

Algebra I

Break-Even Analysis for Small Business

Name: _____

Date: _____

Hour: _____

- 1) Jesse wants to start a business making and selling toboggans. She will charge \$75 for each one. Her costs will be \$30 per toboggan for materials. She must pay \$500 per month rent (which includes utilities) so that she has a place to make and sell the sled.

money she makes
↓

- a) Write a rule for her revenue.

R = revenue function

a) $R(t) = 75t$

t = toboggans (independent variable)

- b) Write a rule for her costs.

C = cost function

b) $C(t) = 30t + 500$

- c) Write a rule for her profit. → revenue - costs

P = profit function

$$P(t) = R(t) - C(t)$$

$$P(t) = 75t - (30t + 500)$$

c) $P(t) = 75t - 30t - 500$

- d) What are her costs, revenue and profit if she sells 6 toboggans in one month?

$$R(6) = 75(6) = 450$$

$$C(6) = 30(6) + 500 = 680$$

$$P(6) = 45(6) - 500 = -230$$

- e) How many toboggans will she have to sell in order to break-even? Show any mathematical work you do.

$$R(t) = C(t)$$
$$75t = 30t + 500$$

$$45t = 500$$

$$t = 11.\bar{1}$$

$$0 = P(t)$$
$$0 = 45t - 500$$
$$+500 \quad +500$$

$$\frac{500}{45} = \frac{45t}{45}$$

$$11.\bar{1} = t$$

She must sell 12 toboggans

- 2) A hot dog vender has studied his revenue, and costs over the course of a month, each depends on the number of hot-dogs he sells. The following algebraic rules represent these two relationships:

R = revenue

C = costs

x = hot dogs

$$R(x) = 1.75x$$

$$C(x) = .45x + 125$$

- a) What can you tell about this situation from the revenue rule?

He charges \$1.75 per hot dog.

- b) What can you tell about this situation from the cost rule?

Each hot dog costs him 45¢ and he rents something for \$125.

- c) What would be the profit rule? Explain how you arrived at this rule.

$$P(x) = R(x) - C(x)$$

$$P(x) = 1.75x - (.45x + 125)$$

$$P(x) = 1.75x - .45x - 125 = 1.3x - 125$$

- d) How many hot-dogs would he have to sell in order to break even?

$$0 = 1.3x - 125$$

$$\frac{125}{1.3} = \frac{1.3x}{1.3}$$

$$96.2 = x$$

he needs to sell 97 hot dogs

- e) What would happen to the revenue rule if the vender decided to sell hot-dogs for \$1.00? Explain how this change would affect the break-even point. (solve your new equation. Explain the new # of hotdogs)

$$R(x) = 1x$$

$$P(x) = 1x - (.45x + 125)$$

$$P(x) = .55x - 125$$

$$0 = .55x - 125$$

$$125 = .55x \quad x = 227.3$$

he would need to sell 228 hot dogs

$$50 = x$$

- f) What if the vendor knew he could only sell 50 hotdogs? How would this affect the amount he charges the customer? Tell me his new price.

$$C(50) = .45(50) + 125$$

$$C(50) = 22.5 + 125 = 147.5$$

$$\frac{147.5}{50} = \frac{p(50)}{50}$$

$$p = \$2.95$$

Adapted from Holt High School Mathematics Department per

hot dog

- 3) The basketball coach is planning the summer basketball camp. Each participant is charged a fixed amount for the camp. Each participant is given a T-shirt, and he has to pay seven student assistants \$50 each. The camp also gives awards for different skill competitions, so the coach must also purchase nine trophies at \$6 each.

Below are tables representing revenue and cost for x numbers of players attending the camp?

Players	Revenue
10	\$250
15	\$375
20	\$500
25	\$625

Players	Cost
10	\$454
15	\$479
20	\$504
25	\$529

- a) Make a table of values for profit.
- b) Write rules for revenue, cost, and profit.
- c) How much does each player pay to attend the camp?
- d) How much does each player's t-shirt cost (assuming that is the only variable cost)?
- e) How many players need to attend in order to break-even?