Part B: The Seven Measures of a Firm's Short-Run Costs

The Morton Boat Company produces the very popular Jazzy Johnboat, which is desired by many fishermen and fisherwomen. Assume the firm operates in the short run with a fixed amount of equipment (capital) and views labor as its only variable resource. If it wants to produce more output, it will add more units of labor to its stock of equipment. Of course, the firm will have to pay its workers and also the owners of its capital, which means its total cost will increase as it produces more boats. Table 3-3.1 defines the seven cost measures the Morton Boat Company must consider.

Table 3-3.1
The Seven Short-Run Cost Measures of a Firm

Cost measure	What it means	How to calculate it
Total fixed cost (TFC)	All costs that do not change when output changes. TFC is a constant amount at all Q levels.	TFC = total cost of all fixed factors of production TFC = Q × AFC
Total variable cost (TVC)	All costs that do change when output changes. TVC gets bigger as Q increases because the firm needs more labor to make more output.	TVC = total cost of all variable factors of production TVC = Q × AVC
Total cost (TC)	All costs at a given output level. TC is the sum of TFC and TVC. TC increases as the level of output increases.	TC = TFC + TVC TC = Q × ATC
Average fixed cost (AFC)	Fixed cost (capital cost) per unit of output. AFC always falls as Q rises since TFC is a constant value.	AFC = TFC/Q
Average variable cost (AVC)	Variable cost (labor cost) per unit of output. AVC falls at first, and then rises as Q increases.	AVC = TVC/Q
Average total cost (ATC)	Total cost per unit of output. It is the sum of AFC and AVC. ATC falls at first, and then rises as Q increases.	ATC = TC/Q ATC = AFC + AVC
Marginal cost (MC)	Change in the firm's TC when it produces another unit of output. Also shows change in TVC from an extra unit of output. MC falls at first, and then rises as Q increases.	MC = ΔTC/ΔQ MC = ΔTVC/ΔQ because the only part of TC that changes when more Q is produced is TVC.

Reminder: The AVC curve is U-shaped (falls, then rises as Q increases) because its shape is the mirror image of the APP curve as shown in Activity 3-2. The MC curve also is U-shaped because it is the mirror image of the MPP curve. Refer back to Figure 3-2.5.

Table 3-3.2 is the cost spreadsheet for the Morton Boat Company. It has information on all seven short-run cost measures based on different Q levels of the firm.

5. Complete Table 3-3.2. Some of the data have been posted for you already.

Table 3-3.2

The Seven Short-Run Cost Measures of the Morton Boat Company (daily data)

Q boats per day	(1) TFC	(2) TVC	(3) TC = TFC + TVC	(4) AFC = TFC/Q	(5) AVC = TVC/Q	(6) ATC = TC/Q = AFC + AVC	(7) MC = ΔTC/ΔQ = ΔTVC/ΔQ
0				–	–	–	–
1	$300		$1,000				
2					$650		$600
3		$1,800					
4				$75			$600
5	$300					$680	
6							$740

6. What trend do you observe in the value of TFC as the level of Q is increased? How do you explain this trend?

7. What trend do you observe in the value of TVC as the level of Q is increased? How do you explain this trend?

8. Compare the ATC value at any Q level with the MC value at the next Q level. What relationship do you see between ATC and MC?

9. Compare the AVC value at any Q level with the MC value at the next Q level. What relationship do you see between AVC and MC?

10. Compare the AFC value at any Q level with the MC value at the next Q level. What relationship do you see between AFC and MC?

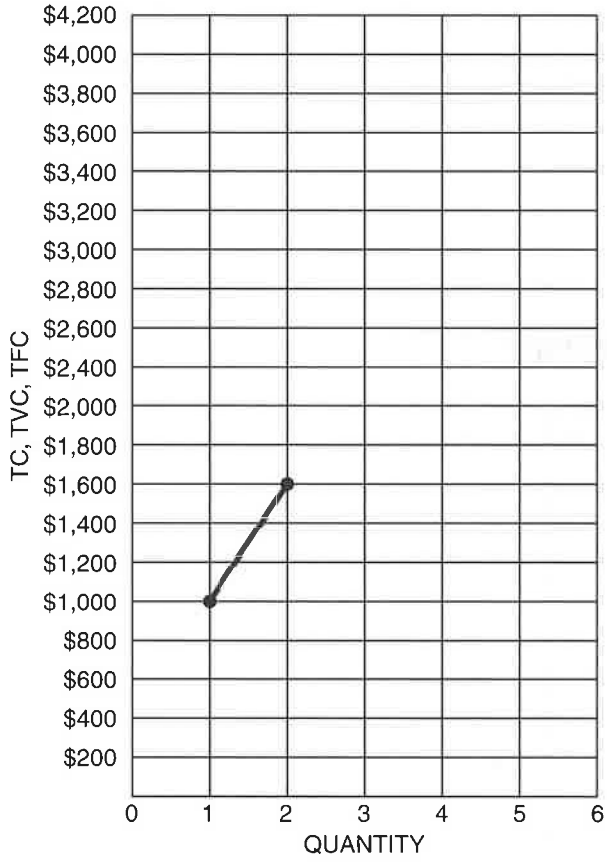
Part C: Graphing the Cost Functions of a Firm

The relationships that exist among the firm's cost functions can be illustrated by plotting the data in Table 3-3.1 in cost graphs. Figure 3-3.1 is the "total" cost graph because it contains information about the firm's TC, TVC, and TFC functions. Figure 3-3.2 is the "marginal-average" cost graph because it shows the data for the firm's MC, ATC, AVC, and AFC functions.

11. Plot the data from Table 3-3.1 in the appropriate graphs. Two observations of TC and AVC have already been plotted for you.

12. Plot the values of MC at the new output level. For example, put a dot on the graph at the combination of Q = 4 and MC = $600 since the MC resulting from producing the fourth boat is $600. Connect the MC dots in your graph with a dotted line.

Figure 3-3.1
The Firm's "Total" Cost Graph



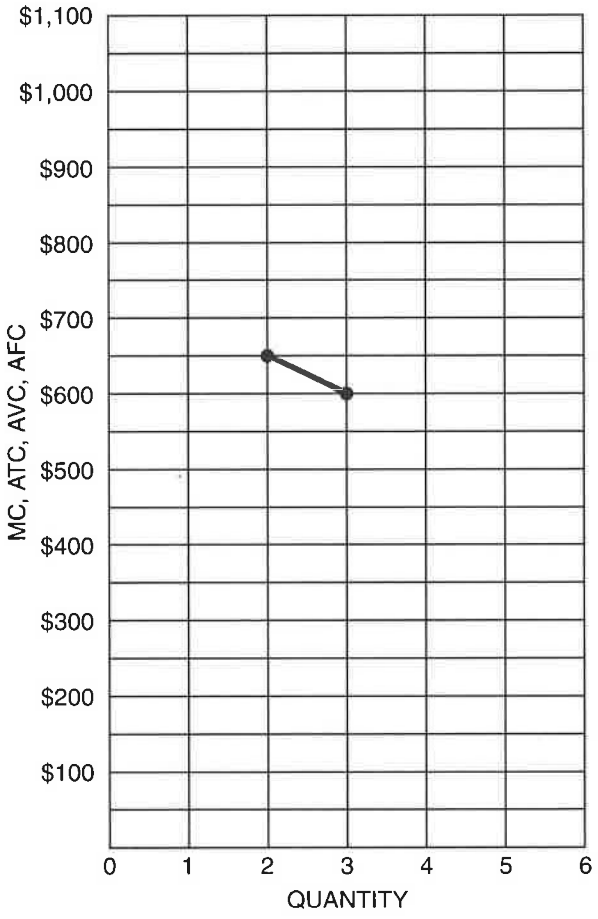
13. Why is the vertical gap between the TC and TVC curves the same at all Q levels?

14. The slope of the TC curve can be expressed as rise/run = $\Delta TC/\Delta Q$. Do you know another cost function that is found using the ratio $\Delta TC/\Delta Q$?

15. Why do both the TC and TVC curves keep climbing higher and higher as the Morton Boat Company increases the number of boats it produces?

16. Why does the TC curve not begin at the origin?

Figure 3-3.2
The Firm's "Marginal-Average" Cost Graph



17. AVC continues to decrease as long as MC is (*greater than / equal to / less than*) AVC.
18. AVC continues to increase as long as MC is (*greater than / equal to / less than*) AVC.
19. ATC continues to decrease as long as MC is (*greater than / equal to / less than*) ATC.
20. ATC continues to increase as long as MC is (*greater than / equal to / less than*) ATC.
21. Mr. Burpin, your AP teacher, asks you to explain the following statement: "Average fixed cost falls as long as marginal cost is less than average fixed cost." What is your response?

22. Do you agree with the following statement? "Average variable cost is minimized at the output level where marginal cost is equal to average variable cost." Explain.

23. What do you say to someone who says, "Fixed cost is the same at all output levels"?

24. Can you tell from Table 3-3.1 how many boats the Morton Boat Company should produce to maximize its total profit? Explain.