Concept Question 1.1

One use of inventory is

- A. to provide a hedge against inflation.
- B. to ensure that item cost is maximized.
- C. to tightly synchronize a firm's production with its customers' demand.
- D. to tightly synchronize production and distribution processes.

Concept Question 1.2

The objective of inventory management is to

- A. decouple various parts of the production process.
- B. strike a balance between inventory investment and customer service.
- C. take advantage of quantity discounts.
- D. provide a selection of goods for anticipated customer demand.

Concept Question 1.3

Which of the following is NOT a type of inventory?

- A. finished goods
- B. work-in-process
- C. raw material
- D. MRP

Concept Question 1.4

Which of the following types of inventory describes inventory that has been purchased but not processed?

- A. finished-goods inventory
- B. work-in-process inventory
- C. raw material inventory
- D. maintenance/repair/operating supply inventory

Concept Question 2.1

ABC analysis divides an organization's on-hand inventory into three classes based upon

- A. unit price.
- B. annual dollar volume.
- C. annual demand.
- D. the number of units on hand.

Concept Question 2.3

Inventory record accuracy would be decreased by

- A. cycle counting.
- B. reorder points.
- C. ABC analysis.
- D. increasing stockroom accessibility. ✔

Concept Question 2.4

Cycle counting

- A. involves shutting down production once per year to perform the annual inventory count.
- B. cannot be performed in an independent demand situation.
- C. is a process by which inventory records are verified. ✔
- D. increases annual inventory adjustments.

Concept Question 3.1

Which of the following does NOT belong to ordering costs?

- A. cost of supplies
- B. order processing
- C. interest payments ✔
- D. clerical support

Concept Question 3.2

Which of the following does NOT belong to holding costs?

- A. order processing ✔
- B. insurance on inventory
- C. pilferage, scrap, and obsolescence
- D. storage costs

Concept Question 3.3

What is the cost to prepare a machine or process for production?

- A. setup cost ✔
- B. preparation cost
- C. ordering cost
- D. holding cost

Concept Question 3.4

Inventory control models assume that demand for an item is

- A. always dependent on the demand for other items.
- B. identical to the demand for other items.
- C. always independent on the demand for other items.
- D. either independent of or dependent on the demand for other items.

Concept Question 4.2

Extra units that are held in inventory to reduce stockouts are called

- A. reorder point.
- B. just-in-time inventory.
- C. demand variance.
- D. safety stock.

Concept Question 5.1

A statistical model applicable when product demand or any other variable is not known but can be specified by means of a probability distribution is referred as

- A. a probabilistic model.
- B. a quantity discount model.
- C. a robust model.
- D. the EOQ.

Concept Question 5.3

The appropriate level of safety stock is typically determined by

- A. choosing the level of safety stock that assures a given service level.
- B. carrying sufficient safety stock so as to eliminate all stockouts.
- C. taking the square root of the economic order quantity.
- D. minimizing the expected stockout cost.

Concept Question 6.1

What is a system for ordering items that have little or no value at the end of a sales period?

- A. single-period inventory model
- B. production order quantity model
- C. ROP
- D. EOQ

Concept Question 6.2

A single-period inventory model is NOT applicable for

- A. furniture.
- B. newspapers.
- C. milk.
- D. seasonal goods.

Concept Question 6.3

In the single-period inventory model, the overage cost is

- A. cost per unit − sales price per unit.
- B. salvage value per unit.
- C. cost per unit − salvage value per unit.
- D. sales price per unit − cost per unit.

Concept Question 6.4

For seasonal products, the service level should be set to equal

- A. overage cost / (overage cost + shortage cost).
- B. shortage cost / (overage cost + shortage cost).
- C. shortage cost / (overage cost − shortage cost).
- D. overage cost / (overage cost − shortage cost).

Concept Question 7.1

A system that triggers ordering on a uniform time basis is called

- A. an EOQ system.
- B. a fixed-quantity system.
- C. a reorder point system.
- D. a fixed-period system.

Concept Question 7.2

A system that keeps track of each withdrawal or addition to inventory continuously is

- A. a continuous inventory system.
- B. a fixed period system.
- C. a constant monitoring system.
- D. a perpetual inventory system.

Problem 12.1

L. Houts Plastics is a large manufacturer of injection-molded plastics in North Carolina. An investigation of the company's manufacturing facility in Charlotte yields the information presented in the table below. How would the plant classify these items according to an ABC classification system? *(Round dollar volume to the nearest whole number and percentage of dollar volume to two decimal places.)*

L. Houts Plastics Charlotte Inventory Levels

Item Code	Avg. Inventory (units)	Value ($/unit)	Dollar Volume	% of Dollar Volume
1289	360	3.25	1170	38.40
2347	300	4.00	1,200	39.39
2349	120	2.50	300	9.85
2363	70	1.80	126	4.14
2394	60	1.75	105	3.45
2395	25	2.00	50	1.64
6782	20	1.15	23	0.75
7844	12	2.05	25	0.81
8210	8	2.00	16	0.53
8310	7	2.00	14	0.46
9111	6	3.00	18	0.59
			3,047	

For the following three questions, consider only items 1289, 2349, and 8210 from the above table for relative classification (these are some of the items for which you computed the metrics).

Based on the percentages of dollar volume, item number 1289 should be classified as A .

Item number 2349 should be classified as B .

Item number 8210 should be classified as C .

Item code	avg. inventory (units)	Value ($/unit)	Dollar Volume		% of Dollar Volume		
1289	360	3.25	**1170**	3.25*360=**1170**	**38.40%**	1170/3046.60=**.3840**	
2347	300	4.00	1200		39.39%		
2349	120	2.50	300		9.85%		
2363	70	1.80	**126**	1.80*70=**126**	**4.14%**	126/3046.60=**.0414**	
2394	60	1.75	105		3.45%		
2395	25	2.00	**50**	2.00*25=**50**	**1.64%**	50/3046.60=**.0164**	
6782	20	1.15	23		0.75%		
7844	12	2.05	24.6		0.81%		
8210	8	2.00	**16**	2.00*8=**16**	**0.53%**	16/3046.60=**.0053**	
8310	7	2.00	14		0.46%		
9111	6	3.00	18		0.59%		
SUM		25.50	**3046.60**				
	1170+1200+300+126+105+50+23+24.6+16+14+18=**3046.60**						

Problem 12.2

Boreki Enterprise has the following 10 items in inventory. Theodore Boreki asks you, a recent OM graduate, to divide these items into ABC classifications. Fill in the blanks and then answer the following questions. *(Round dollar volume to the nearest whole number and percentage of dollar volume to two decimal places.)*

Item	Annual Demand	Cost/Unit	Dollar Volume	% of Total Dollar Volume
A2	3500	50	175,000	17.11
B8	4000	12	48,000	4.69
C7	1500	45	67,500	6.60
D1	6000	20	120,000	11.74
E9	1000	20	20,000	1.96
F3	500	500	250,000	24.45
G2	200	1500	300,000	29.34
H2	600	20	12,000	1.17
I5	1750	10	17,500	1.71
J8	2500	5	12,500	1.22

For the following two questions consider only items A2 and F3 for relative classification (these are some of the items for which you computed the metrics).

Based on the percentages of dollar volume, item A2 should be classified as A .

Item F3 should be classified as A .

Item	Annual Demand	Cost/Unit	Dollar Volume		% of Total Dollar Volume	
A2	3500	50	**175000**	50*3500=**175,000**	**17.11%**	175,000/1,022,500=**.1711**
B8	4000	12	48000		4.69%	
C7	1500	45	67500		6.60%	
D1	6000	20	**120000**	20*6000=**120,000**	**11.74%**	120,000/1,022,500=**.1174**
E9	1000	20	20000		1.96%	
F3	500	500	**250000**	500*500=**250,000**	**24.45%**	250,000/1,022,500=**.2445**
G2	200	1500	300000		29.34%	
H2	600	20	12000		1.17%	
I5	1750	10	**17500**	10*1750=**17,500**	**1.71%**	17,500/1,022,500=**.0171**
J8	2500	5	12500		1.22%	
	SUM	2182	**1022500**			
	175000+48000+67500+120000+20000+250000+300000+12000+17500+12500=**1,022,500**					

Problem 12.4

Question Help

Lindsay Electronics, a small manufacturer of electronic research equipment, has approximately 7,300 items in its inventory and has hired Joan Blasco-Paul to manage its inventory. Joan has determined that 9% of the items in inventory are A items, 34% are B items, and 57% are C items. She would like to set up a system in which all A items are counted monthly (every 19 working days), all B items are counted quarterly (every 61 working days), and all C items are counted semiannually (every 124 working days). How many items need to be counted each day?

The total number of items that need to be counted each day is 109 items *(round your response to the nearest whole number).*

Items	7300					
	Percentage	Total	count when	# of items counted per day		
A	9%	657	19	34.58		
B	34%	2482	61	40.69		
C	57%	4161	124	33.56		
	TOTAL	7300	204	**109**		
# of items counted per day=(inventory * % of inventory)/working days						

Problem 12.7

William Beville's computer training school, in Richmond, stocks workbooks with the following characteristics:

Demand D	19,000 units/year
Ordering cost S	$26/order
Holding cost H	$3/unit/year

a) The EOQ for the workbooks is 574 *(round your response to the nearest whole number).*

b) What are the annual holding costs for the workbooks? $ 861 *(round your response to the nearest whole number).*

c) What are the annual ordering costs? $ 861 *(round your response to the nearest whole number).*

EOQ	**574**	SQRT((2*19000*26)/3)=**574**
sqrt((2*D*OC)/HC)		
annual holding cost	**861**	(574*3)/2=**861**
EOQ*HC/2		
Annual ordering cos	**861**	(574*3)/2=**861**
EOQ*HC/2??		

Annual cost of ordering= (D/Q)*S;

Annual cost of holding= (EOQ/2)*H

Problem 12.8

If D = 7,800 per month, S = $43 per order, and H = $2.50 per unit per month,

a) What is the economic order quantity?

The EOQ is 518 units *(round your response to the nearest whole number).*

b) How does your answer change if the holding cost doubles?

The EOQ is 366 units *(round your response to the nearest whole number).*

c) What if the holding cost drops in half?

The EOQ is 733 units *(round your response to the nearest whole number).*

D	7800				
S	43				
H	2.50				
EOQ	**518**	SQRT((2*7800*43)/2.5)=**518**			
sqrt((2*D*OC)/HC)					
D	7800				
S	43				
H	5.00				
EOQ	**366**	SQRT((2*7800*43)/5)=**366**			
sqrt((2*D*OC)/HC)					
D	7800				
S	43				
H	1.25				
EOQ	**733**	SQRT((2*7800*43)/1.25)=**733**			
sqrt((2*D*OC)/HC)					

Problem 12.14

Thomas Kratzer is the purchasing manager for the headquarters of a large insurance company chain with a central inventory operation. Thomas's fastest-moving inventory item has a demand of 5,850 units per year. The cost of each unit is $104, and the inventory carrying cost is $11 per unit per year. The average ordering cost is $31 per order. It takes about 5 days for an order to arrive, and the demand for 1 week is 117 units. (This is a corporate operation, and there are 250 working days per year).

a) What is the EOQ? 181.58 units *(round your response to two decimal places).*

b) What is the average inventory if the EOQ is used? 90.79 units *(round your response to two decimal places).*

c) What is the optimal number of orders per year? 32.22 orders *(round your response to two decimal places).*

d) What is the optimal number of days in between any two orders? 7.76 days *(round your response to two decimal places).*

e) What is the annual cost of ordering and holding inventory? $ 1,997.42 per year *(round your response to two decimal places).*

f) What is the total annual inventory cost, including the cost of the 5,850 units? $ 610,397.42 per year *(round your response to two decimal places).*

Demand D	5850				
cost per unit	104				
inventory carrying cost H	11				
average order cost S	31				
EOQ	**181.58**	SQRT((2*5850*31)/11)=**181.58**			
sqrt((2*D*OC)/HC)					
avg inventory	**90.79**	181.58/2=**90.79**			
EOQ/2					
optimal number of orders	**32.22**	5850/181.58=**32.22**			
D/EOQ					
optimal number of working days	**7.76**	250/32.22=**7.76**			
annual cost of ordering	**998.73**	(5850/181.58)*31=**998.73**			
(D/Q)*S					
annual inventory holding cost	**998.69**	(181.58/2)*11=**998.69**			
(EOQ/2)*H					
annual cost of ordering & inventory holding cost	**1997.42**	998.73+998.69=**1997.42**			
Total costs	**610397.42**	998.73+998.69+5850*104=**610,397,42**			
annual cost of ordering+inventory holding cost+ actual cost of units*cost per unit					

Problem 12.15

Joe Henry's machine shop uses 2,470 brackets during the course of a year. These brackets are purchased from a supplier 90 miles away. The following information is known about the brackets:

Annual demand	2,470
Holding cost per bracket per year	$1.65
Order cost per order	$19.50
Lead time	2 days
Working days per year	250

a) What is the EOQ? 241.62 units *(round your response to two decimal places).*

b)What is the average inventory if the EOQ is used? 120.81 units *(round your response to two decimal places).*
What would be the annual inventory holding cost? $ 199.34 *(round your response to two decimal places).*

c)Given the EOQ, how many orders will be made annually? 10.22 orders *(round your response to two decimal places).*
What would be the annual order cost? $ 199.29 *(round your response to two decimal places).*

d)Given the EOQ, what is the total annual cost of managing (ordering and holding) the inventory? $ 398.68 *(round your response to two decimal places).*

e)What is the time between orders? 24.46 days *(round your response to two decimal places).*

f) What is the reorder point (ROP)? 19.76 units *(round your response to two decimal places).*

annual demand	2470
holding cost	1.65
order cost	19.5
lead time	2
working days per yr	250
EOQ	**241.62**
sqrt((2*D*S)/H)	SQRT((2*2470*19.5)/1.65)=**241.62**
Avg. inventory level	**120.81**
EOQ/2	241.62/2=**120.81**
Annual inventory hold cost	**199.34**
(EOQ/2)*H	(241.62/2)*1.65=**199.34**
Total # of orders made per yr	**10.22**
D/EOQ	2470/241.62=**10.22**
Annual order cost	**199.34**
(D/EOQ)*S	(2470/241.62)*19.5=**199.34**
Total annual cost of managing inventory	**398.68**
order cost + holding cost	199.34+199.34=**398.68**
time b/t orders	**24.46**
# of working days per year/# orders per year	250/10.22=**24.46**
Reorder Point (ROP)	**19.76**
daily demand*lead time	(2470/250)*2=**19.76**

Problem 12.26

M. P. VanOyen Manufacturing has gone out on bid for a regulator component. Expected demand is 725 units per month. The item can be purchased from either Allen Manufacturing or Baker Manufacturing. Their price lists are shown in the table. Ordering cost is $55, and annual holding cost per unit is $5.

Allen Mfg.		Baker Mfg.	
Quantity	Unit Price	Quantity	Unit Price
1-499	$16.00	1-399	$16.10
500-999	15.50	400-799	15.60
1000+	15.00	800+	15.10

a) What is the economic order quantity if price is not a consideration? 437 units *(round your response to the nearest whole number).*

b) Which supplier, based on all options with regard to discounts, should be used? Allen Mfg.

c) What is the optimal order quantity and total annual cost of ordering, purchasing, and holding the component?

The optimal order quantity is 1,000 with a total cost of $ 133,479 *(round your responses to the nearest whole number).*

Demand D	8700	12*725=**8700**
Ordering cost S	55	
carrying cost H	5 per unit	
EOQ	**437**	
sqrt((2*D*OC)/H)	SQRT((2*8700*55)/5)=**437**	
For up to 499 units		
Total cost	**141406.42**	
D*P+(Q/2*H)+(D/Q*S)	(8700*16)+(499/2*5)+(8700/499*55)=**141,406.42**	
For up to 999 units		
Total cost	**137826.48**	
D*P+(Q/2*H)+(D/Q*S)	(8700*15.5)+(999/2*5)+(8700/999*55)=**137,826.48**	
For 1000+ units		
Total cost	**133479**	
D*P+(Q/2*H)+(D/Q*S)	(8700*15)+(1000/2*5)+(8700/1000*55)=133478.50=**133,479**	

Problem 12.27

Chris Sandvig Irrigation, Inc., has summarized the price list from four potential suppliers of an underground control valve. See the table below. Annual usage is 800 valves; order cost is $11 per order; and annual inventory holding costs are $7.55 per unit.

Vendor A		Vendor B		Vendor C		Vendor D	
Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
1-9	$35.00	1-14	$34.75	1-24	$34.50	1-74	$34.25
10-14	34.75	15-49	34.00	25-74	33.75	75-199	33.00
15-49	33.55	50-99	32.80	75-199	32.50	200+	31.00
50-99	32.35	100-299	31.60	200+	31.10		
100-299	31.15	300+	30.50				
300+	30.75						

Which vendor should be selected and what order quantity is best if Sandvig Irrigation wants to minimize total cost?

Chris Sandvig Irrigation should order 100 units at a time from Vendor A *(enter your response as a whole number).*

Annual usage D	800 Valves				
order cost S	11				
annual inventory holding H	7.55				
EOQ	SQRT((2*800*11)/7.55)=**48 units**				
SQRT((2*D*S)/H)	**48**				
Total cost	(800*33.55)+(48/2*7.55)+(800/48*11)=**27204.53**				
D*P+(Q/2*H)+(D/Q*S)	**27204.53**				
At 48 units, price for Vendor A is the lowest					
At 48 units, Price (P) = 33.55					
if units increased to 100, Price for Vendor A is 32.35, which is also lowest for vendor A					
Total cost	(800*32.35)+(100/2*7.55)+(800/100*11)=**26345.50**				
D*P+(Q/2*H)+(D/Q*S)	**26345.50**				
at 200, vendor A has lowest price 31.15					
Total cost	(800*31.15)+(200/2*7.55)+(800/200*11)=**25719.00**				
D*P+(Q/2*H)+(D/Q*S)	**25719.00**				
at 300, vendor D is lowest which is 31.00					
Total cost	(800*31)+(300/2*7.55)+(800/300*11)=**25961.83**				
D*P+(Q/2*H)+(D/Q*S)	**25961.83**				
at 400, vendor B is lowest which is 30.5					
Total cost	(1100*30.5)+(400/2*7.55)+(1100/400*10)=35087				
D*P+(Q/2*H)+(D/Q*S)	**25932.00**				
so, lowest is at 100 units for vendor A					

Problem 12.41

Barbara Flynn is in charge of maintaining hospital supplies at General Hospital. During the past year, the mean lead time demand for bandage BX-5 was 65 (and was normally distributed). Furthermore, the standard deviation for BX-5 was 6. Ms. Flynn would like to maintain a 95% service level. Refer to the standard normal table for z-values.

a) What safety stock level do you recommend for BX-5?

Safety stock = 10 units *(round your response to the nearest whole number).*

b) What is the appropriate reorder point?

Reorder Point = 75 units *(round your response to the nearest whole number).*

mean	65		
st dev	6		
service level	95%		
z-value for 95%	1.65		
safety stock	**9.9**	1.65*6=**9.9=10**	
z-value+st. dev.			
ROP	**75**	65+10=**75**	
mean+safey stock			

Problem 12.42

Based on available information, lead time demand for PC jump drives averages 50 units (normally distributed), with a standard deviation of 4 drives. Management wants a 90% service level. Refer to the standard normal table for z-values.

a) What value of Z should be applied? 1.28

b) How many drives should be carried as safety stock? 5 units *(round your response to the nearest whole number).*

c) What is the appropriate reorder point? 55 units *(round your response to the nearest whole number).*

mean	50		
st dev	4		
service level	90%		
z-value for 90%	**1.28**		
safety stock	**5.28**	1.28+4=**5.28=5**	
z-value+st. dev.			
ROP	**55**	50+5=**55**	
mean+safey stock			

Problem 12.46

Question Help

Chicago's Hard Rock Hotel distributes a mean of 800 bath towels per day to guests at the pool and in their rooms. This demand is normally distributed with a standard deviation of 105 towels per day, based on occupancy. The laundry firm that has the linen contract requires a 3-day lead time. The hotel expects a 95% service level to satisfy high guest expectations. Refer to the standard normal table for z-values.

a) What is the reorder point? 2,700 towels *(round your response to the nearest whole number).*

b) What is the safety stock? 300 towels *(round your response to the nearest whole number).*

mean	800				
st dev	105				
service level	95%				
z-value for 90%	1.65				
safety stock	**300**	1.65*105*SQRT(3)=**300**			
z-value+st. dev.*sq.rt of lead time					
ROP	**2700**	(800*3)+1.65*105*SQRT(3)=**2700**			
ROP=(Avg daily demand X lead time in days)+Z* st. dev *sq. rt. Of lead time					

Problem 12.51

Cynthia Knott's oyster bar buys fresh Louisiana oysters for $3 per pound and sells them for $8 per pound. Any oysters not sold that day are sold to her cousin, who has a nearby grocery store, for $2 per pound. Cynthia believes that demand follows the normal distribution, with a mean of 120 pounds and a standard deviation of 12 pounds. How many pounds should she order each day? Refer to the standard normal table for z-values.

Cynthia should order 131.6 pounds of oysters each day *(round your response to one decimal place).*

Cost of actual utilization (Co)	**5**	8-3=**5**	
Cost of under utilization (Cu)	**1**	3-2=**1**	
Probability of sale= Co/(Cu+Co)	**0.8333**	5/(1+5)=**0.8333**	
z-score at that probability	**0.97**		
she should order= mean + (z-score*st.dev.)	**131.6**	120+(0.97*12)=**131.6**	

Problem 12.52

Henrique Correa's bakery prepares all its cakes between 4 A.M.and 6 A.M.so they will be fresh when customers arrive. Day-old cakes are virtually always sold, but at a 50% discount off the regular $10 price. The cost of baking a cake is $7, and demand is estimated to be normally distributed, with a mean of 20 and a standard deviation of 8. What is the optimal stocking level? Refer to the standard normal table for z-values.

The optimal stocking level for the bakery is 22 cakes *(round your response to the nearest whole number).*

Revenue	10			
cost	7			
original cost	7			
C shortage= rev. per unit-cost per unit				
	10-7=**3**			
C excess=original cost per unit - salvage value per unit				
	7 -5 =**2**			
service level= C shortage/ (C shortage + C excess)				
	3/(3+2)=0.60			
Mean demand	20			
st. dev.	8			
z-value of 0.60	mean + z of sl * S demand			
22.08	20+(0.26*8)=**22.08 = 22 cakes**			