Practice Set 7 Supply Chain Management

Question 1

A supplier produces a product at per unit cost $35 and sells it to a retailer at the wholesale price $75. The retailer decides how many units to order (q) before the sales season. The demand of customers is normally distributed with mean 250 and standard deviation of 125. The retail price is $115 and each unit of leftover inventory has salvage value of $15. Which of the following statements is false?

a. The retailer should order less than 250 units

b. If the wholesale price decreases from $75 to $65, the retailer would order more than 250 units

c. If the retailer price increases from $115 to $145, the retailer would order more than 250 units

d. If the wholesale price decreases from $75 to $35, the total profit earned in the supply chain would be maximized

Question 2

A supplier produces a product at per unit cost $35 and sells it to a retailer at the wholesale price $75. The retailer decides how many units to order (q) before the sales season. The demand of customers is normally distributed with mean 250 and standard deviation of 125. The retail price is $115 and each unit of leftover inventory has salvage value of $15. Which of the following statements is false?

a. The retailer should order less than 250 units

b. If the wholesale price decreases from $75 to $85, the retailer would order less than 250 units

c. If the retailer price decreases from $115 to $105, the retailer would order more than 250 units

d. If the wholesale price decreases from $75 to $35, the total profit earned in the supply chain would be maximized

Question 3

A supplier produces a product at per unit cost $35 and sells it to a retailer at the wholesale price $75. The retailer decides how many units to order (q) before the sales season. The demand of customers is normally distributed with mean 250 and standard deviation of 125. The retail price is $115 and each unit of leftover inventory has salvage value of $25. Which of the following statements is false?

a. The retailer should order less than 250 units

b. If the wholesale price decreases from $75 to $65, the retailer would order more than 250 units

c. If the retailer price decreases from $115 to $105, the retailer would order more than 250 units

d. If the wholesale price decreases from $75 to $35, the total profit earned in the supply chain would be maximized

Question 4

Umbra Visage (UV) is a retailer of Zamatia, an upscale maker of eyewear. UV purchases each pair of sunglasses from Zamatia for $75 and sells them for $115. Zamatia's production cost per pair is $35. At the end of the season, UV offers deep discounts to sell remaining inventory. The estimate is each pair will only have $25 salvage value if not sold by the end of the season. UV's forecasting department believes the demand for this pair of sunglasses is:

Demand	800	1,000	1,200	1,400	1,600	1,800
Probability	0.11	0.11	0.28	0.22	0.18	0.10
Cumulative Probability	**0.11**	**0.22**	**0.50**	**0.72**	**0.90**	**1.00**

(a) What is the **optimal order quantity for UV**?

Cu = 115-75 = 40
Co = 75-25=50
Prob = Cu/(Cu+Co) = 4/9 = 0.444
Q= 1200

(b) What is **UV's expected profit** under its optimal order quantity in part (a)?

UV Profit = revenue + salvage value collected – purchase cost

= E[p* min (D,Q) +s*max(Q-D,0) - w*Q]

= E[115*min(D,1200) + 25*max(1200-D,0) - 75*1200]

=115*[800*0.11+1000*0.11+1200* 0.78] +25*[400*0.11+200*0.11] - 75*1200

=42,060

(c) What is **Zamatia's expected profit** when UV orders its optimal order quantity in part (a)?

Zamatia Profit = (w-c) *Q = (75-35)*1200 = 48,000

(d) What is the **supply chain's total profit** (that is the sum of UV and Zamantia's profits) when UV orders its optimal order quantity in part (a)?

Supply Chain Profit =42060+48000 = 90,060

(e) What would be the **integrated supply chain's optimal order quantity** if there's a centralized decision maker?

Optimal order quantity under Integrated centralized supply chain:

Cu = 115-35 = 80
Co = 35-25=10
Prob = Cu/(Cu+Co) = 8/9 = 0.888
Q= 1,600

(f) What would be the **integrated supply chain's total profit** under the optimal order quantity in part (e)?

Integrated SC Profit

= E[p* min (D,Q) +s*max(Q-D,0) - c*Q]

= E[115*min(D,1600) + 25*max(1600-D,0) - 35*1600]

=115*(800*0.11+1000*0.11+1200* 0.28+1400*0.22+1600*0.28)
+25*(800*0.11+600*0.11+400*0.28+200*0.22) -35*1600

=100,100