

**Chapter 6 (Perfectly  
Competitive Supply),  
part two**

**Tuesday, July 6**

## a widget factory

<b>N</b>	<b>Q</b>
<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**I own a widget factory.**

**N is the number of employees that I have...**

**Q is the number of widgets that I can make and sell per day...**

**Suppose that I get \$2 for each widget that I sell, and I have to pay each worker \$50 per day. Not only that, but I also have to pay some other factory-related expenses of \$100 per day no matter what.**

## QUESTION 1 (marginal product)

<b>N</b>	<b>Q</b>
<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the marginal product of the 5<sup>th</sup> worker?**

**That is, when I add the 5<sup>th</sup> worker, how many extra widgets can I produce as a result?**

- A) 60**
- B) 160**
- C) 375**
- D) 40**
- E) 12**

## answer to question 1

**N**

**Q**

**1**

**10**

**2**

**40**

**3**

**90**

**4**

**160**

**5**

**220**

**6**

**270**

**7**

**310**

**8**

**340**

**9**

**360**

**10**

**370**

**11**

**375**

**What is the marginal product of the 5<sup>th</sup> worker?**

**That is, when I add the 5<sup>th</sup> worker, how many extra widgets can I produce as a result?**

**A) 60**

**B) 160**

**C) 375**

**D) 40**

**E) 12**

## QUESTION 2 (value of marginal product)

**N**                      **Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the 3<sup>rd</sup> worker's value of marginal product?**

**That is, when I add the 3<sup>rd</sup> worker, how much extra revenue can I produce as a result?**

**A) \$50**

**B) \$90**

**C) \$100**

**D) \$160**

**E) \$200**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 2

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the 3<sup>rd</sup> worker's value of marginal product?**

**That is, when I add the 3<sup>rd</sup> worker, how much extra revenue can I produce as a result?**

**A) \$50**

**B) \$90**

**C) \$100**

**D) \$160**

**E) \$200**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

### QUESTION 3 (optimal number of workers)

**N**                      **Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**How many workers should I hire in order to maximize my profit?**

**Or... how many workers can I hire until the value of workers' marginal product decreases below the marginal cost of labor, which is the wage rate (\$50)?**

- A) 6**
- B) 7**
- C) 8**
- D) 9**
- E) 10**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

### answer to question 3

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**How many workers should I hire in order to maximize my profit?**

**Or... how many workers can I hire until the value of workers' marginal product decreases below the marginal cost of labor, which is the wage rate (\$50)?**

- A) 6**
- B) 7**
- C) 8**
- D) 9**
- E) 10**

**widget price = \$2, worker price = \$50, fixed cost is \$100**



## answer to question 3, continued

<b>N</b>	<b>Q</b>	<b>MP</b>	<b>VMP</b>
<b>1</b>	<b>10</b>	<b>10</b>	<b>20</b>
<b>2</b>	<b>40</b>	<b>30</b>	<b>60</b>
<b>3</b>	<b>90</b>	<b>50</b>	<b>100</b>
<b>4</b>	<b>160</b>	<b>70</b>	<b>140</b>
<b>5</b>	<b>220</b>	<b>60</b>	<b>120</b>
<b>6</b>	<b>270</b>	<b>50</b>	<b>100</b>
<b>7</b>	<b>310</b>	<b>40</b>	<b>80</b>
<b>8</b>	<b>340</b>	<b>30</b>	<b>60</b>
<b>9</b>	<b>360</b>	<b>20</b>	<b>40</b>
<b>10</b>	<b>370</b>	<b>10</b>	<b>20</b>
<b>11</b>	<b>375</b>	<b>5</b>	<b>10</b>

**After the 8<sup>th</sup> worker, the value of the marginal product of labor starts to be lower than the wage, so it's not profitable to hire additional workers.**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## QUESTION 4 (total cost)

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the total cost when the number of workers is 5?**

**A) \$100**

**B) \$150**

**C) \$200**

**D) \$250**

**E) \$350**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 4

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the total cost when the number of workers is 5?**

**A) \$100**

**B) \$150**

**C) \$200**

**D) \$250**

**E) \$350**

**variable cost (VC) =  $\$50 \times 5 = \$250$**

**fixed cost (FC) = \$100**

**total cost (TC) = \$350**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## QUESTION 5 (average total cost)

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the average total cost (ATC) when the number of workers is 8?**

**A)  $\$100 / 340 \approx \$0.29$**

**B)  $\$500 / 340 \approx \$1.47$**

**C)  $\$500 / 8 = \$62.5$**

**D)  $\$400 / 8 = \$50$**

**E)  $\$400 / 340 \approx \$1.18$**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 5

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the average total cost (ATC) when the number of workers is 8?**

**A)  $\$100 / 340 \approx \$0.29$**

**B)  $\$500 / 340 \approx \$1.47$**

**C)  $\$500 / 8 = \$62.5$**

**D)  $\$400 / 8 = \$50$**

**E)  $\$400 / 340 \approx \$1.18$**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 5, continued

**N**                      **Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the average total cost (ATC) when the number of workers is 8?**

$$\text{ATC} = \text{TC} / \text{Q}$$

$$\text{ATC} = (\text{VC} + \text{FC}) / \text{Q}$$

$$\text{ATC} = (\$50 \times 8 + \$100) / 340$$

$$\text{ATC} = (\$400 + \$100) / 340$$

$$\text{ATC} = (\$500) / 340 \approx \$1.47$$

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## QUESTION 6 (total revenue)

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the total revenue when the number of workers is 8?**

**A) \$30**

**B) \$60**

**C) \$100**

**D) \$340**

**E) \$680**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 6

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is the total revenue when the number of workers is 8?**

**A) \$30**

**B) \$60**

**C) \$100**

**D) \$340**

**E) \$680**

$$\mathbf{TR = P \times Q = \$2 \times 340 = \$680}$$

**widget price = \$2, worker price = \$50, fixed cost is \$100**



## QUESTION 7 (profit)

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is profit when the number of workers is 8?**

**A) \$60**

**B) \$100**

**C) \$180**

**D) \$280**

**E) \$340**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 7

**N**

**Q**

<b>1</b>	<b>10</b>
<b>2</b>	<b>40</b>
<b>3</b>	<b>90</b>
<b>4</b>	<b>160</b>
<b>5</b>	<b>220</b>
<b>6</b>	<b>270</b>
<b>7</b>	<b>310</b>
<b>8</b>	<b>340</b>
<b>9</b>	<b>360</b>
<b>10</b>	<b>370</b>
<b>11</b>	<b>375</b>

**What is profit when the number of workers is 8?**

**A) \$60**

**B) \$100**

**C) \$180**

**D) \$280**

**E) \$340**

**widget price = \$2, worker price = \$50, fixed cost is \$100**

## answer to question 7, continued

**N**

**Q**

**1**

**10**

**2**

**40**

**3**

**90**

**4**

**160**

**5**

**220**

**6**

**270**

**7**

**310**

**8**

**340**

**9**

**360**

**10**

**370**

**11**

**375**

**What is profit when the number of workers is 8?**

$$\Pi = TR - TC$$

$$\Pi = (P \times Q) - (VC + FC)$$

$$\Pi = (\$2 \times 340) - (\$50 \times 8 + \$100)$$

$$\Pi = (\$680) - (\$400 + \$100)$$

$$\Pi = (\$680) - (\$500)$$

$$\Pi = \$180$$

**widget price = \$2, worker price = \$50, fixed cost is \$100**

# WIDGET FACTORY GRAPH

