

2.4: Calculating Opportunity Cost

Learning Objectives

- Calculate the opportunity costs of an action

It makes intuitive sense that Charlie can buy only a limited number of bus tickets and burgers with a limited budget. Also, the more burgers he buys, the fewer bus tickets he can buy. With a simple example like this, it isn't too hard to determine what he can do with his very small budget, but when budgets and constraints are more complex, equations can be used to demonstrate budget constraints and opportunity cost.

Very simply, when Charlie is spending his full budget on burgers and tickets, his budget is equal to the total amount that he spends on burgers plus the total amount that he spends on bus tickets. For example, if Charlie buys four bus tickets and four burgers with his \$10 budget (point B on the graph below), the equation would be

$$\$10 = (\$2 \times 4) + (\$0.50 \times 4)$$

You can see this on the graph of Charlie's budget constraint, Figure 1, below.

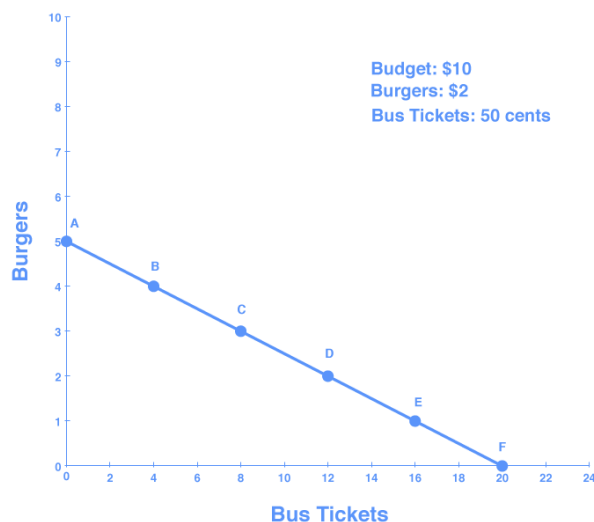


Figure 1. Charlie's Budget Constraint.

If we want to answer the question, "how many burgers and bus tickets can Charlie buy?" then we need to use the budget constraint equation.

Work It Out

Step 1. The equation for any budget constraint is the following:

$$\text{Budget} = P_1 \times Q_1 + P_2 \times Q_2 + \dots + P_n \times Q_n$$

where P and Q are the price and respective quantity of any number, n, of items purchased and Budget is the amount of income one has to spend.

Step 2. Apply the budget constraint equation to the scenario.

In Charlie's case, this works out to be

$$\begin{array}{l} \text{Budget} = P_1 \times Q_1 + P_2 \times Q_2 \\ \text{Budget} = \$10 \\ P_1 = \$2 \text{ (the price of a burger)} \\ Q_1 = \text{quantity of burgers} \\ P_2 = \$0.50 \text{ (the price of a bus ticket)} \\ Q_2 = \text{quantity of tickets} \end{array}$$

For Charlie, this is

$$\$10 = \$2 \times Q_1 + \$0.50 \times Q_2$$

Step 3. Simplify the equation.

At this point we need to decide whether to solve for Q_1 or Q_2 .

Remember, $Q_1 = \text{quantity of burgers}$. So, in this equation Q_1 represents the number of burgers Charlie can buy depending on how many bus tickets he wants to purchase in a given week. $Q_2 = \text{quantity of tickets}$. So, Q_2 represents the number of bus tickets Charlie can buy depending on how many burgers he wants to purchase in a given week.

We are going solve for Q_1 .

$$\begin{aligned} 2Q_1 &= 0.50Q_2 \\ 2Q_1 - 0.50Q_2 &= 0 \\ 2Q_1 - 0.50Q_2 + 10 &= 10 \\ 2Q_1 - 0.50Q_2 + 10 - 10 &= 10 - 10 \\ 2Q_1 - 0.50Q_2 &= 0 \\ 2Q_1 - 0.50Q_2 + 10 &= 10 \\ 2Q_1 - 0.50Q_2 + 10 - 10 &= 10 - 10 \\ 2Q_1 - 0.50Q_2 &= 0 \\ 2Q_1 - 0.50Q_2 + 10 &= 10 \\ 2Q_1 - 0.50Q_2 + 10 - 10 &= 10 - 10 \\ 2Q_1 - 0.50Q_2 &= 0 \\ 2Q_1 - 0.50Q_2 + 10 &= 10 \\ 2Q_1 - 0.50Q_2 + 10 - 10 &= 10 - 10 \\ 2Q_1 - 0.50Q_2 &= 0 \end{aligned}$$

Step 4. Use the equation.

Now we have an equation that helps us calculate the number of burgers Charlie can buy depending on how many bus tickets he wants to purchase in a given week.

For example, say he wants 8 bus tickets in a given week. Q_2 represents the number of bus tickets Charlie buys, so we plug in 8 for Q_2 , which gives us

$$Q_1 = 5 - \left(\frac{1}{4}\right)Q_2$$

This means Charlie can buy 3 burgers that week (point C on the graph, above).

Let's try one more. Say Charlie has a week when he walks everywhere he goes so that he can splurge on burgers. He buys 0 bus tickets that week. Q_2 represents the number of bus tickets Charlie buys, so we plug in 0 for Q_2 , giving us

$$Q_1 = 5 - \left(\frac{1}{4}\right)Q_2$$

So, if Charlie doesn't ride the bus, he can buy 5 burgers that week (point A on the graph).

If you plug other numbers of bus tickets into the equation, you get the results shown in Table 1, below, which are the points on Charlie's budget constraint.

Table 1.		
Point	Quantity of Burgers (at \$2)	Quantity of Bus Tickets (at 50 cents)
A	5	0
B	4	4
C	3	8
D	2	12
E	1	16
F	0	20

Step 4. Graph the results.

If we plot each point on a graph, we can see a line that shows us the number of burgers Charlie can buy depending on how many bus tickets he wants to purchase in a given week.

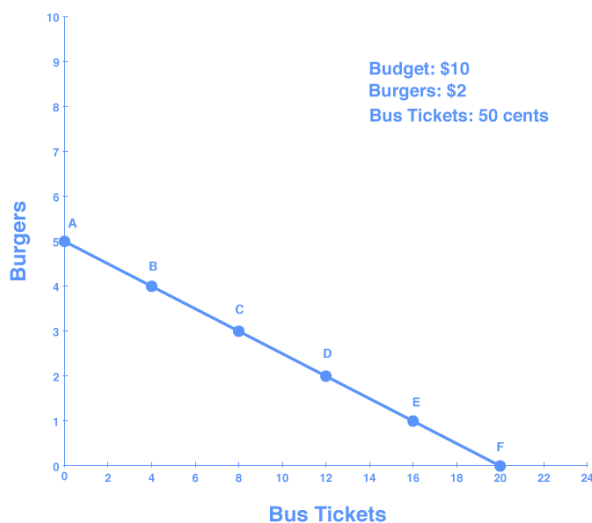


Figure 2. Charlie's Budget Constraint.

We can make two important observations about this graph. First, the slope of the line is negative (the line slopes downward from left to right). Remember in the last module when we discussed graphing, we noted that when X and Y have a negative, or inverse, relationship, X and Y move in opposite directions—that is, as one rises, the other falls. This means that the only way to get more of one good is to give up some of the other.

Second, the slope is defined as the change in the number of burgers (shown on the vertical axis) Charlie can buy for every incremental change in the number of tickets (shown on the horizontal axis) he buys. If he buys one less burger, he can buy four more bus tickets. The slope of a budget constraint always shows the opportunity cost of the good that is on the horizontal axis. If Charlie has to give up lots of burgers to buy just one bus ticket, then the slope will be steeper, because the opportunity cost is greater.

This is easy to see while looking at the graph, but opportunity cost can also be calculated simply by dividing the cost of what is given up by what is gained. For example, the opportunity cost of the burger is the cost of the burger divided by the cost of the bus ticket, or

$$\frac{\$2.00}{\$0.50} = 4$$

The opportunity cost of a bus ticket is:

$$\frac{\$0.50}{\$2.00} = 0.25$$

Let's look at this in action and see it on a graph. What if we change the price of the burger to \$1? We will keep the price of bus tickets at 50 cents.

A link to an interactive elements can be found at the bottom of this page.

Figure 3 (Interactive Graph). A Changing Budget Constraint.

Try It

<https://assessments.lumenlearning.co...sessments/7091>

Contributors and Attributions

CC licensed content, Original

- Modification, adaptation, and original content. **Provided by:** Lumen Learning. **License:** [CC BY: Attribution](#)

CC licensed content, Shared previously

- How Individuals Make Choices Based on Their Budget Constraint. **Authored by:** OpenStax College. **Located at:** https://cnx.org/contents/vEmOH-_p@4.44:t8ejHQax@9/How-Individuals-Make-Choices-B. **License:** [CC BY: Attribution](#). **License Terms:** Download for free at <http://cnx.org/contents/bc498e1f-e1fe...69ad09a82@4.44>

2.4: Calculating Opportunity Cost is shared under a [not declared](#) license and was authored, remixed, and/or curated by LibreTexts.