

### The Magical Break Even Point

The “break even point” (BEP) for someone selling something is the point at which all expenses have been paid. Any items sold > BEP causes you to earn a “profit.” If items sold < BEP, then you have a “loss.”

Scenario: Your soccer team wants to sell candy bars to make money for new uniforms. The cost to your team is \$0.50 per bar. The shipping and handling (S&H) cost is \$30 for the number of boxes of candy bars you buy. Your group decides to sell each bar for \$1.00 each. How many does your group need to sell to “break even”?

Solution: Write 2 equations.

Cost equation: Cost = \$0.50x + \$30.00    Income equation: Income = \$1.00x

Since “break even” means that your Income equals your Cost, then write this equation

Income = Cost    The Transitive Property of Equality says that if 2 things are equal to a 3<sup>rd</sup> thing, then they are equal to each other.

Substitute \$1.00x for Income and \$0.50x + \$30.00 for Cost

\$1.00x = \$0.50x + \$30.00    Clean it up and remove the \$

1.0x = 0.5x + 30    Solve for x.

-0.5x    -0.5x    Subtract 0.5x from both sides

0.5x = 30    Rewrite

0.5    0.5    Divide each side by 0.5

x = 60    30 divided by 0.5 is the same as 30 times 2. Why?

So, you would need to sell 60 candy bars to break even. All candy bar sales after that would increase your profit (Profit is Income - Costs)

You don't know how many candy bars you want to sell. What if you knew you wanted to raise a profit of \$500?

Income - Costs = 500

1x - (0.5x + 30) = 500    Notice how your are subtracting a quantity in parentheses.

1x - 0.5x - 30 = 500    Actually distribute a -1 over the parentheses.

0.5x - 30 = 500    Collect like terms.

   + 30       + 30    Add 30 to both sides.

0.5x = 530    Rewrite.

0.5    0.5    Divide each side by 0.5 (Multiply by 2).

x = 1060    You must sell 1060 candy bars to make \$500.

If you wanted to know how much profit you'd make selling different quantities of candy bars, you can make a table using your TI-84+. You can graph it, too, but it would be difficult to see on the low resolution screen.

X	Y1	
0	-30	
10	-25	
20	-20	
30	-15	
40	-10	
50	-5	
60	0	
X=0		

Really, though, you can't buy individual candy bars from the candy bar company. You have to buy boxes, each containing 50 bars.

How would that change your original equation? You'd have to think in boxes, instead of candy bars.

Income: 50 bars \* \$1 each = \$50 per box.

Costs: 50 bars \* \$0.50 each + \$30 S&H

So, your new equation looks like this:

$$50x = 25x + 30. \text{ Solve for } x.$$

$x = 30/25$  or 1.2 boxes. You'd have to sell at least 2 boxes to make a profit.

The TI-84+ table now looks like this:

But, now we're talking boxes, not individual candy bars.

The break even point is not attainable now, since it's in the middle of the 2<sup>nd</sup> box!

X	Y1	
0	-30	
1	-5	
2	20	
3	45	
4	70	
5	95	
6	120	

X=0

New scenario:

You want to sell glow necklaces at a party. You're pretty sure you can sell quite a few at \$1 each. The company you want to buy from charges \$0.17 each in tubes of 50 necklaces. How much is that per tube?\_\_\_\_\_ You must buy a minimum of 10 tubes. Shipping on 10 tubes is \$24. How many do you need to sell to cover your costs (break even)? How much will you make/lose if you sell all the glow necklaces you bought? Show all work below.