Day 20 MATD 0385 Mon. April 5 Systems, Lesson 5

Go over quiz problems.

Classwork:

In Lesson 4, we talked about the harvest model, where we looked at how the cost and revenue per fish depend on the size of the fish population.

Now we're going to look at the business model, were we think of a time period, like a year, and think about the cost and the revenue over that entire time period. This helps us determine whether we have a money-making business plan or not. And what do the cost and revenue depend on? As you might guess – on how many fish we can catch in that year.

Read the discussion at the end of page 41 which describes the scenario we will discuss.

Continue through pages 42 and the top of page 43, where there are four things for you to fill in (see the pencils.) Those are the revenue formula, the graph of the revenue formula, the cost formula and the graph of the cost formula.

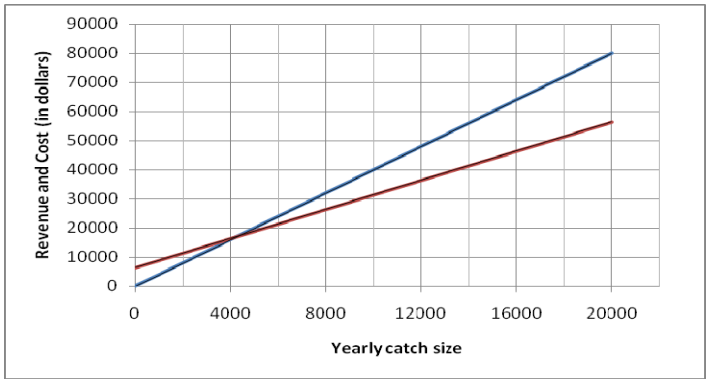
For both formulas, the input variable is x = the yearly catch size.
First, find both of the formulas and write them below:

Revenue: R(x) = Cost: C(x) =

How would you graph these on separate axes? (Answer: For each, plug in several x values, compute the y-values, and then draw the graph.)

If you want to see where they intersect, where should you draw them? (On the same axes.)
On the graph below, label which graph is your Cost graph.

- Hint: Think of the intercept of the Cost formula. Does that help you choose which one?
- Second hint: Compare the slopes of both formulas. Which graph should be steeper? Does that help you label these?



Use the formulas you wrote above and the graph here to answer the questions in Activity 1 on pages 43-45. Write the answers in your notes.

Now, answer the "wrap-up" on page 45.

We'll skip the "Nitty Gritty" about solving systems of equations by substitution that is on pages 46-47. We're already using all of that we need when we set Revenue equal to Cost and solve for x.

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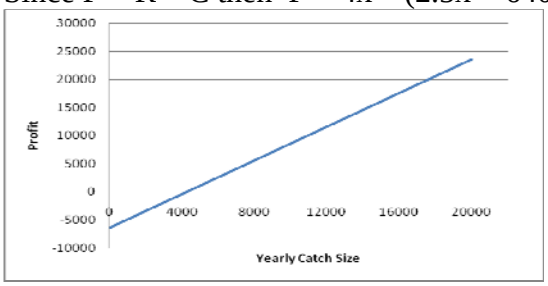
Look at the Homework on pages 47-51. The first three problems use ideas from the previous lesson. Let's do those now, in class.

Homework: Lesson 5, pages 47-51. 6, 7, 8, 9, 10, 11, 12, 13

Quiz: Lesson 5, page 51. 14, 15.

Answers:
Page 42: R(x) = 4x and C(x) = 2.50x + 6400.
Activity 1. Pages 43-44.

1. Cost is about \$24,000. Revenue is about \$28,000. The vertical distance between them represents the profit and is about \$4000.
2. Since P = R – C then P = 4x – (2.5x + 6400) = 1.5x – 6400



3. From the above graph, we can see that P at 7000 is about 4000. From the formula,
$P = 1.5 \cdot 7000 - 6400$
$P = 4100$
This is close to our estimate from number 1 and from the graph.
4. The x-intercept is where y = 0, so that is where Profit = 0. When Profit = 0, then we know that the Revenue is equal to the Cost.
5. The break-even point, on the graph, seems to have x-coordinate a little larger than 4000 and y-coordinate between 10,000 and 20,000, and closer to 20,000. So we'll say it is about x = 4200 and y = 17000. That is, if the yearly catch size is about 4200 fish, then both the revenue and the cost are about \$17,000.
6. Set Revenue equal to cost and find the x-coordinate. Then plug that x into either formula to find the y-coordinate.
$R = C$
$4x = 2.5x + 6400$
$1.5x = 6400$
$x = 6400 / 15$
$x = 4267$
Then $R = 4 \cdot x$
$R = 4 \cdot 4267$
$R = 17,067$
Break-even point (4267,17067)

Wrap-up: 1. Find the break-even point by looking at the graph to find the intersection point. Find the break-even point by finding the solution to R = C.

2. The Harvest model has input the fish population size and output the cost per fish and the market price. That cost per fish and market price go into the Business Model, and then profit comes out of the Business Model. There are also other inputs into the Business model: Fixed costs and the number of fish caught. (See diagram for HW problem 4 in the answers in the back.)

Homework Answers. pages 47-51.

1. P = 25,000(8.5) – 25,000(6) – 60,000 = 2,500 shillings
2. P = 25,000(8.5) – 25,000(8) – 60,000 = –47,500 shillings (This is not good. Negative profit means a loss!)
3. The cichlid fishermen can no longer make a profit, and, in fact, have a VERY large loss if they're still trying to fish when the fish population size is 20 million.
4. See the back of the book for one such diagram.
5. Processing: Variable because it depends on the amount caught
   Refrigeration: variable because it depends on the time spent harvesting
   Payments on boat: Fixed because the boat costs the same whether you use it or not.
   Salaries: Variable, because you pay by the hour and so it depends on harvesting time
   Docking fees: Fixed, because you dock the boat whether you are harvesting or not
   Fuel: Variable, because it depends on how much time you spend harvesting.
   Boat maintenance: Mostly variable, because the more you use it, the more you have to maintain it.
6. a. (2,70) and (4,120). b. You draw the graph. c. She charges $170 for a 6-hour job.
7. a. $220 b. $133 c. 7 hours d. 3.5 hours
8. No, it doesn't double; 4 hours cost $120, but 8 hours cost $220, which is not doubled.
9. The graph shows there must be a fee, because when time = 0, the y-intercept isn't 0, but is positive. It is fair for there to be a fee, because the electrician had to spend his time traveling to the job.
10. a. $25 b. $25 c. 6 hrs: $170-$25 = $145; 7 hrs: $170+$25 = $195 d. $25 per hour.
11. a. So we just decided the slope is $25. Now we need the intercept. That's the price when the time is 0. Since the Price for 2 hours is $70, then if we subtract 2*$25 from that, we get the price for 0 hours. That's $20. So the equation is Price = 20 + 25x where x is the number of hours.
    b. $95 and $207.50
12. a. (2,80) b. (8,260) c. (5,170)
13. a. graph b. The new line rises more steeply. c. The y-intercept (cost-intercept) is the same. d. C = 20+30t