

Break Even

SUBMITTED BY: Nina Hoe, University of Pennsylvania

SUBJECT(S): Computation

GRADE LEVEL(S): 9, 10, 11, 12

≡ OVERVIEW:

In this lesson, students are introduced to the idea of break even, revenues and expenses (both fixed and variable). The lesson begins with a whole group discussion of these topics, applied to different business scenarios. In small groups, students work through calculating break-even points for businesses with fixed expenses only. Finally, students report their findings and prepare for the subsequent lesson that extends beyond a simple fixed expense model to incorporate variable expenses as well.

≡ NBEA STANDARD(S):

- Computation, I. Mathematical Foundations
- Computation, II. Number Relationships and Operations
- Computation, III. Patterns, Functions, and Algebra

Common Core Standard(s):

- Modeling
- F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- A-CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

Objectives/Purposes:

- Understand the concept of breaking even and the relationship between revenues and expenses.
- Model break-even situations graphically.
- Solve systems of equations numerically and graphically

Knowledge@Wharton Article:

- [“Smooth as Silk: Product Diversification Gives Afghan Women a Competitive Edge”](#)

Activity:*1. Whole Class Discussion (15 mins)*

1. What are revenues?

Play the WGYG Glossary: [Revenues](#)

“Revenues are the sales of products, merchandise and services that a company makes to customers due to the normal business activities. The Philadelphia Phillies, the 2008 World Series Champions, generated a record-breaking \$216 million in revenues from ticket sales, merchandise, and refreshments last year.”

Note: Does not include side investments or portfolios.

2. What are expenses?
3. What are fixed vs. variable expenses/costs?

Play the Wharton Global Youth Program (WGYG) Glossary: [Fixed/Variable Cost](#)

“A fixed cost is a cost that remains unchanged in total, regardless of changes in the level of total activity or volume. Earthquake insurance for a table factory is a fixed cost, because regardless of whether 200 or 2000 tables are made, the cost for earthquake insurance will be the same. A variable cost is a cost that changes directly in proportion to changes in the level of total activity, or

volume. The wood used to make a table is a variable cost, because each additional table requires additional wood for the tables to be made.”

There are also initial, start-up, or capital costs or investments involved in starting a business that may not be figured into the monthly expenses. For example, to start up a corner store, you would need to invest in shelving, a price gun, signage, etc.

4. If you ran a corner store – what would your **revenues** be? (***your total sales, how much money was in the register at the end of each day***)
5. If you ran a corner store – what would you **fixed expenses** be? (***paying hourly or salaried employees – note that this would not include commissions, bonuses, and paying employees for services rendered, rent for the space or mortgage, utilities, etc***)
6. If you ran a corner store – what would you **variable expenses** be? (***cost of food and merchandise to stock the shelves, potentially adding additional employees if the need got high enough***)

Different businesses have different profiles and different relationships between and proportions of fixed and variable.

7. Brainstorm some businesses that would have higher fixed costs and lower variable costs. (***ex: barber shop, massage parlor, bicycle rental shop***)
8. Brainstorm some businesses that would have lower fixed costs and higher variable costs. (***ex: grocery or retail store, anything where you are selling something tangible***)
9. What do you think it means to “break even”? Have you heard this term before?

Play the WGYP Glossary: [Break Even](#)

“Break even is when revenues and expenses are equal. Or, put another way, when net income is zero. The Bluth Company is projected to break even, at selling 100,000 tables. If they sell less tables, they’ll make a loss. If they sell more tables, they’ll make a profit.”

Play the WGYP Glossary: [Break Even Point](#)

“Break even point refers to either the quantity of output sold, or the total revenues where operating income is zero. The Bluth Company’s break even point in quantity is 100,000 tables, and in sales dollars, is \$1 million.”

Essentially, the break-even point is when:

$$\text{Revenues} = \text{Costs}$$

$$\text{Revenues} - \text{Costs} = 0 \text{ (or the Net Income} = 0)$$

$$\text{Quantity} = \frac{\text{Fixed Costs}}{\text{Revenue} - \text{Variable Costs per Unit}}$$

10. Why is knowing your break-even point important?
11. What does it mean if revenues are greater than expenses?
12. What does it mean if revenues are less than expenses?
13. How and where does a company report their profit and losses?

Every start-up business has to anticipate that in the beginning, the expenses will be larger than the revenues and that their business will essentially be losing money initially. Business owners and investors look to break-even projections to analyze the risk involved with starting a particular business. Companies think about break-even points in different ways, and ask different questions regarding breaking even. Sometimes, a new company will expect that expenses will exceed revenues in the beginning, so they may ask – given this **pricing** strategy, at what point in time will we reach a break-even point? Another company may use the break-even point as a goal, and ask – if we want to break even within three years, what pricing strategy must we use?

Play the WGYG Glossary: [Pricing](#)

“Pricing is the price a firm sets for the products it sells. Wal-Mart has a pricing policy to be as low or lower than any of the competitors. Wal-Mart will match or beat anyone’s prices.”

An **income statement** is where a company reports its profits and losses over a given period of time (i.e. monthly, quarterly, or yearly). An income statement shows the **net income**, which is the total revenues and gains minus the total expenses and losses. If this number is positive, the company has made a **profit** in that given period of time. If that number is negative, the company has experienced a loss.

$$\text{Profit} = \text{Revenues} - \text{Cost}$$

or

$$\text{Profit per unit} = \text{Revenue per unit} - (\text{Fixed Cost} + \text{Variable Cost per Unit})$$

Play the WGYG Glossary: [Net Operating Losses](#)

“Net operating losses, or NOLs, are the accumulated losses of a business that can be used to reduce income reported to the tax authorities in other years. Start-up companies usually have substantial net operating losses, because it takes a couple of years for a new business to become profitable.”

2. Small Group/Pair Activity

Have students break up into small groups and come up with an idea for a company. Students should make a list of:

- Start-up costs
- Fixed costs
- Variable Costs
- At least 3 possibilities for revenues (should be determined based on different pricing strategies from previous lesson) – think about High Margin vs. High Quantity Business

Then, have students:

1. Determine the break-even points for different quantity and pricing scenarios
2. Determine the likelihood of different revenue scenarios
3. Determine the profit for different quantity and pricing scenarios

Tying It All Together:

Whole Class Discussion: (10 mins)

1. Have students present their businesses to the class.
2. Which businesses seemed the most profitable? Why?
3. How can you manipulate elements of the break-even equation to increase profits?

4. Why is it important to calculate your break-even point when starting or planning a business?
5. As a business owner, what is the relationship between fixed and variable expenses?
6. How do you balance these to maximize your profits?

Practice Outside of the Classroom: Look at other businesses and think about what the fixed and variable expenses are. Think about where their break-even points might be.

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