

Finding the Optimal Quantity

Name: _____ Date: _____

Directions: Read the information in Part A to help answer the questions in Part B. Be prepared to share your answers with the rest of the class.

Part A.

A basic goal of economics is finding the “best” solution, whether it is some amount of activity or resources to use. Economists strive to find the unit of each activity where the MB is greater than the MC. These activities may be as simple as eating ice cream and studying for exams or as complex as determining how many units of microchips to produce for a rocket or a cell phone. The concept of economic thinking is based on comparing the marginal benefit to the marginal cost of each additional unit of the activity, allowing the decision maker to choose the most efficient (best) amount.

Terms

1. total benefit (TB): total value from a given number of units of the activity
2. total cost (TC): sum of all costs associated with a given number of units of the activity
3. marginal benefit (MB): change in TB resulting from one more unit of the activity:
 $MB = \Delta TB / \Delta Q$
4. marginal cost (MC): change in TC resulting from one more unit of the activity: $MC = \Delta TC / \Delta Q$
5. net total benefit (NTB): difference between TB and TC from a given number of units of the activity
6. net marginal benefit (NMB): difference between MB and MC from an extra unit of the activity

Relationships

1. $NTB = TB - TC$
2. $NMB = MB - MC$
3. $TB = \text{sum of the MBs}$
4. $TC = \text{sum of the MCs}$
5. $NTB = \text{sum of the NMBs}$

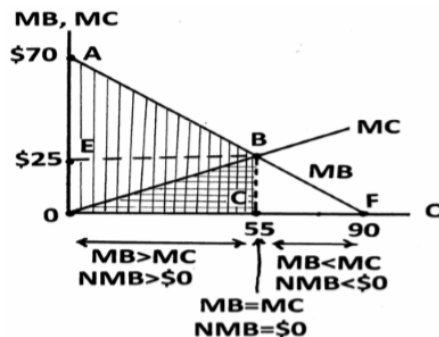
Graphically

1. TB: The area under the MB for the amount of the activity provided = trapezoid OABC for 55 units.
2. TC: the area under the MC curve for the amount of the activity provided = triangle OBC for 55 units.
3. NTB: the area between the TB area and the TC area = triangle OAB for 55 units.
4. NMB for an extra unit is the vertical gap between the MB and MC curves at that quantity.

The sum of these NMB values is equal to the NTB for that quantity = area OAB for 55 units.

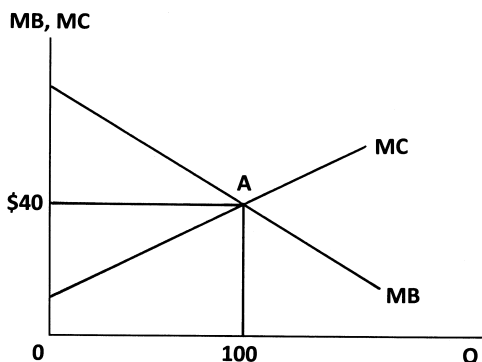
*Why is 55 units the optimal amount of this activity?

Each of the first 54 units has $MB > MC$ (positive NMB); therefore, NTB increases when these units are provided. Units #56 and beyond have $MB < MC$ (negative NMB) which means NTB decreases when they are provided. Even though the 55th unit has $MB = MC$ (NMB = \$0), producing 55 units means you have enjoyed all the “good” units and stopped before consuming any “bad” units, thus maximizing your NTB from this activity. NTB = area of triangle OAB.



Part B.

The Basic Graph of the Optimal Amount of an Activity



The optimal amount of this activity is 100 units. By providing/consuming this quantity, the net total benefit from the activity is maximized.

Here is the logic of choosing the quantity at which $MB = MC$. As shown in this chart, by providing 100 units we are providing all those units which have $MB > MC$ and stopping before providing units which have $MB < MC$.

Units	MB compared to MC	Net Marginal Benefit	Net Total Benefit
#1-99	$MB > MC$	$NMB > 0$	NTB increases
#100	$MB = MC$	$NMB = 0$	NTB is maximized
#101 and above	$MB < MC$	$NMB < 0$	NTB decreases

Marginal Analysis in Action: Determining the Optimal Amount of an Activity

The graph shows the marginal benefit and marginal cost you will receive from different amounts of some activity. Answer these questions based on the graph.

- The number of units that will maximize your total benefit (TB) is _____ units.
(a) 0 (b) 5 (c) 8 (d) 10 (e) 12
- The net marginal benefit (NMB) you would receive from the 5th unit is
(a) JK (b) JN (c) KN (d) OJNA (e) ABN
- The marginal cost (MC) of the 10th unit is
(a) DX (b) DY (c) XY (d) ODY (e) ODXA
- The number of units that will maximize your net total benefit (NTB) is _____ units
(a) 0 (b) 5 (c) 8 (d) 10 (e) 12
- The deadweight loss from having 5 units of the activity is
(a) OJK (b) JRWN (c) KNW (d) NK (e) RW
- The net total benefit (NTB) from 8 units is
(a) OWA (b) ORWA (c) KNW (d) RW (e) FWA
- Net marginal benefit (NMB) is 0 at _____ units.
(a) 0 (b) 5 (c) 8 (d) 10 (e) 12
- The optimal number of units of this activity is _____ units.
(a) 0 (b) 5 (c) 8 (d) 10 (e) 12

