Lecture 2 – Unit Conversions

Question 1

Unit Conversions, Concepts

Economists often think of everything in monetary values because:

A) Economists are principally concerned with maximizing profits at all costs
B) Money is a very liquid asset and often represents a convenient unit to use when comparing things
C) Economists are unconcerned with intangible things, and intangible things cannot be converted to monetary values
D) Economists more than other specialists prefer to capture intangible things using hard constraints rather than conversion rates

Question 2

Liquidity

Order the following from least to most "liquid" (where we mean "liquid" in business terms, not physics terms):

1. A gold bar
2. A $100 bill
3. A swimming pool

A) 1 < 2 < 3
B) 2 < 3 < 1
C) 3 < 1 < 2
D) 2 < 1 < 3

Question 3

Cost of Labour Conversion Rates

A new electric car model is being manufactured at McMaster Motors. The following costs are necessary as part of developing this car, of which 250 will be manufactured:

Budgeted Production Cost	$8,000,000
Expected Design Cost	$1,300,000
Expected Manufacturing Costs	
Material Cost per Car	$18,500
Production Overhead Cost per Car	$780
Base Hourly Wage	$65/hr (per person)

The time it takes the staff (who all work at once) to produce the first car is 13 hours (i.e., 12 people all work 13 hours and one car is produced). As time goes on, the staff get quicker at producing cars while retaining the same quality

level. For the first 100 cars (including the first), it takes an average of 11 hours per car (i.e., it took 12 people 1100 hours each to produce the first 100 cars). For the next 100 cars, it takes an average of 9 hours per car. For the last 50 cars, it takes an average of 8 hours per car.

What is the direct labour cost of producing all 250 cars?

Question 3.1

Follow-up Question

If the actual design cost of the cars is $1,200,000, what is the total production cost for this 250-car run?

A) $8,000,000
B) $7,892,000
C) $6,692,000
D) $5,140,000
E) $6,700,000

Question 3.2

Follow-up Question

After you've finished designing the car, what is the marginal cost of then producing the first car?

Question 3.3

Follow-up Question

What is the marginal cost of producing the 250th car?

Question 4

Cost of Time Conversion Rates

You are in the market for a new blender. After searching online, you find one you love for $319.99, but realize the shipping cost is $10. After some more searching, you find that the retailer has a physical location 15 km (20 minutes) away from you by car. Purchasing the item in the store will take 10 minutes. You have an email coupon that can only be redeemed in store for 20% off any item. Your car has a typical mileage of 8.5 L/100 km. Gas currently costs $1.60/L.

If you value your cost of free time as $50/hr – is it a cheaper option to ship the blender, or go get it yourself?

A) Shipping the blender is cheaper.
B) Getting the blender by yourself is cheaper.
C) Both options cost the same.
D) I don't need a blender.

Question 5

Environmental Impact

Using the following information, calculate the air pollution costs of the aluminum smelting and refining sector in Canada.

Pollutant	$PM_{2.5}$	NO_2	O_3
Health cost per year, from all emissions (Billions of CAD)	$77,000,000,000 ($77 billion CAD)	$29,500,000,000 ($29.5 billion CAD)	$7,000,000,000 ($7 billion CAD)
Emissions per year, total (million tonnes)	1.6	1.8	1.9
Emissions per year, aluminum smelting and refining sector in Canada (tonnes)	3400	1100	2000

Question 5.1

Environmental Impact

Suppose that 10% of all smelted and refined aluminum produced in Canada is used for beverage cans, and that one standard beverage can is made from 15 grams of aluminum. Suppose the Canadian sector is producing a total of 3.0 million tonnes of aluminum yearly. From this information and the information in Question 5, what is the air pollution costs present in the manufacturing of the aluminum for one beverage can? (Ignore additional pollution from the specific refining of the aluminum into the can shape.)

Question 5.2

Environmental Impact

Transporting processed aluminum (from various locations across Canada) to a firm that shapes the cans (in various locations across Canada) takes an average of 800 km per shipment. Transporting the empty cans to the facilities where the cans are filled, labelled, and packaged takes an average of another 100 km per shipment. Transporting the filled cans to retailers takes an average of 50 km per shipment.

Suppose a standard semi-trailer truck will transport 50,000 cans at once. With the current carbon tax valuation ($50/tonne of CO_2) and average CO_2eq emissions of 300 g-CO_2/km, what is the average carbon cost for the transportation of one beverage can?

Assume for the last part of the journey the cans are filled with liquid weighing down the truck and the city driving also lowers its gas mileage so it emits 800 g-CO_2/km.

Assume that in raw-form, the aluminum is dense enough that the semi can instead carry its max load of 55000 lbs worth of aluminum, and that at this capacity despite the highway driving it emits 500 g-CO_2/km.

Question 6

Option Premium Set-up

You urgently need to purchase a new car, and have three feasible options to pick from: A, B, or C. You will be financing this car (with monthly payments), can provide a $3,000 down payment today, and expect to drive 20,000 km/yr. Exclusively based on the following cost categories, which car is the cheapest option if the lifetime of the car (time period being evaluated) is six years?

(Note that the total monthly payment for the financing costs is given; we'll learn how you'll calculate these from the interest rates and payment periods later in the course.)

	A	B	C
Down Payment	$3,000	$3,000	$3,000
Remaining Cost (Amount being financed)	$20,000	$22,000	$24,000
Insurance	$250/month	$270/month	$190/month
Gas Mileage	9.0L/100km	7.0L/100km	7.5L/100km
Gas Price (Assume Unchanging)	$1.50/L		
Expected Lifetime Maintenance Costs	$15,000	$12,000	$16,000
Financing Costs	60 months @ 8.0% annual interest rate (monthly payment of $405.53)	60 months @ 7.5% annual interest rate (monthly payment of $440.83)	60 months @ 6.5% annual interest rate (monthly payment of $469.59)

A) Car A is the cheapest option
B) Car B is the cheapest option
C) Car C is the cheapest option
D) Cars A & B are equally the cheapest
E) Cars B & C are equally the cheapest

Question 6.1

Option Premium

You make the unexpected decision to purchase Car D instead, which you estimated would cost you $72,500.00 total over 6 years. The dealership tells you that the car is not yet available but will arrive in one-months' time. You make an agreement that you'll provide an extra non-refundable payment of $1,000 today as a "reservation cost," for the benefit of being able to back out of the entire deal (except the $1,000) within the next month.

Later that month, the dealership selling Car C has an end-of-season sale begin where the financing rate on Car C is reduced to 0% (e.g., 60 months @ 0.0% annual interest rate). Since this makes Car C cost less than even car D, you buy Car C. What was the added net value from buying this back-out option with the dealership selling Car D?

Question 7

Opportunity Cost

As a hunter and a gatherer, Edward hunts wild turkeys and gathers apples for his village. Since Edward can only hunt so much or gather so much in a week's effort, Edward may end the week with the following returns:

Scenario	Wild Turkeys	Apples
A	6	0
B	5	20
C	4	36
D	3	48
E	2	56
F	1	60

If Edward's past week reflected scenario C, but people of his village asked for more apples next week, what is the opportunity cost of gathering 12 more apples by moving to scenario D (assuming staying with option C was the best alternative we gave up)? What is the net change compared to sticking with scenario D? What is the opportunity cost of scenario D overall (still assuming staying with option C was the best alternative we gave up)?

Question 7.1

Opportunity Cost

Nolo has $800 but isn't sure what to do with it. He assesses three options of what to do with the money:

1. Hide the money under his mattress for one year

2. Invest the money in a savings account which will return 4% in one year.

3. Spend the money on a PS5. Nolo estimates he will value the enjoyment of playing the PS5 as $5/hr for the 200 hours he expects to play it this year. After one year, Nolo expects the PS5 to retain a value of $500.

If Nolo proceeds with the second-best option (determined by net value), what is the opportunity cost expended to gain the outcome of the 2nd best option?

Question 7.2

Opportunity Cost

Suppose Nolo opts to purchase the PS5. If NV_1, NV_2, and NV_3 represent the net value (relative to doing nothing, i.e., just keeping the $800) of each of the three options above, which of the following represents the opportunity cost of choosing the PS5?

a) NV_2
b) NV_3
c) NV_1+NV_2
d) $800
e) $832

Question 7.3

Opportunity Cost

Suppose Nolo opts to purchase the PS5. If NV_1, NV_2, and NV_3 represent the net value (relative to doing nothing, i.e., just keeping the $800) of each of the three options above, which of the following represents the relative value change of going with the PS5 compared to the best alternative?

a) Final value of PS5 – Cost of PS5
b) NV_3
c) $NV_3 – NV_2$
d) $NV_3 – NV_2 – NV_1$
e) Final value of PS5 – Cost of PS5 – Final Value of Investment Option

Question 8

Logical Fallacies

Sandy: “I believe we should increase spending towards our customer service department. Our manpower is low, and it is leading to user dissatisfaction.”

Chris: “Spending all our money on customer support would mean we need to cut production and fire employees.”

Which logical fallacy is being demonstrated here?

Question 8.1

Logical Fallacies

Sandy and Chris are assessing whether the company should implement environmental upgrades in order to pay less GHG emissions tax. Currently, the company spends $1 million per year on these taxes, but estimates that they could cut this down to $200,000 per year with a one-time $1.5 million investment.
Chris: "We should do the upgrades because it'll save money in the long run."

What's wrong with this argument?
a) nothing, it's valid and has correct premises.
b) it's valid but has incorrect premises.
c) it's invalid - it commits the straw man fallacy.
d) it's invalid - it's an ad hominem.
e) it's invalid - it's an appeal to emotion
f) it's invalid - it's a false dichotomy
g) it's invalid - it's an appeal to authority

Question 8.2

Logical Fallacies

Sandy: "I don't think we should, because Steve says it's a bad investment and that the government is going to drop the tax to stimulate the economy.."

What's wrong with this argument?
a) nothing, it's valid and has correct premises.
b) it's valid but has incorrect premises.
c) it's invalid - it commits the straw man fallacy.
d) it's invalid - it's an ad hominem.
e) it's invalid - it's an appeal to emotion
f) it's invalid - it's a false dichotomy
g) it's invalid - it's an appeal to authority

Question 8.3

Logical Fallacies

Chris: "But pollution has the potential to hurt people, money doesn't matter in situations where we have moral obligations to do the right thing."

What's wrong with this argument?
a) nothing, it's valid and has correct premises.
b) it's valid but has incorrect premises.
c) it's invalid - it commits the straw man fallacy.
d) it's invalid - it's an ad hominem.

e) it's invalid - it's an appeal to emotion
f) it's invalid - it's a false dichotomy
g) it's invalid - it's an appeal to authority

Question 8.4

Logical Fallacies

Sandy: "Chris, you drive a monster truck to work every day - who are you to say anything about what we should do towards pollution reduction?"

What's wrong with this argument?

a) nothing, it's valid and has correct premises.
b) it's valid but has incorrect premises.
c) it's invalid - it commits the straw man fallacy.
d) it's invalid - it's an ad hominem.
e) it's invalid - it's an appeal to emotion
f) it's invalid - it's a false dichotomy
g) it's invalid - it's an appeal to authority