Monmouth COLLEGE

- Name: _____
- Date: _____
- Section: _____

ECON 300: Intermediate Price Theory

Problem Set #1: Suggested Solutions

Fall 2024

INSTRUCTIONS:

- It is strongly recommended that students try out the problem set on their own before consulting the suggested solutions.

Problem 1. Formalizing the Budget Constraint

Suppose that in a local cafe, a cup of coffee costs \$2, and a sandwich costs \$4, and that you have \$24 to spend on coffee and sandwiches.

1.A. If you spend ALL of your budget on coffee, how many cups of coffee and sandwiches can you purchase?

A cup of coffee costs \$2 each, and you are spending \$24 on coffee, so you can purchase 12 cups. No sandwiches can be purchased.

$$\texttt{Max Cups of Coffee} = \frac{24}{2} = 12$$

1.B. If you spend ALL of your budget on sandwiches, how many cups of coffee and sandwiches can you purchase?

A sandwich costs \$4 each, and you are spending \$24 on sandwiches, so you can purchase 6 sandwiches. No amount of coffee can be purchased.

$$\texttt{Max Number of Sandwiches} = \frac{24}{4} = 6$$

1.C. If you already know that you have to buy two sandwiches, with the remaining budget, how many cups of coffee can you purchase?

Since you have to purchase 2 sandwiches, \$8 of your \$24 budget is already committed. So, with the \$16 remaining budget, you can purchase 8 cups of coffee.

$$\texttt{Max Cups of Coffee with 2 Sandwiches} = \frac{24 - 2 \times 4}{2} = \frac{16}{2} = 8$$

1.D. Why can't you purchase 6 cups of coffee and 4 sandwiches?

6 cups of coffee will cost \$12, and 4 sandwiches will cost \$16, a total of \$28. The cost of this bundle of 6 cups of coffee and 4 sandwiches exceed your budget.

$$\texttt{Cost of Bundle} = 2 \times 6 + 4 \times 4 = 12 + 16 = 28 > 24 = \texttt{Budget}$$

1.E. Would you be spending all of your budget if you purchase 7 cups of coffee and 2 sandwiches?

7 cups of coffee will cost \$14, and 2 sandwiches will cost \$8, a total of \$22. The cost of this bundle of 7 cups of coffee and 2 sandwiches fall within your budget.

$$\texttt{Cost of Bundle} = 2 \times 7 + 4 \times 2 = 14 + 8 = 22 > 24 = \texttt{Budget}$$

1.F. The budget constraint can be formally expressed as:

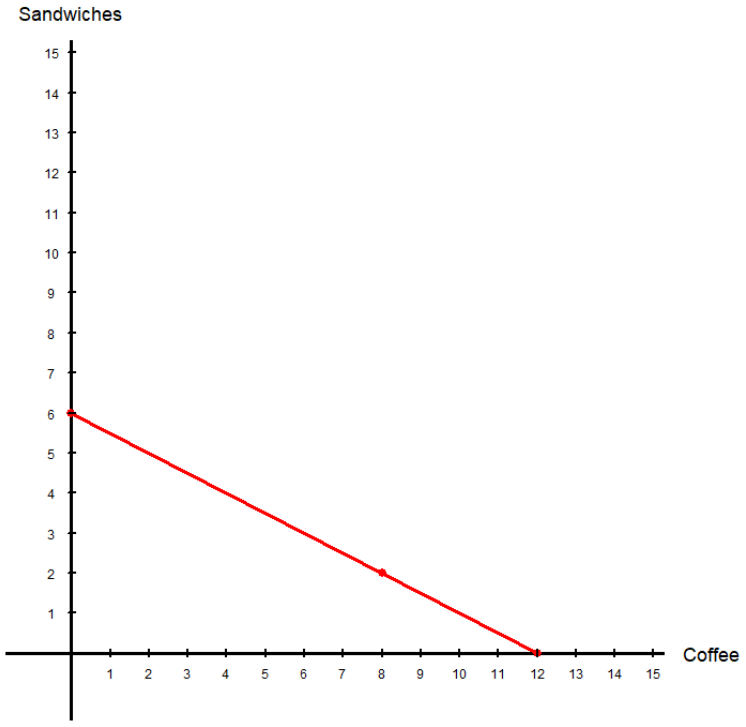
$$\texttt{Price of Coffee} \times \texttt{\# Coffee} + \texttt{Price of Sandwiches} \times \texttt{\# Sandwiches} = \texttt{Budget}$$

Using the relevant numbers, express your budget constraint as a mathematical equation.

$$2 \times \texttt{Coffee} + 4 \times \texttt{Sandwiches} = 24$$

1.G. Using the empty chart given below, plot your budget constraint with coffee on the horizontal (x) axis, and sandwiches on the vertical (y) axis.

- Plot the point that corresponds to your answer from Problem 1.A., 1.B, and 1.C.
- Linking these three points will give you the "budget line."



1.H. What is the slope of the budget line?
(Hint: The slope can be calculated as "rise / run.")

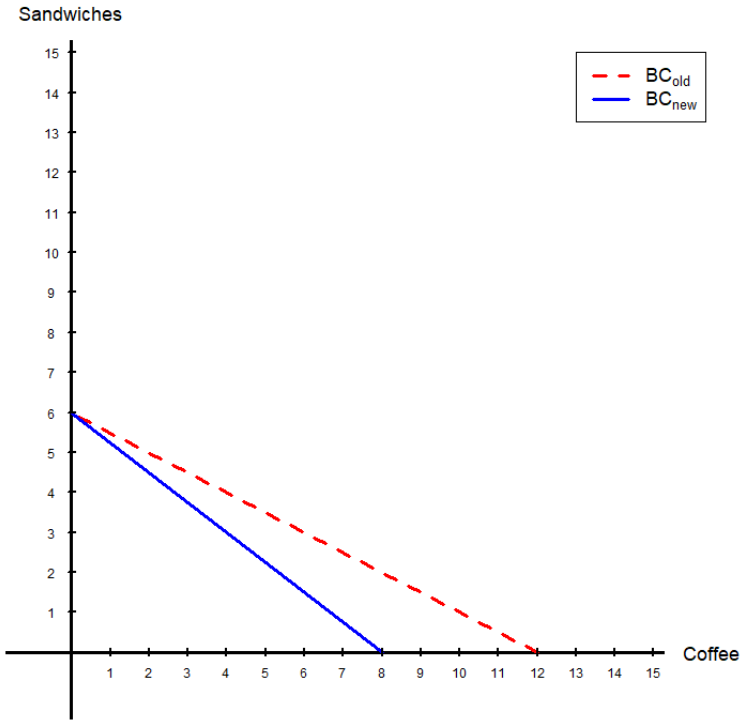
Using the x and y intercepts:

$$\texttt{Slope} = \frac{\texttt{Rise}}{\texttt{Run}} = \frac{\texttt{From 6 to 0}}{\texttt{From 0 to 12}} = \frac{-6}{12} = -\frac{1}{2}$$

Problem 2. Changes to the Budget Constraint

Due to the price of coffee beans increasing, the local cafe decides to increase their prices. Now, a cup of coffee costs \$3, and a sandwich costs \$4, and that you still have \$24 to spend on coffee and sandwiches.

2.A. In the empty chart below, plot and label the old (from Problem 1) and new budget constraints.



2.B. What happened to the "budget set"?

The budget set shrunk, since you can now afford less units of coffee.

2.C. What is the slope of the new budget line?

The slope of the new budget line is more "steep." In terms of numbers, the slope of the new budget line (using the x and y intercepts) can be calculated as follows:

$$\texttt{Slope} = \frac{\texttt{Rise}}{\texttt{Run}} = \frac{-6}{8} = -\frac{3}{4}$$

Problem 3. Interpreting the Budget Constraint

We return to the world before the price increase. A cup of coffee costs $2, and a sandwich costs $4, and that you have $24 to spend on coffee and sandwiches. (Same setup as Problem 1)

3.A. You have already placed an order for 2 cups of coffee and 5 sandwiches, spending all of your budget. If you then decide to get one more cup of coffee, how many sandwiches do you have to cancel? *(Hint: Assume that you can order "fractions" of coffee or sandwiches!)*

Since a cup of coffee is worth $2, you have to cancel "$2 worth" of sandwiches from your order. So, you have to give up half of a sandwich.

3.B. How many sandwiches have "the same worth" as one cup of coffee?

This is basically the same question as 3.A. Based on the prices set by the local cafe, a cup of coffee is worth half of a sandwich.

3.C. Are you happy with this trade-off? Why? Why not? *(Hint: There is no "correct" answer for this one.)*

There is no single correct answer for this question, because the answer will boil down to the readers' preferences. A coffee addict such as myself would (in most cases) be happy with the trade. People who do not drink coffee at all will not be happy with this trade-off. In order to answer this question, we will need to discuss the consumers' preferences, which will be the next topic we discuss.

Problem 4. Budget Constraints with Purchasing Limits

Suppose that in a local cafe, a cup of coffee costs \$2, and a sandwich costs \$4, and that you have \$24 to spend on coffee and sandwiches. However, due to overwhelming demand for coffee, the cafe decided to limit the number of cups of coffee that any customer can purchase to 6 cups.

4.A. If you spend all of your money on coffee, how many cups can you purchase?

If there were no purchasing limits, based on the price of coffee and your budget alone, you have enough purchasing power to buy 12 cups of coffee. However, due to the "ceiling" placed on coffee, you can only purchase 6 cups.

4.B. If you spend all of your money on sandwiches, how many can you purchase?

There are no purchasing limits to sandwiches, so you can purchase 6 sandwiches.

4.C. Can you purchase 6 cups of coffee and 3 sandwiches?

Yes, 6 cups of coffee and 3 sandwiches cost exactly \$24 which is equal to your budget, and does not exceed the purchasing limit:

$$\texttt{Expenditure} = \$2 \times 6 + \$4 \times 3 = 12 + 12 = 24$$

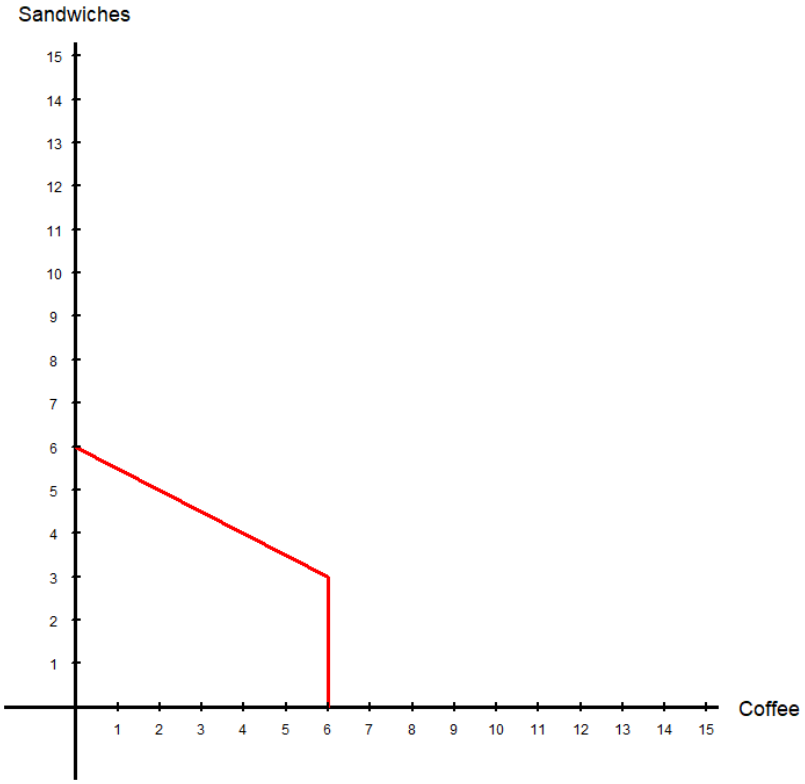
4.D. Can you purchase 8 cups of coffee and 2 sandwiches?

No. While you would have the budget to afford the bundle of 8 cups of coffee and 2 sandwiches, purchasing 8 cups of coffee is not allowed under the current "ceiling" on coffee purchases.

4.E. Can you purchase 10 cups of coffee and 1 sandwich?

No. While you would have the budget to afford the bundle of 10 cups of coffee and 1 sandwich, purchasing 10 cups of coffee is not allowed under the current "ceiling" on coffee purchases.

4.F. Using your answers from 4.A. ∼ 4.E., plot your budget constraint.

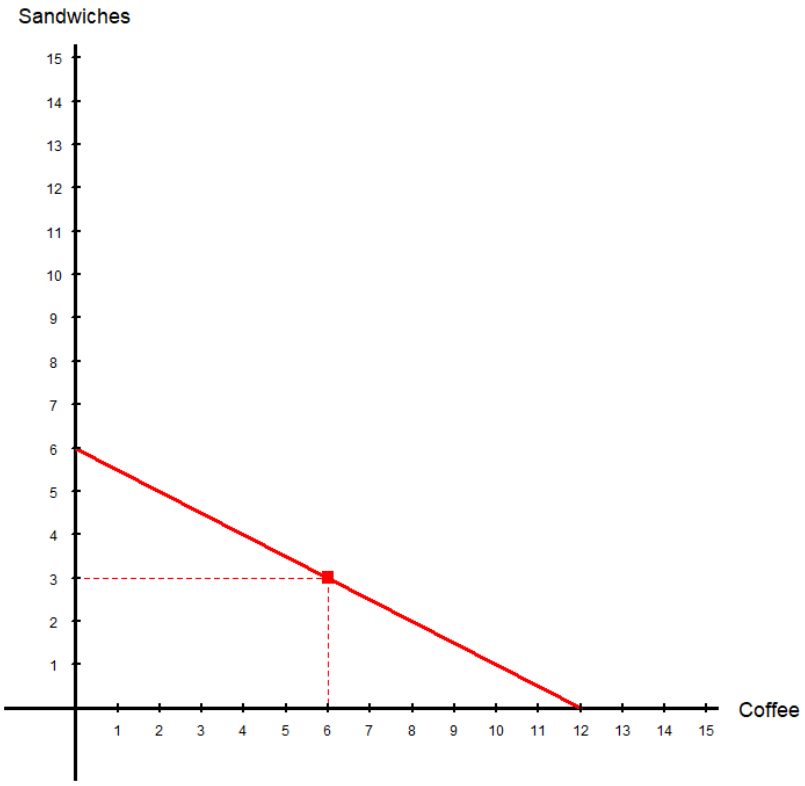


Problem 5. Budget Constraints with Endowments

Suppose that in a local cafe, a cup of coffee costs $2, and a sandwich costs $4. Instead of having a budget of $24, you now have 6 cups of coffee and 3 sandwiches that you can "trade" in the cafe. Since a cup of coffee costs $2, and a sandwich costs $4, you can trade in one of your sandwiches for two cups of coffee, or you can trade in one cup of your coffee for half of a sandwich.

5.A. Plot your budget constraint.

- Find your "endowment point," commodity bundle that you start off with.
- Find out how many units of coffee you can consume if you sell all of your sandwiches.
- Find out how many units of sandwiches you can consume if you sell all of your coffee.
- Draw a line through all three points.



5.B. Plot your budget constraint assuming that the price of coffee rises to \$4.