**INVENTORY MANAGEMENT**

**HOMEWORK 1**

**Problem 1:** Input data of AAC in excel and try to change:

* Value of Demand to increase 4 times.
* Value of Holding Cost to reduce 4 times.
* Value of Ordering Cost to reduce 4 times.
* Observed the results and explain.

**Problem 2:** Input data of AAC in excel for the case of discount

* Change the range of quantity to the levels of 500 units.
* Change the discount price to the level of 0.5USD.
* Observe the results and explain.

**Problem 3:** Input data of SCANLON in excel and change the lead time to be longer, observe the results and explain **(SKIP)**

**Problem 4:** A manufacturing company based in Calgary manufactures a product with a three-month supply cycle. An analyst is working to introduce a more rational method for determining production quantities and has acquired the following estimates regarding the item's attributes:

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1. The economic order quantity of the item is:

The time between consecutive replenishments of the items when the EOQ is used is:

1. The EOQ at A = $5 is 2,000. TRC (2,000) = A×4,000/2,000 + 0.04×0.25×2,000/2 = 2A + 10

Under a three-month supply rule: Q = 4,000/4 = 1,000

TRC (1000) = A×4,000/1,000 + 0.04×0.25×1000/2 = 4A + 5

2A + 10 ≤ 4A + 5 where 2A ≥ 5 or A ≥ $2.5

**Problem 5:** The famous Ernie of Sesame Street continually faces replenishment decisions concerning his cookie supply. The Cookie Monster devours the cookies at an average rate of 200 per day. The cookies cost $0.03 each. Ernie is getting fed up with having to go to the store once a week. His friend Bert has offered to do a study to help Ernie with his problem.

1. If Ernie is implicitly following an EOQ policy, what can Bert say about the implicit values of the two missing parameters?

The two missing parameters are cookie fixed cost (A) and interest rate (r). If Ernie is implicitly following an EOQ policy, then:

This implies that:

We can say about the implicit values that the ratio of ordering cost and interest rate is 147.

1. Suppose that the store offered a special of 10,000 cookies for $200. Should Ernie take advantage of the offer? Discuss. (Hint: Consult your local TV listing for the timing of and channel selection for Sesame Street)

The total cost from a special order for 10,000 at the discount price is:

The total cost from order daily 200 per day:

The cost savings from a special order for 10,000 at the discount price is:

From the saving cost function above, we can see that the higher the interest rate are, the more Ernie can save. For example, if the interest rate is 10% per year (0.027% per day), Ernie will save:

F(0.0027%)=7,106(0.0027%)+100 = $101.95

So, from a financial viewpoint, the special offer is worth taking. However, a purchase of 10,000 cookies represents a 50-day supply of cookies. The shelf life if the cookies could be a problem here, i.e., perhaps 50-day-old cookies would be too stale for the Cookie Monster.

**Problem 6:** A mining company routinely replaces a specific part on a certain type of equipment. The usage rate is forty per week, and there is no significant seasonality. The supplier of the part offers the following all-units discount structure.

|  |  |
| --- | --- |
| Range Q | Unit cost |
| 0 < Q < 300 units | $10.00 |
| Q >= 300 | $9.7 |

The fixed cost of a replenishment is estimated to be $25, and a carrying charge of 0.26 $/$/yr. is used by the company.

1. What replenishment size should be used?

D = 40 units/week = 2080 units/year

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Range Q | v | D | A | r | Ch | EOQ | Modified Q | TC |
| 0 < Q < 300 units | $10 | 2,080 | $25 | 0.26 | $2.6 | 200 | 200 | $21,320 |
| Q >= 300 | $9.7 | 2,080 | $25 | 0.26 | $2.522 | 203.0692 | 300 | $20,728 |

So, the size that should be used is 300 units.

1. If the supplier was interested in having the mining company acquire at least 500 units at a time, what is the largest unit price they could charge for an order of 500 units?

As the supplier wants the mining company to take the order of 500 units, they should set the unit price to make the new total cost of mining company will be at least equal to the total cost of order 300 units $20,728. Therefore, we will have:

**Problem 7:** A supplier offers the following discount structure on purchases of any single item:

|  |  |
| --- | --- |
| 0 < Q < 1000 | $5.00 per unit |
| 1000 <= Q < 2000 | $4.90 per unit |
| 2000 <= Q | $4.75 per unit |

The discounts apply to all units. For each of the following items treated separately, what is the appropriate order quantity to use, assuming a common value of r = 0.3 $/$/yr.?

|  |  |  |
| --- | --- | --- |
| Item | D (units/yr.) | A ($) |
| 1 | 10,000 | 25 |
| 2 | 1,000 | 25 |
| 3 | 4,000 | 25 |
| 4 | 130,000 | 25 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Item 1 | | | | | | | | |
| Q | v | D | A | r | Ch | EOQ | Modified Q | TC |
| 0 < Q < 1000 | $ 5.00 | 10,000 | $ 25.00 | 0.3 | $ 1.50 | 577.35 | 578.00 | $ 50,866.03 |
| 1000 <= Q < 2000 | $ 4.90 | 10,000 | $ 25.00 | 0.3 | $ 1.47 | 583.21 | 1,000.00 | $ 49,985.00 |
| 2000 <= Q | $ 4.75 | 10,000 | $ 25.00 | 0.3 | $ 1.43 | 592.35 | 2,000.00 | $ 49,050.00 |
| Item 2 | | | | | | | | |
| 0 < Q < 1000 | $ 5.00 | 1,000 | $ 25.00 | 0.3 | $ 1.50 | 182.57 | 183.00 | $ 5,273.86 |
| 1000 <= Q < 2000 | $ 4.90 | 1,000 | $ 25.00 | 0.3 | $ 1.47 | 184.43 | 1,000.00 | $ 5,660.00 |
| 2000 <= Q | $ 4.75 | 1,000 | $ 25.00 | 0.3 | $ 1.43 | 187.32 | 2,000.00 | $ 6,187.50 |
| Item 3 | | | | | | | | |
| 0 < Q < 1000 | $ 5.00 | 4,000 | $ 25.00 | 0.3 | $ 1.50 | 365.15 | 366.00 | $ 20,547.72 |
| 1000 <= Q < 2000 | $ 4.90 | 4,000 | $ 25.00 | 0.3 | $ 1.47 | 368.86 | 1,000.00 | $ 20,435.00 |
| 2000 <= Q | $ 4.75 | 4,000 | $ 25.00 | 0.3 | $ 1.43 | 374.63 | 2,000.00 | $ 20,475.00 |
| Item 4 | | | | | | | | |
| 0 < Q < 1000 | $ 5.00 | 130,000 | $ 25.00 | 0.3 | $ 1.50 | 2,081.67 | - | - |
| 1000 <= Q < 2000 | $ 4.90 | 130,000 | $ 25.00 | 0.3 | $ 1.47 | 2,102.80 | - | - |
| 2000 <= Q | $ 4.75 | 130,000 | $ 25.00 | 0.3 | $ 1.43 | 2,135.74 | 2,000.00 | $ 620,550.00 |

Conclusion:

Item 1: Order 2,000 items for the lowest total cost.

Item 2: Order 183 items for the lowest total cost.

Item 3: Order 1,000 items for the lowest total cost.

Item 4: Order 2,000 items for the lowest total cost.