

Revenue, Expenses, and the Break-Even Point

Lesson Plan

Objective

Introduce students to fundamental concepts of starting and running a business successfully. Focus on revenue, expenses, expansion, and use of break-even point analysis.

Students will be able to:

- Understand the vocabulary associated with revenue and expenses.
- Understand the relationship among revenue, expenses, and profit.
- Analyze break-even data in a variety of situations.
- Calculate price, sales units, and revenue values for different situations.
- Design a plan for success.
- Plan for expansion.

Consumer Math Standards and Benchmarks

Common Core State Standards Initiative (CCSSI): The Common Core State Standards Initiative is a state-led effort coordinated by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO), developed to standardize learning practices across the nation and prepare students for college.

CCSSI Mission Statement: Provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy.

This lesson corresponds with the eight Standards for Mathematical Practice as published by CCSSI:

Mathematical Practices

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

The National Standards in K-12 Personal Finance Education

The National Standards in K-12 Personal Finance Education were created and are maintained by the Jump\$tart Coalition[®] for Personal Financial Literacy. The Standards outline the personal finance knowledge and skills that K-12 students should possess. The Jump\$tart Coalition asserts that all young people graduating from high school should be able to take individual responsibility for their personal economic well-being. Financially literate high school graduates should know how to:

- Find, evaluate, and apply financial information.
- Set financial goals and plan to achieve them.
- Develop income-earning potential and the ability to save.
- Use financial services effectively.
- Meet financial obligations.
- Build and protect wealth.

Standards Addressed

Financial Responsibility and Decision Making

- Standard 1: Take responsibility for personal financial decisions.
- Standard 2: Find and evaluate financial information from a variety of sources.
- Standard 4: Make financial decisions by systematically considering alternatives and consequences.

Planning and Money Management

- Standard 2: Develop a system for keeping and using financial records.
- Standard 6: Develop a personal financial plan.

Risk Management and Insurance

- Standard 1: Identify common types of risks and basic risk management methods.

Saving and Investing

- Standard 2: Explain how investing builds wealth and helps meet financial goals.
- Standard 3: Evaluate investment alternatives.
- Standard 4: Describe how to buy and sell investments.

Teaching Materials

- Lesson plan
- Student content document
- Analytical examples with pre-calculated examples
- Assessment/evaluation worksheet
- Teaching tool: A Public Service Announcement is available to support this lesson at <http://video.channelone.com/generation-money/> (scroll halfway down the page to the box that says “videos” and choose “Trevor Cleans Up” from the box on the right.)

Lesson Activity

Determine prior knowledge: Suggested questions to determine knowledge of fundamental vocabulary and concepts:

- If you wanted something you can't afford, how would you get it?
- What are start-up costs? Provide examples.
- What is profit and where does it come from?
 - Revenue above and beyond expenses.
- What is revenue and how does it differ from income?
 - Revenue is earned income from a business or occupation, while income can be passive such as interest and dividends.
- What is your understanding of break-even point in an investment activity?

Introduce/Present Student Content Document

(Note to teachers: Depending on grade level, content may require further explanation.)

Introduction of the fundamental premise (page one of student document)

- Trevor has a goal, and he's motivated to accomplish it.
- Trevor is a good organizer.

Ask for student feedback (page one of student document).

- Has Trevor forgotten anything?
- Are there some things you would do differently?

Basic business terminology (page two of student document). Review with students for understanding:

Revenue = Expenses + Profit

$Px (FC + Vx) + Profit$

P = Price of service

x = Number of clients

FC = Fixed costs (costs of running a business not related to performing each individual service)

V = Variable costs (cost of performing each service)

Profit is revenue in excess of expenses.

Revenue = (Price charged for a service) x (Number of clients)

Expenses = (Fixed costs + Variable costs)

Break-even point (BEP): Revenue = Expenses with no profit

Break down expenses to fixed and variable expenses.

- Fixed expenses are costs that do not vary based on the number of units sold.
 - Trevor's agreement for use of equipment.
- Variable expenses are related to production of each unit.
 - Gasoline to power equipment.
- Trevor needs to determine a price for his services.
 - To break-even, price will be determined by the number of clients.
 - A table is presented to explain his reasoning.
 - He is trying to determine the amount of lawns that must be mowed to break-even.
 - This is the definition of the concept: break-even sales units.

Break-Even Sales Units (page three of content document)

- The number of units that must be sold to reach the break-even point.

$$Px = Vx + FC$$

x is the number of units sold to bring the equation into balance.

Use algebra to solve for x:

$$Px = Vx + FC$$

$$(Px - Vx) = FC$$

$$x(P - V) = FC$$

$$x = \frac{FC}{(P - V)}$$

Use the formula for break-even sales units to verify information reflected in the table is correct.

Lawns Mowed	Expenses FC + Vx	Price Charged BEP
5	50+(1.90)(5)= 59.50	\$11.90

Lawns mowed = Number of lawns = $x = 5$

FC = Fixed costs = \$50

Variable costs = $V = 1/2$ gallon of gasoline per lawn = \$1.90

Price charged = $P = \$11.90$

$$x = \frac{FC}{(P - V)} = \frac{\$50}{(\$11.90 - \$1.90)} = \frac{\$50}{\$10} = 5 \text{ Lawns}$$

Contribution Margin (page three of content document)

The amount of revenue available for use in paying the business's fixed costs.

Contribution margin = Revenue - Variable costs

Subtracting the per-unit costs (variable costs) from the revenue earned leaves the contribution margin. Once Trevor's contribution margin exceeds \$50, he will be making a profit, which can be put toward his bike.

The table on page three calculates contribution margin for four different prices Trevor could charge and four different customer points. Review the table with students.

Comprehension Check (page four of content document)

What would Trevor's contribution margin be if he charged \$25 per lawn and was cutting eight lawns per week?

Revenue = Price x Clients = $\$25 \times 8 = \200

$V = \$1.90 \times (8) = \15.20

CM = Revenue - Variable cost = $\$200 - \$15.20 = \$184.80$

\$20 per lawn with a dozen clients?

Revenue = Price x Clients = $\$20 \times 12 = \240

$V = \$1.90 \times (12) = \22.80

CM = Revenue - Variable cost = $\$240 - \$22.80 = \$217.20$

Trevor's Availability (page four of content document)

How many lawns can Trevor cut in one week? Trevor keeps Saturday open should he get rained out during the week.

Four hours of light (after school) = 240 minutes
50 minutes per lawn (40 to cut, 10 minutes to reposition to next lawn)
Four lawns = 200 minutes with 40 minutes left to cut one additional lawn
Trevor will finish when it's dark.

Trevor can service:

- Five lawns per afternoon.
- 25 lawns in a five-day work week.
- Trevor can't service all 200 clients if everyone who received a flier hired him.

Group Exercises (page five of content document)

Based on the lesson, ask students to answer the following questions:

- If Trevor can't successfully take on all 200 clients, how many can he actually handle?
 - Use calculation from previous page.
 - Trevor can service 25 clients per week.

Trevor fills his schedule, charging \$20 per lawn. What will be his contribution margin? Is he making a profit?

$$\text{Clients} = x = 25$$

$$\text{Price} = \$20$$

$$\text{Revenue} = Px = (\$20) \times (25) = \$500$$

$$Vx = (\$1.90) \times (25) = \$47.50$$

$$\text{CM} = \text{Revenue} - \text{Variable cost} = \$500 - \$47.50 = \$452.50/\text{week}$$

$$\text{Revenue} = \text{Expenses} + \text{Profit}$$

$$\$500 = (\$50) + (\$47.50) + \text{Profit}$$

$$\$500 = (97.50) + \text{Profit}$$

$$\text{Profit} = \$500 - \$97.50 = \$402.50/\text{week}$$

Yes, Trevor is profiting.

- If we assume his bike (including tax and accessories) costs \$500, how long will it take for Trevor to purchase the bike?
 - A profit of \$402.50 per week will allow Trevor to purchase the bike before his second full week of servicing clients is complete.
 - After one week, Trevor will have made \$402.50 profit.

Week Two: Day One

$$(\$20) \times (5) = \$50 + (\$1.90) \times (5) + \text{Profit}$$

$$\$100 = \$50 + \$9.50 + \text{Profit}$$

$$\$100 - \$59.50 = \text{Profit}$$

$$\text{Profit} = \$40.50$$

$$\$402.50 + \$40.50 = \$443.00$$

Week Two: Day Two

$$\$100 = (1.90) \times (5) + \text{Profit (fixed cost for the week is paid)}$$

$$\text{Profit} = \$100 - \$9.50$$
$$\text{Profit} = \$90.50$$

By the end of day two of the second week, Trevor will have made \$533.50 toward the bike.

Recalculate contribution margin, profit, and time until bike purchase. Assume a full schedule at \$25 per lawn.

$$\text{Clients} = x = 25$$
$$\text{Price} = \$25$$
$$\text{Revenue} = Px = (\$25) \times (25) = \$625$$
$$Vx = (\$1.90) \times (25) = \$47.50$$

$$\text{CM} = \text{Revenue} - \text{Variable cost} = \$625 - \$47.50 = \$577.50/\text{week}$$

$$\text{Revenue} = \text{Expenses} + \text{Profit}$$
$$\$625 = (\$50) + (\$47.50) + \text{Profit}$$
$$\$625 = (97.50) + \text{Profit}$$
$$\text{Profit} = \$625 - \$97.50 = \$527.50/\text{week}$$

A profit of \$527.50 per week will allow Trevor to purchase the bike after one week of work.

What would be the pros and cons of each price decision?

Expected discussion responses:

- \$25 would generate more revenue and more profit.
- \$25 would allow Trevor to purchase the bike two days quicker.
- \$20 would make his service more attractive and would fill his schedule more quickly.

Class Discussion (page four of content document)

Suggested questions to discuss with students (expected responses are also included, but student perspective may provide interesting conversation):

- Do you think Trevor will continue to get business?
- Instead of Trevor refusing work, what can he do?
- Is it plausible for Trevor to expand business outside of his neighborhood?
 - What should he consider with an expanded geographic area?
- What numbers would change if Trevor expanded?

Assessment/ Evaluation

Following is the Revenue, Expenses, and the Break-Even Point assessment to check student comprehension:

1. Define revenue:
 - a) The price charged for a service
 - b) Income in excess of expenses

- c) **Total income produced by selling a product or service**
 - d) The income necessary to pay all expenses
2. What is the break-even point?
- a) **The point where revenue exactly equals expenses with zero profit**
 - b) Expenses that are not affected by how many products are sold
 - c) Expenses of producing or delivering each product or service
 - d) The point where zero profit has been earned
3. Expenses of running a business are:
- a) Fixed and recurring
 - b) Variable and constantly changing
 - c) Unpredictable
 - d) **A combination of fixed and variable per-unit**
4. Contribution margin is:
- a) Revenue available to only pay fixed costs
 - b) Equal to fixed costs at the break-even point
 - c) Calculated by subtracting variable costs from total revenue
 - d) **All of the above**
5. With equipment and facility rental costs of \$525/month and employee wages of \$120/week per employee, Trevor's Lawn Service has a contribution margin of \$2,640 on monthly revenue of \$3,175. What are Trevor's Lawn Service's monthly variable costs?
- a) \$1,005
 - b) **\$535 (Revenue - Contribution margin) (\$3,175 - \$2,640)**
 - c) Cannot be determined without knowing how many employees
 - d) Cannot be determined without knowing the number of monthly sales (lawns mowed)
6. If Trevor's Lawn Service employs four full-time workers and they service 107 lawns each month, what are the per lawn variable costs?
- a) **\$5.00 (\$535/107 = \$5.00)**
 - b) \$535.00
 - c) \$1,920
 - d) \$2,445
7. If Trevor's Lawn Service charges \$38.95/lawn, how many lawns represent their break-even point?

$$x = FC$$

$$(P - V)$$

$$x = \frac{525 + (16 \times 120)}{38.95 - 5} \quad 4 \text{ employees, 4 weeks}$$

$$\frac{x = 2445}{33.95} = 72$$

- a) 63
- b) 19
- c) **72**
- d) 30

8. How much revenue would it take for Trevor's Lawn Service to break even if they cut 107 lawns?

- a) \$3,632.65
- b) \$2,804.40
- c) \$2,444.40
- d) **\$2,980.00 (2445 + (107 x \$5)= \$2,980.00)**

9. What would Trevor's Lawn Service's profit be at \$38.95/lawn and cutting 107 lawns?

$$\text{Revenue} = 107 \times \$38.95 = \$4,167.65$$

$$\text{Profit} = \text{Revenue} - \text{Expenses} = \$4,167.65 - \$2,980.00 = \$1,187.65$$

- a) \$1,723.25
- b) \$1,363.25
- c) **\$1,187.65**
- d) \$535.00

10. What would Trevor's Lawn Service have to charge to cut a lawn if it took 107 lawns for them to break-even?

$$P(107) = 2980 \quad (2445 + 5(107))$$

$$\frac{P = 2980}{107} = \$27.85$$

- a) **\$27.85**
- b) \$33.95
- c) \$38.95
- d) \$41.25

Answer Key

Question	Answer
1	C
2	A
3	D
4	D
5	B

6	A
7	C
8	D
9	C
10	A