**MSBA7004 Assignment 3:**

1. (a) From the question we have:

|  |  |
| --- | --- |
| Unit Cost (C) | $10 |
| Set up Cost (S) | $250 |
| Percent carrying cost (i) | 33% |
| Lead Time (LT) | 1 week |
| Annual Demand(D) | 25750 |

Therefore we can compute:

Annual holding cost per unit per year (H) = iC = $3.3/unit/year

Order Quantity (Q)=== 1975.23 units

Converting Lead time (LT) to 1/50=0.02 year

Reorder Point (ROP)= LT x D= 0.02\*25750=515 units

(b) Annual Holding Costs = QH/2 = 1975.23\*3.3/2 = $3259.13

Order Costs = SD/Q = 250\*25750/1975.23 = $3259.11

1. (a) new ROP=515+SS= 515+=515+NORM.S.INV(0.95)

=515+1.645x25=556.12

(b) new Annual Holding Costs=(Q/2+SS)H=(1975.23/2+1.645x25)\*3.3=$3394.84

Order Costs is unchanged = $3259.11

1. (a)

When

Multiplying both sides by (by definition Q>0) and rearranging terms, we have

(b) Annual Holding Cost

= =

Annual Ordering Cost

=====

1. (a) From the question we have:

|  |  |
| --- | --- |
| Unit Cost (C) | $0.02 |
| Set up Cost (S) | $12 |
| Annual Percent carrying cost () | 25% |
| Weekly Demand(D) | 60 |

Assuming one year has 52 weeks, we can compute:

Annual Demand = 52\*60 = 3120

Holding cost per unit per year (H) = C

= 0.02\*0.25=$0.005/unit/year

Order Quantity (Q)=== 3869.88 units

Cycle time = Q/D = 3869.88/60 = 64.50 weeks (or 1.24 year)

(b) Annual Holding cost = QH/2 = 3869.88\*0.005/2 = $9.67

Annual setup costs = SD/Q = 12\*3120/3869.88 = $9.67

5. (a)

(b) Optimal TC =

(c) Increase in cost = (29.02-27.36)/27.36 = 6%. The EOQ is somewhat unsensitive to errors in the data as the cost would only increase by a small percentage.

6. From the question we have:

|  |  |
| --- | --- |
| Annual Demand () | 15600 |
| Weekly Demand () | 300 |
| Weekly demand SD () | 90 |
| Lead Time (LT) | 4 weeks |

ROP for 98% service level

=

=

= =

If Safety Stock is decreased by 50%, i.e. 369.67/2 = 184.84, new service level

= = 84.78%

7. (a) From the question we have, for each warehouse:

|  |  |
| --- | --- |
| Weekly Demand () | 10000 |
| Weekly demand SD () | 2000 |
| Unit cost (C) | $10 |
| Annual holding cost percentage (i) | 25% |
| Setup cost (S) | 1000 |
| Lead Time (LT) | 1 week |

Annual Demand () of each warehouse = 10000\*50 = 500000 units

Holding cost per unit per year (H) = iC = 10\*0.25 = $2.5/unit/year

Order Quantity (Q) per warehouse === 20000 units

Safety Stock (SS) per warehouse

= =

= = 3289.71 units

Average inventory per warehouse

= units

Average inventory of 4 warehouses combined = 13289.71\*4 = 53158.84 units

Annual holding cost of 4 warehouses combined = H\*Average inventory

= 2.5\*53158.84 = $132897.1

Annual order cost of 4 warehouses combined = 4\*SD/Q

= 4\*(1000\*500000/20000) = $100000

Annual Total costs of 4 warehouses combined

= 132897.1+100000 = $232897.1

Average time a unit spends in the warehouses

= Average inventory per warehouse/Throughput rate per warehouse

= 13289.71/500000 = 0.266 year (or 1.33 weeks)

(b) New Annual Demand ) = 500000 \* 4 = 2000000 units

New Order Quantity === 40000 units

New Weekly Demand Standard deviation () = = 4000

New Safety Stock

= =

= = 6579.42 units

New Average inventory

= units

New Annual holding cost = H\*Average inventory

= 2.5\*26579.42 = $66448.55

New Annual ordering cost = /

= 1000\*2000000/40000 = $50000

New Annual Total costs

= 66448.55+50000 = $116448.55

Average time a unit spends in the warehouse

= Average inventory / Throughput rate

= 26579.42/2000000 = 0.0133 year (or 0.66 weeks)