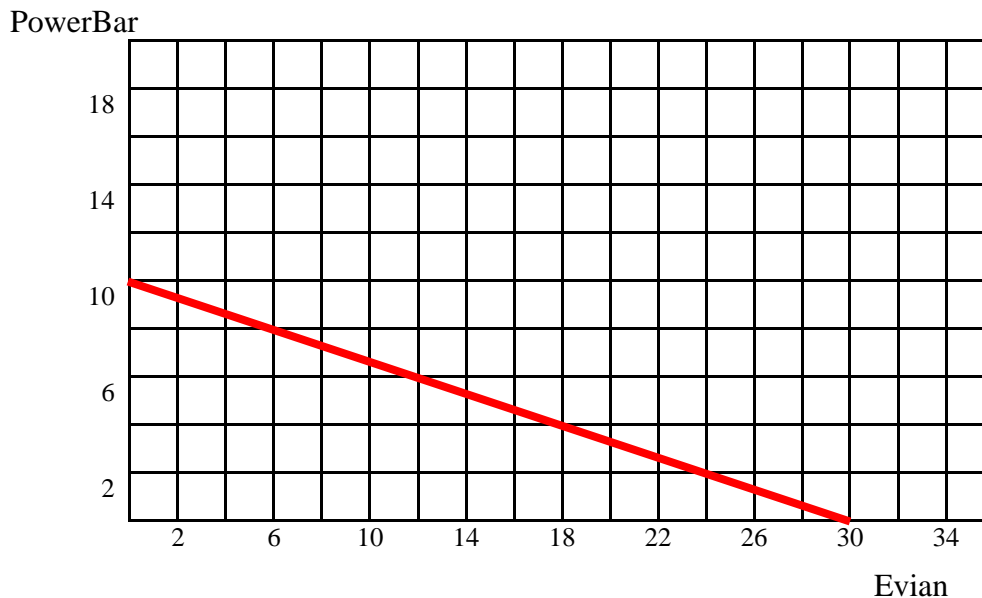


Answers Problem Set 1

Ch.2 Budget Constraint

Problem 1: Mr. Slick has \$30 to spend on Evian and PowerBars. The price of a Powerbar is \$3, and the price of a bottle of Evian is \$1.

a) Draw a picture of Mr. Slick's budget line (measure Evian on the horizontal axis and PowerBars on the vertical axis):



b) How many PowerBars can he afford if he buys 6 bottles of Evian?

You can either read it off the graph or look at the budget line. Let x_P denote the number of PowerBars: $3 \cdot x_P + 1 \cdot 6 = 30$. Solve it, $x_P = 8$.

c) What is the largest number of PowerBars he can afford?

Once again you can either look at the vertical intercept in the graph above or use the budgetline. Let consumption of Evian be 0. Then

$$\begin{aligned} 3 x_P &= 30 \\ \Rightarrow x_P &= 10. \end{aligned}$$

d) What is the slope of the budget line? (Be sure to include the sign)

Let b be the slope, then $b = - p_E / p_P = - 1/3$.

e) Explain in plain English what this slope measures.

It measures the number of Powerbars the market requires that he gives up to purchase one bottle of Evian.

f) Using the price and income above write an equation for Mr. Slick's budget constraint (denote Evian by x_E , and PowerBars by x_P and use the prices given above).

$$1 \cdot x_E + 3 \cdot x_P \leq 30$$

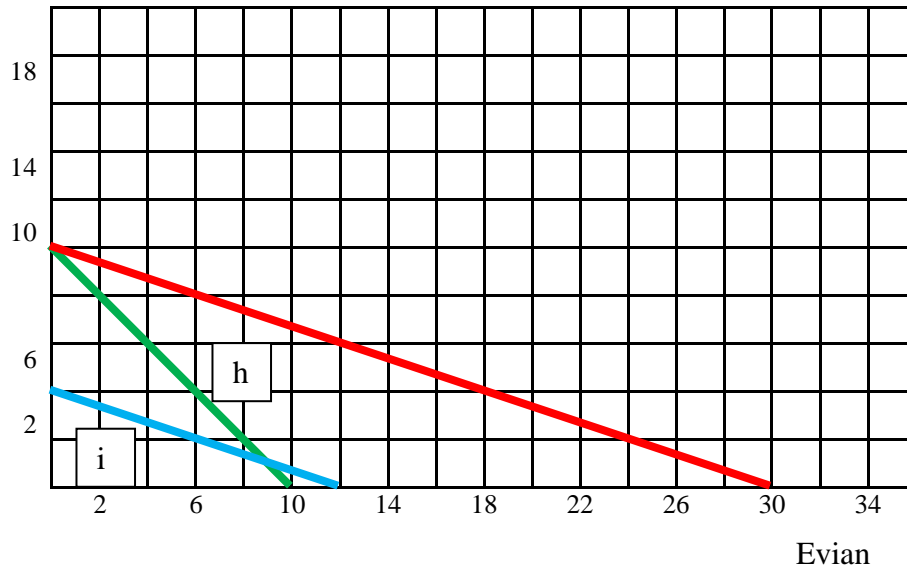
g) Rearrange the equation of the budget line such that x_P as a function of x_E , i.e. $x_P = f(x_E)$

$$\begin{aligned} 1 \cdot x_E + 3 \cdot x_P &= 30 \\ 3 \cdot x_P &= 30 - x_E \\ x_P &= \frac{30 - x_E}{3} = 10 - \frac{1}{3} x_E \end{aligned}$$

h) Illustrate on your graph how the budget line from question a) changes when the price of Evian increases to \$3 per bottle.

i) Illustrate on your graph above how the budget line from question a) changes when his income decreases to \$12.

PowerBar



Problem 2: Martha is preparing for exams in economics and sociology. She has time to read 40 pages in economics and 30 pages in sociology. In the same amount of time she could also read 30 pages of economics and 60 pages in sociology.

a) Assuming that the number of pages per hour she can read of either subject does not depend on how she allocated her time, how many pages of sociology could she read if she decided to spend all of her time on sociology and none on economics? (Show your work)

By the statement above we know that the slope b of her budget line will be constant. Let x_E be the number of pages she reads in economics and x_S be the number of pages she reads in sociology. Let the slope of the budgetline b denote the number of pages in sociology she must give up to read one more page in economics. We know that she can afford the two bundles $(x_E, x_S) = (40, 30)$ and $(30, 60)$. Since the total time available is the same, we know that

$$\begin{aligned} 30 + b \times 40 &= 60 + b \times 30 \\ b \times 10 &= 30 \\ b &= 3 \end{aligned}$$

Thus it takes three times longer to read a page in economics than it takes to read a page in sociology. For every page she reads in economics she has to give up reading three pages in sociology. Now looking at the bundle $(x_E, x_S) = (30, 60)$, if she stopped reading economics it would free up 30 pages in economics, this corresponds to reading $3 \cdot 30 = 90$ additional pages in sociology. Thus if she only reads sociology she can read $60 + 90 = 150$ pages

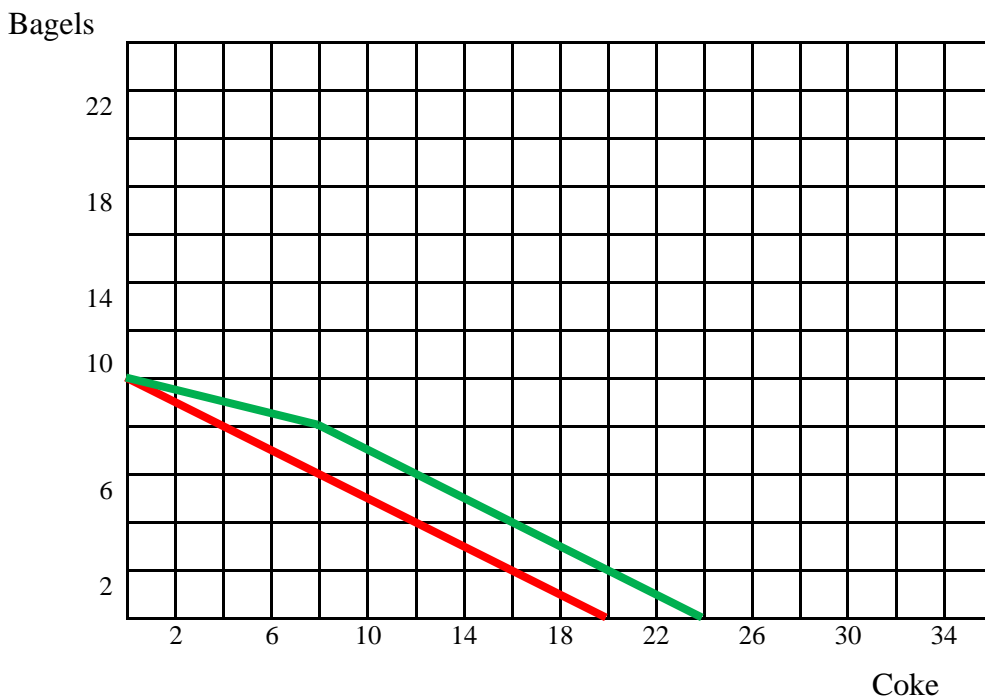
b) How many pages of economics could she read if she decided to spend all of her time reading economics? (Show your work)

Since it takes three times longer to read a page in economics the largest number of pages she can read in economics (i.e. setting $x_S = 0$) is $150/3 = 50$ pages.

Problem 3: Kate likes Bagels and Coca-Cola. She has \$10 per week to spend on the two goods. Bagels cost \$1 each and Cokes cost \$0.50 per can.

a) Draw her budget line with Coke on the horizontal axis and bagels on the vertical axis.

The red line is the budget line.



b) Suppose Kate receives a coupon through the mail that will last all of next week. By using the coupon Kate will get a discount of 25 cents per can of Coke that she buys. The coupon is good for 8 cans of Coke. Kate has \$10 to spend on bagels and Coke during the next week. Draw her budget line.

Let us start with the maximum number of bagels she can buy. This remains at 10 ($\$10/\1). Now given the change in price at 8 cokes we know there has to be a kink in the budget line at 8 cokes. With the 25 cent discount on coke the actual unit price she pays for each of the first 8 cans of Coke is $0.50 - 0.25 = \$0.25$. The total cost of 8 cans of Coke is $0.25 \cdot 8 = \$2$. Leaving $\$10 - \2 to

spend on bagels, at \$1 a piece she can buy 8 bagels. I.e. the kink is at 8 Cokes and 8 bagels. After 8 cans of Cokes, the unit price is 0.5. What is the largest number of Cokes she can afford? Where is the horizontal intercept? She gives up the remaining 8 bagels which with a cost of \$1 per unit frees up \$8, with Coke costing 50 cents a piece, she can buy two Cokes for every bagel she gives up. She can buy at most $8 + (10 - 2)/0.5 = 8 + 16 = 24$ cans of Coke. The green line is the new budget line.

c) While Kate no longer has a coupon for Coke, there is now a special deal at the bakery. For the upcoming week she can get two bagels for free for every four bagels that she buys. Draw her budget line.

