

Commerce 398-201 Winter 2014-2015 Term - ANSWERS

Assignment 3

Due at beginning of class March 17, 2013

Please do all questions in order. Marks in parenthesis is the maximum mark for answers to the questions;

1. In an agreement between a supplier and a customer, the supplier must ensure that all parts are within tolerance before shipment to the customer. What would be the effect on the cost of quality to the customer? (6)

Answer

Before the agreement was made, the customer probably inspected each part to protect against off-spec supplies. This agreement (ideally) eliminates the need for this inspection. Appraisal costs, such as materials and supplies inspection and reliability testing, will be reduced since the agreement would ensure that the supplies are totally within tolerance. This allows the customer to focus attention on quality improvement within his or her own processes, requiring an increase in prevention cost. Scrap and rework costs will initially drop because of the improvement in the quality of the part supply. Once prevention programs are in force, scrap, repair, rework, and downtime costs will drop even further because of improvements in the internal process. External failure costs will drop because of improvement in the product and the process.

2. What strategies are used by supermarkets, airlines, hospitals, banks, and cereal manufacturers to influence demand? (10)

Answer

Supermarkets—several sales items, free giveaway items (such as a pound of butter or a loaf of bread), an occasional “midnight madness” sale where the store is open late or even all night.

Airlines—excursion rates, age rates (senior citizens, children, youth fares), charter flights, off-season rates, exceptionally good meals (or no meals for further reduced prices), more flights, tie-in with hotels or auto rental, and tour agencies for “package tours,” free champagne, free stop-over at a third point, or new terminals.

Hospitals—patients generally go to the hospital recommended by their physician. Therefore, hospitals offer free office space, nursing assistance, lab equipment, staff positions, and patient billing to physicians. Hospitals frequently advertise their occupancy rate and room rates, which tend to influence demand. Also, they could become a preferred provider organization.

Banks—free gifts for new accounts, free checking, free safety deposit box, free financial advice, “club memberships,” and free use of “executive lounges” for depositors in various size account ranges, community rooms for club meetings.

Cereal manufacturers—TV advertising, sponsorship of some youth events, free prizes in cereal boxed, using prime display space.

3. Historic demand data for a product is:

<u>Month</u>	<u>Demand</u>
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January	12
February	11
March	15
April	12
May	16
June	15

- (a) Using a weighted moving average with weights of 0.60, 0.30, and 0.10 find the July forecast. (3)

$$F_{\text{July}} = .60(15) + .30(16) + .10(12) = 15.0$$

- (b) Using a simple three-month moving average, find the July forecast. (3)

$$F_{\text{July}} = (15 + 16 + 12) / 3 = 14.3$$

- (c) Using single exponential smoothing with $\alpha=0.2$ and a June forecast =13, find the July forecast. Make whatever assumptions you wish but be clear what they are. (4)

$$F_{\text{July}} = F_{\text{June}} + \alpha(A_{\text{June}} - F_{\text{June}}) = 13 + .2(15-13) = 13.4$$

- (d) Using simple linear regression analysis, calculate the regression equation for the demand data. (5)

	x	y	xy	x ²
	1	12	12	1
	2	11	22	4
	3	15	45	9
	4	12	48	16
	5	16	80	25
	6	15	90	36
Total	21	81	297	91

$$\bar{x} = 3.5$$

$$\bar{y} = 13.5$$

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2} = 0.77$$

$$a = \bar{y} - b\bar{x} = 10.8$$

$$Y = a + bx = 10.8 + .77x$$

- (e) Using the regression equation in (d), calculate the forecast for July. (4)

F_{July} , where July is the 7th month.

$$Y = a + bx = 10.8 + .77(7) = 16.2$$

4. The local supermarket buys lettuce each day to ensure really fresh produce. Each morning any lettuce left from the previous day is sold to a dealer who resells it to farmers who uses it to feed their animals. This week the supermarket can buy fresh lettuce for \$4.00 per box. The lettuce is sold for \$10 per box and the dealer that sells old lettuce is willing to pay \$1.50 per box. Past history says that tomorrow's demand for lettuce averages 250 boxes with a standard deviation of 34 boxes. How many boxes of lettuce should the supermarket purchase tomorrow? (6)

Answer

$$C_u = \$10 - \$4 = \$6$$

$$C_o = \$4 - \$1.50 = \$2.50$$

$$P \leq \frac{C_u}{C_o + C_u} = \frac{6}{2.50 + 6} = .7059, \text{ NORMSINV}(.7059) = 0.541446$$

Should purchase $250 + .541446(34) = 268.4$ or 268 boxes of lettuce.

5. Daily demand for a product is 100 units, with a standard deviation of 25 units. The review period is 10 days and the lead time is 6 days. At the time of review there were 50 units in stock. If 98 percent service probability is desired, how many units should be ordered? (6)

Answer

Service level $P = .98$, $\bar{d} = 100$ per day, $T = 10$ days, $L = 6$ days, $\sigma = 25$ per day, and $I = 50$.

$$q = \bar{d}(T + L) + z\sigma_{T+L} - I$$

$$\sigma_{T+L} = \sqrt{(T + L)\sigma^2} = \sqrt{(10 + 6)(25)^2} = 100$$

From Standard normal distribution, $z = 2.05$

$$q = 100(10 + 6) + 2.05(100) - 50 = 1755 \text{ units}$$

Total 47