

$$MC = 10$$

1. Cournot

(a) Firm 1:

$$MR_1 = 50 - 20Q_1 - 10Q_2$$

$$MR_1 = MC$$

$$50 - 20Q_1 - 10Q_2 = 10$$

$$-20Q_1 = -40 + 10Q_2$$

$$Q_1 = 2 - \frac{Q_2}{2}$$

(b) Output and (c)

$$Q_1 = 2 - \left(2 - \frac{Q_1}{2}\right)$$

$$2$$

$$Q_1 = 2 - 1 + \frac{Q_1}{4}$$

$$3Q_1 = 4$$

$$R^1(Q_2) = 2 - \frac{Q_2}{2}$$

$$Q_1^C = \frac{4}{3}$$

$$R^2(Q_1) = 2 - \frac{Q_1}{2}$$

$$Q_2^C = \frac{4}{3}$$

(d) Price

$$Q^C = Q_1^C + Q_2^C = \frac{4}{3} + \frac{4}{3} = \frac{8}{3}$$

$$P^C = 50 - 10\left(\frac{8}{3}\right) = 50 - \frac{80}{3}$$

$$P^C = \frac{150}{3} - \frac{80}{3} = \frac{70}{3}$$

$$P^C = \frac{70}{3} = 23.\bar{3}$$

(e)  $\pi_1^C$  and  $\pi_2^C$

$$\pi_1^C = (P - C)Q_1^C$$

$$\pi_1^C = \left(\frac{70}{3} - 10\right)\left(\frac{4}{3}\right)$$

$$\pi_1^C = \left(\frac{70}{3} - \frac{30}{3}\right)\left(\frac{4}{3}\right) = \left(\frac{40}{3}\right)\left(\frac{4}{3}\right)$$

$$\pi_1^C = \frac{160}{9} = 17.78$$

$$\pi_2^C = \frac{160}{9} = 17.78$$

(f)  $\pi^C = \pi_1^C + \pi_2^C$

$$\pi^C = 17.78 + 17.78$$

$$\pi^C = 35.56$$

### 2. PERFECT Competition

$$P = 50 - 10Q$$

$$MC = c = 10$$

(a)  $P = MC$

$$50 - 10Q = 10$$

$$-10Q = -40$$

$$Q^* = 4$$

Assume firms split

Output EQUALLY

$$Q_1^* = Q_2^* = \frac{Q^*}{2} = 2$$

(b) Price

$$P^* = MC = 10$$

$$P^* = 10$$

(c)  $\pi^*$

$$\pi^* = (P^* - c)Q^*$$

$$= (10 - 10)(4)$$

$$= 0$$

$$\pi^* = 0$$

### 3. Monopoly

(a)  $MR = 50 - 20Q$

$$MR = MC$$

$$50 - 20Q = 10$$

$$-20Q = -40$$

$$Q^m = \frac{40}{20} = 2$$

$$Q_1^m = Q_2^m = \frac{Q^m}{2} = 1$$

(b) Price

$$P^m = 50 - 10Q^m = 50 - 10(2)$$

$$P^m = 50 - 20$$

$$P^m = 30$$

(c)  $\pi^m$

$$\pi^m = (P^m - c)Q^m$$

$$\pi^m = (30 - 10)(2)$$

$$\pi^m = (20)(2)$$

$$\pi^m = 40$$

$$\pi_1^m = \pi_2^m = \frac{\pi^m}{2} = 20$$

## 4. Comparison

Output:

$$Q^m < Q^c < Q^*$$

Price:

$$P^* < P^c < P^m$$

Profit:

$$\pi^* < \pi^c < \pi^m$$