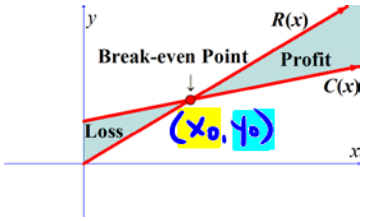
Section 1.5B
Break Even Analysis

When a company neither makes a profit nor sustains a loss this is called the **break-even level of operation.**

Note: The break even level of operation is represented by the point of intersection of two lines.

The break even level of production means the profit is zero. This means $P(x) = R(x) - C(x) = 0$, which implies that $R(x) = C(x)$.

Consider the following graph:



The point of intersection above, (x_o, y_o), is referred to as the break-even point.

x_o = break even quantity $\qquad$ y_o = break even revenue

If $x < x_o$ then $R(x) < C(x)$. Hence, $P(x) = R(x) - C(x) < 0$ which indicates a LOSS.

If $x > x_o$ then $R(x) > C(x)$. Hence, $P(x) = R(x) - C(x) > 0$ which indicates a PROFIT.

Example 1: A company has a break-even point of (1,575, $125,000). If it produces and sells 2,000 units would the company make a profit or sustain a loss? How do you know?

1575 < 2000 Profit

Example 2: A company has a profit function of $P(x) = 32x - 300,000$.

a. What is the break even quantity? P(x) = 0

$32x - 300000 = 0$

$32x = 300000$

$x = 9375$ units

b. How many units must the company produce and sell to make a profit of $84,000?

P(x) = 84000

$32x - 300000 = 84000$

$+300000 \quad +300000$

$x = 12000$ units

$P(x) = 0$ same as $C(x) = R(x)$

Example 3: Find the break-even quantity and break-even revenue if $C(x) = 32x + 375000$ and $R(x) = 62x$

$32x + 375000 = 62x$

$375000 = 30x$

$x = 12500$ items

$R(12500) = 62(12500) = \$775000$

break-even quantity: 12500 *break-even revenue:* $775000

Example 4: The XYZ Company has a fixed cost of 200,000, a production cost of $12 for each unit produced and a selling price of $20 for each unit produced.

a. Find the break-even point for the company.

$C(x) = 12x + 200000$

$R(x) = 20x$

$C(x) = R(x)$

$12x + 200000 = 20x$

$200000 = 8x$

$x = 25000$

$R(25000) = 20(25000)$

$= 500{,}000$

(25000, 500000)

break-even quantity: 25000 *break-even revenue:* $500,000

b. If the company produces and sells 33,000 units, would it have a profit or loss?

$25000 < 33000$ Profit

c. If the company produces and sells 40,000 units, what would be the profit?

$25000 < 40000$ Profit

$P(x) = R(x) - C(x) = 20x - (12x + 200000)$

$P(x) = 8x - 200000$

$P(40000) = 8(40000) - 200000 = \$120{,}000$

Example 5: *Iota Airplane Supplier* manufactures a certain airplane part for small airplanes. Each part sells for $250 and the variable cost of producing each unit is 42% of the selling price. The manufacturer's monthly fixed cost is $638,000. What is the manufacturer's break-even point?

variable cost = 42% of $250

$= .42(250)$

$= \$105$

$C(x) = 105x + 638000$

$R(x) = 250x$

$105x + 638000 = 250x$

$638000 = 145x$

$x = 4400$

Break-even quantity = 4400

Break-even revenue $= 250(4400) = \$1,100,000$

$(4400, 1100000)$