

### Quiz #8

**Instructions:**

- This is a closed book, closed note quiz.
- You have **25 minutes** to complete the quiz.

ACME is the only producer of widgets. The market demand for widgets is given by the following expression:

$$Q = 1200 - 100P$$

$$P = 12 - \frac{1}{100}Q$$

$$MR = 12 - \frac{2}{100}(Q_1 + Q_2)$$

ACME can operate two plants in order to produce widgets:

$$C_1(Q) = 2\frac{Q_1^2}{100} + 200$$

$$MC_1 = 4Q_1/100$$

$$C_2(Q) = \frac{Q_2^2}{100} + 1000$$

$$MC_2 = 2Q_2/100$$

1. Find the profit maximizing quantity and price for ACME. (Be sure to indicate how much output is produced by each factory.)
2. Suppose that ACME is only allowed to produce widgets using plant number 2. How much more/less profit is ACME able to earn using a single plant than it would if it were able to use both plants?

$$12 - \frac{2}{100}(Q_1 + Q_2) = 2Q_2/100$$

$$\frac{4Q_1}{100} = \frac{2Q_2}{100}$$

$$1200 - 2Q_1 - 2Q_2 = 2Q_2$$

$$2Q_1 = Q_2$$

$$1200 - 2Q_1 = 4Q_2$$

$$1200 - 2Q_1 = 4(2Q_1)$$

$$1200 = 10Q_1$$

$$Q_1 = 120 \quad Q_2 = 240$$

$$P^* = 8.40$$

$$\pi = 3024 - \left(2\frac{120^2}{100} + 200\right) - \left(\frac{240^2}{100} + 1000\right) \Rightarrow$$

$$\pi = 3024 - (480) - (1576) = 960$$

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$$MC_2 = \frac{2Q_2}{100}$$

$$12 - \frac{2}{100}Q = \frac{2}{100}Q$$

$$1200 = 4Q$$

$$Q^* = 300$$
$$P^* = 9$$

$$\pi = 2700 - \left( \frac{(300)^2}{100} + 1000 \right)$$

$$\pi = 800$$

\$ 160 less