

Day 8 - Profits, Costs, and Break Even Points - Notes

Scenario: You have a part time job at a company that makes and sells color art markers. As part of your job, you are studying the company's production costs. The markers are made one color at a time. It costs \$2 to manufacture each marker and there is a \$100 set up cost for each color. You are also studying the income, or the amount of money the company earns, from the sales of the markers. The company sells the markers to office and art supply stores for \$3 each.

a. Write an equation that gives the production costs in dollars to make one color of marker in terms of the number of markers produced. Define your variables.

$$y = 2x + 100$$

x : # of markers
 y : total cost

c. Find the production costs to make 80 markers of the same color.

$$y = 2(80) + 100$$

$$y = 260$$

e. Find the production costs to make 100 markers of the same color.

$$y = 2(100) + 100$$

$$y = 300$$

g. Find the production costs to make 200 markers of the same color.

$$y = 2(200) + 100$$

$$y = 500$$

i. Complete the table below and use it to create a graph to describe the scenario.

Number of Markers	Production Costs	Income
x	$2x + 100$	$3x$
0	100	0
80	260	240
100	300	300
150	400	450
200	500	600
400	900	1200

$$400 = 2x + 100$$

$$300 = 2x$$

$$150 = x$$

$$1200 = 3x$$

$$400 = x$$

b. Write an equation that gives the income, in dollars, in terms of the number of markers sold. Define your variables.

$$y = 3x$$

x : # of markers
 y : total income

d. Find the income from selling the 80 markers. Has the company made a profit from selling the 80 markers?

$$y = 3(80)$$

$$y = 240$$

f. Find the income from selling the 100 markers. Has the company made a profit from selling the 100 markers?

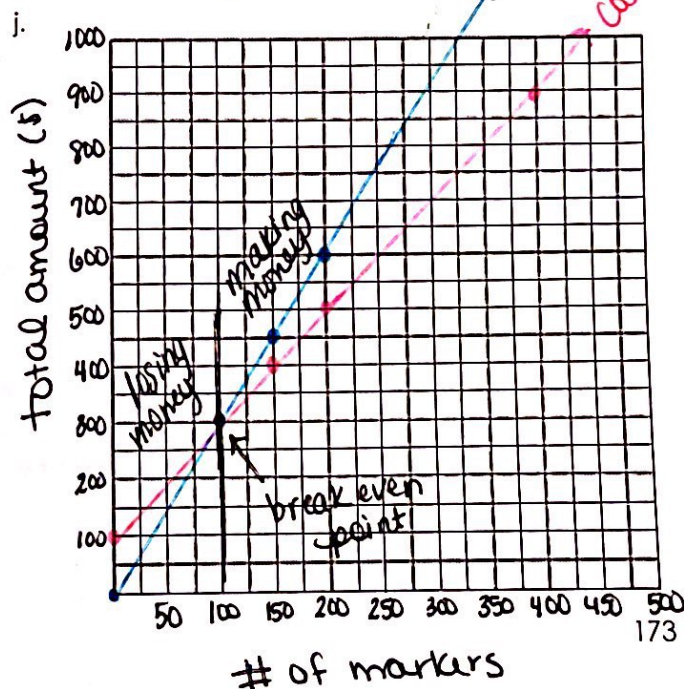
$$y = 3(100)$$

$$y = 300$$

h. Find the income from selling the 200 markers. Has the company made a profit from selling the 200 markers?

$$y = 3(200)$$

$$y = 600$$



k. At what point does the production costs equal the income costs? Use either substitution or elimination to confirm the point of intersection. Interpret the solution in terms of the problem scenario.

When they sell 100 markers,
they make and lose \$300.

l. Using your graph, determine the number of markers for which the production cost is greater than the income.

When they sell less than 100 markers

m. Use your graph to determine the number of markers for which the income is greater than the production costs.

When they sell more than 100 markers

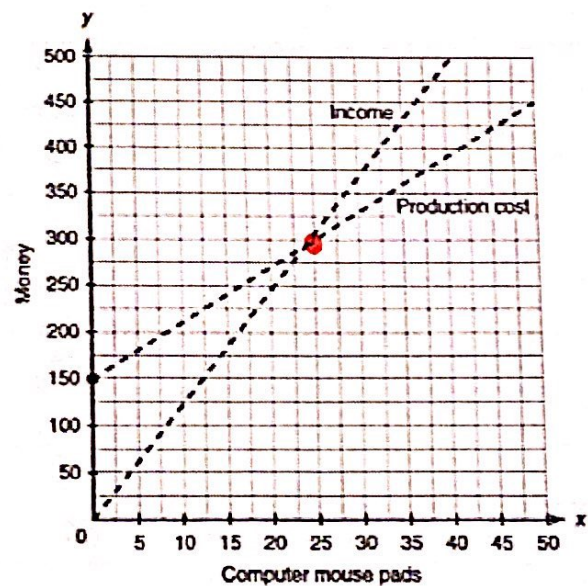
What you just discovered is called the **break-even point**. The break-even point is where production costs equal income. The break-even point can be found by finding the intersection of the two lines or by setting production/cost equation equal to the income equation. The x-coordinate of the break-even point represents how many of an item you need to make and sell to break-even and the y-coordinate of the break-even point represents how much the company spent making the item and then selling the item. The difference between the cost and income amounts will always equal 0.

Practice: Find the break-even point for the following graphs. How many of each item will the company need to sell to make a profit?

Point of Intersection: (25, 300)

Break Even Point: 25 mousepads

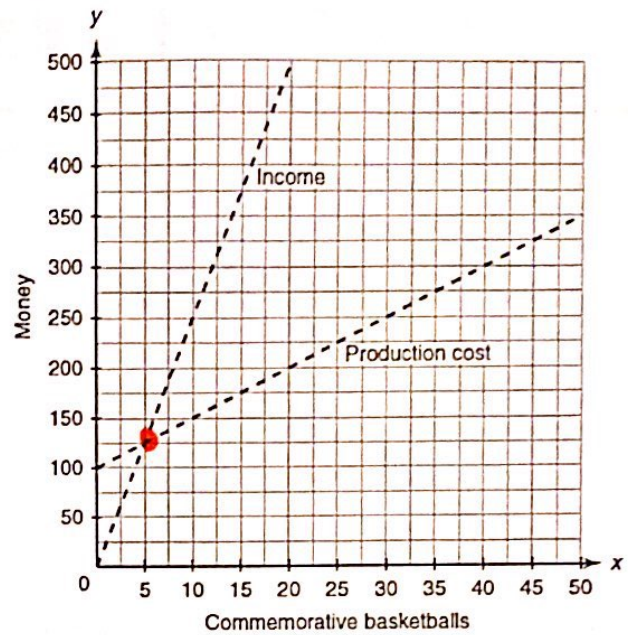
They need to sell at least 26
mousepads to make a profit.



Point of Intersection: (5, 125)

Break Even Point: 5 basketballs

They need to sell at least 6
basketballs to make a profit.



Practice: Your work at the marker company has inspired you to start your own business. You decide to design and sell customized T-shirts. The company that supplies your T-shirts charges you \$7.50 for each t-shirt and \$22.50 for a new design. You decide to sell the T-shirts for \$8.25 each. How many T-shirts do you need to make and sell to break even? How many t-shirts do you need to sell to make a profit?

$$\text{Cost: } y = 7.50x + 22.50$$

$$8.25x = 7.50x + 22.50$$

$$\text{Income: } y = 8.25x$$

$$0.75x = 22.50$$

$$x = 30$$

If they sell 30 t-shirts, they will break-even, therefore, they need to sell at least 31 t-shirts to begin to make a profit.

Practice: The cost to take pictures at a school dance is \$200 for the photographer and \$3 per print. The dance committee decides to charge \$5 per print. How many pictures need to be taken for the dance committee to break-even? How many pictures need to be taken to make a profit?

$$\text{Cost: } y = 3x + 200$$

$$3x + 200 = 5x$$

$$\text{Income: } y = 5x$$

$$200 = 2x$$

$$x = 100$$

They will break even if they take 100 pictures, so they need to take at least 101 pictures to make a profit.