kilowatts used | Amount of electricity | Typical amount of | Amount of energy | Kilowatt hours | Kilowatt hours | Cost of electricity | Cost of the appliance |
|-----------|------------|---------------|----------------|-----------------------|-------------------|------------------|----------------|----------------|---------------------|-----------------------|
| | | | | | | | | | | |

(Kill-a-watt)

[illegible]

- “Vampire” appliances: Some appliances are always on, and drawing some electricity, even when they seem to be off. Examples include televisions with remote controls, computers, DVD players, microwaves, any appliance with a clock, and satellite receivers. You will now look at how much these consume even when they are off. Because these typically draw low amounts, please measure each for a few minutes to get an accurate amount.

| Appliance | Watts | Time | Kilowatts | Kilowatt hours | Kilowatt hours | Cost of electricity | Cost of the |
|-----------|-------|------|-----------|----------------|----------------|---------------------|-------------|
|-----------|-------|------|-----------|----------------|----------------|---------------------|-------------|

