

**23. Correct. The answer is true.** With more firms competing in a market, there will be a tendency for the market price to be pushed down. First, the calculation for 2 firms:

$$\pi_1 = [1,000 - (q_1 + q_2)]q_1 - 100q_1.$$

For profit maximization, we get the first order condition (F.O.C.):

$$\partial\pi_1/\partial q_1 = 1,000 - 2q_1 - q_2 - 100 = 0.$$

Solving for the firm 1 's reaction function, we get  $q_1 = 450 - 0.5q_2$ . Since firm 2 has an identical profit function, its reaction function is  $q_2 = 450 - 0.5q_1$ . Equilibrium quantities can be found by solving the system of two reaction functions. The solution is  $q_1 = q_2 = 300$ . The equilibrium price is found by substituting these quantities into the demand function:

$$P = 1,000 - (300 + 300) = 400.$$

For three firms, the profit function for firm 1 is:

$$\pi_1 = [1,000 - (q_1 + q_2 + q_3)]q_1 - 100q_1.$$

The profit-maximizing F.O.C. is

$$\partial\pi_1/\partial q_1 = 1,000 - 2q_1 - q_2 - q_3 - 100 = 0.$$

Solving for  $q_1$ , we get firm 1 's reaction function  $q_1 = 450 - 0.5(q_2 + q_3)$ . Again since firms 2 and 3 have identical profit functions, they have similar reaction functions. The system of reaction functions that when solved will give equilibrium quantities is

$$q_1 = 450 - 0.5(q_2 + q_3)$$

$$q_2 = 450 - 0.5(q_1 + q_3)$$

$$q_3 = 450 - 0.5(q_1 + q_2)$$

The solution to this system of equations is  $q_1 = q_2 = q_3 = 225$ . The equilibrium price is

$$P = 1,000 - (225 + 225 + 225) = 325.$$

This price is lower than in the case with only two firms (400). The addition of more firms will lower the price even further eventually approaching the competitive market equilibrium price of 100 (the constant marginal cost of each firm).