

STOCK CONTROL

Inventory refers to stock of raw material, work in progress or finished goods.

NEEDS FOR INVENTORY

1. Transaction motive i.e. to meet daily operational needs.
2. Economic reasons i.e. to save on inventory cost example bulky purchases may result in quantity discount.
3. Seasonal factors – Seasonal items are stocked when available.
4. Precautionary motive i.e. to avoid running out of stocks by having safety stock.

OBJECTIVES OF INVENTORY CONTROL

1. To avoid stock out – Understocking leads to stock out of materials leading to shortages of materials or stocks, which makes the customers lose confidence hence the goodwill of the entity is affected.
2. To avoid overstocking – overstocking ties up capital in the business hence leading to high storage costs which affects the operations of the organization.
3. To minimize the ordering costs – It aims at reducing all the costs associated with making an order to supply materials or stocks items.
4. Economy in purchasing – it aims in taking advantage of quantity discounts which minimizes the costs of goods.
5. It minimizes wastage – Losses of material occur due to evaporation, fraud etc. therefore efforts should be made to keep these losses at a minimum level.

REQUIREMENTS OF A GOOD MATERIALS / STOCK CONTROL SYSTEM

- I. There should be proper coordination between various departments dealing with materials or stocks.
- II. There should be central purchasing department under the control of an efficient and competent purchasing manager.
- III. There should be proper classification and codification of stocks or materials items.
- IV. Adequate records should be introduced to control materials and stock items during production and the supply of the finished goods.
- V. The storage of raw materials should be well coordinated subject to control measures.
- VI. Various stock levels like minimum, maximum should be fixed for each stock / material items.
- VII. The purchase of materials should be controlled through a budget.

STOCK LIMITS LEVELS

Re-order level - It is the point, which it is necessary to make a requisition for the supply of materials. It is calculated as:

Re – order level = maximum consumption X maximum re – order period.

Minimum stock level – It is a level below which stock should not be allowed to fall. If stocks goes below this point, there is likelihood of stock out.

Minimum stock level = Re-order level – (Normal/Average consumption x Normal Re-order period)

Maximum stock Level – It is the level above which stock should not be allowed to rise if stock goes beyond this level; there is a likelihood of high management costs.

Maximum Stock level = Re – order level + Re-order quantity – (minimum consumption x minimum re-order period)

Average Stock level = Minimum stock level + maximum stock level

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INVETORY RELATED COSTS

1. **ORDERING COST** – This refers to the cost incurred in getting an item into the firm's stores. These costs are incurred each time an order is placed and include:
 - a) Cost of preparing a purchase requisition.
 - b) Cost of issuing the purchase order.
 - c) Cost of inspecting inventory items to be purchased.
 - d) Communication costs e.g. telephone, fax, e-mails.
 - e) Freight charges including insurance of goods in transit.
 - f) Clearing charges.
2. **PURCHASE COST** – This refers to the amount that is paid to the suppliers of the stock items.
3. **HOLDING/CARRYING COST** – These are costs incurred because the firm has decided to maintain inventory items in the store. Holding cost includes:
 - a) Opportunity cost of capital used to purchase the stock items e.g. interest foregone.
 - b) Rent of storage space or the opportunity cost.
 - c) Protection costs such security systems costs, insurance premium etc.
4. **STOCK OUT OR SHORTAGE COST** - This is the cost associated with either a delay in meeting the customers demand or inability to meet the demand. Stock out cost include:
 - a) Lost contribution.
 - b) Loss goodwill and loss of customers.
 - c) Cost of idle staff.
 - d) Back order cost. i.e. Cost of dealing with disappointed customer etc.

Total inventory ordering cost = purchase cost + Holding cost + ordering cost + stock out cost

ECONOMIC ORDER QUANTITY (EOQ)

The EOQ is the quantity which when ordered would lead to minimum inventory costs.

CHARACTERISTICS OF EOQ MODEL

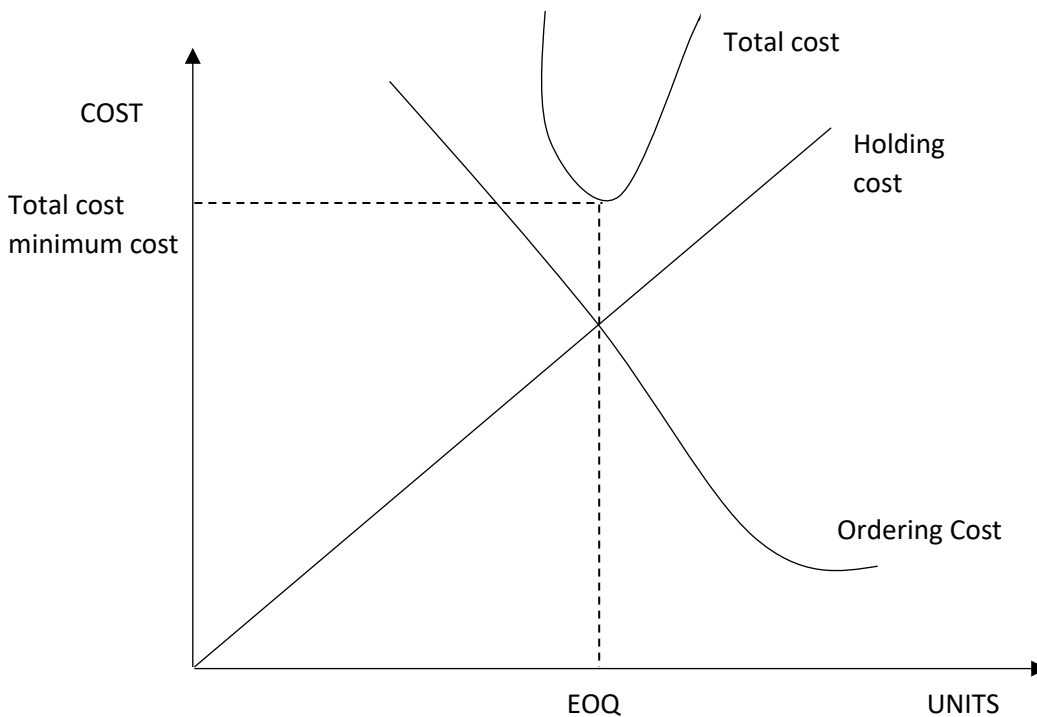
1. It deals with a single stock item.

2. It deals with a durable stock item.
3. Merchandizing firms use it.

BASIC ASSUMPTION OF EOQ MODEL

- 1) Annual demand is constant and known in advance with certainty.
- 2) Lead-time is constant and known in advance with certainty.
- 3) There are no stock outs
- 4) Purchase cost per unit remains constant i.e. there are no quantity discount.
- 5) Ordering cost per order remains constant irrespective of the size.
- 6) Holding cost per unit remains constant.
- 7) Replenishment of items is instantaneous.

DERIVATION OF EOQ MODEL



Cost is minimized where: Holding cost = ordering cost

Holding cost = Average stock x holding cost per unit (Ch.)
 $= \frac{Q}{2} \times Ch.$

Ordering cost = number of orders x cost per order (co)

Number of orders = $\frac{\text{Annual demand (D)}}{\text{Quantity ordered (Q)}}$

Ordering cost = $\frac{D \times co}{Q}$

$$EOQ (Q) = \sqrt{\left\{ \frac{2DCo}{CH} \right\}}$$

WHERE:

D= Annual demand

Co= ordering cost per order

CH = Holding cost per unit

C = purchase cost per unit

Illustration

Demand for parts DP648 used by kings limited is constant at annual rate of 4000units. The cost per unit of the part is Sh. 200. The cost of placing an order is sh. 5000. Kings Ltd estimate that the annual inventory carrying cost expressed as a percentage of cost per unit is 20%.

Required: Determine the best inventory policy for part DP648 assume a lead-time of 10days and the company works 300days per annum.

Inventory policy variable

1. EOQ.
2. Number of orders.
3. Re-order level.
4. Frequency of orders.
5. Total inventory cost.

$$1. Q = \sqrt{\left\{ \frac{2DCo}{CH} \right\}}$$

$$\sqrt{\left\{ \frac{2 \times 4000 \times 5000}{20\% \times 200} \right\}} = 1000 \text{ units}$$

$$2. \text{ Number of orders} = D/Q = \frac{4000}{1000} = 4 \text{ orders}$$

$$3. \text{ Re-order level} = \text{daily demand} \times \text{lead time} = \frac{4000}{300} \times 10 \text{ days} = 133 \text{ units}$$

$$4. \text{ Frequency of ordering} = \frac{\text{number days in a year}}{\text{Number of orders}} = \frac{300}{4} = 75 \text{ days}$$

$$5. \text{ Total inventory costs} = \text{Purchase cost} + \text{ordering cost} + \text{Holding cost}$$

$$D.C + D/QCO + Q/2CH$$

$$4000 \times 200 + \frac{4000}{1000} \times 5000 + \frac{1000}{2} \times 40$$

$$= \text{Ksh. } 840,000$$

CPA JUNE 2009 Q3

Smart Option Ltd. has been selling a product branded “Exe” for the last five years. The demand for product “Exe” for the past one year is as follows:

Month	Demand in units
January	160,000
February	180,000
March	200,000
April	240,000
May	260,000
June	280,000
July	280,000
August	240,000
September	200,000
October	160,000
November	120,000
December	80,000

Additional information:

- I. Minimum re-order period is 3months.
- II. Average re-order period is 4 months.
- III. Maximum re-order period is 5months
- IV. Purchase cost per unit is sh. 60
- V. Holding cost percentage is 20%
- The company has been ordering 5000units per order
- VI. Ordering cost is sh. 40 per order.

Required:

(a) Calculate the following:

- i. Re-order level (2 marks)
- ii. Minimum stock level. (2 marks)
- iii. Maximum Stock level. (2 marks)
- iv. Average stock. (2 marks)
- v. Economic order quantity (EOQ) of product Exe (2 marks)
- vi. Total cost at the economic order quantity (2 marks)

(b) Compute the cost savings if the company changes from buying 5,000 units per order to buying the economic order quantity computed in (a) (v) above. (2 marks)

(c) Highlight four limitations of the economic order quantity model (4 marks)

SOLUTIONS:

(a)

- i. Re- order level = *maximum consumption * maximum Re Order period*
$$280,000 \times 5 = 1,400,000$$
- ii. Minimum stock level= *Re order level – (Normal consumption × Normal re order period)*
$$1,400,000 - (200,000 \times 4) = 600,000$$

iii. Maximum stock level = *Re order level + Re order quantity – (minimum consumption × minimum re order level period)*
 $1400000 + 5000 - (80000 \times 3) = 1165,000$

iv. Average stock = $\frac{\text{minimum stock level} + \text{maximum stock level}}{2}$
 $= \frac{600,000 + 1165,000}{2} = 882,500$

v. $EOQ = \sqrt{\frac{2DCO}{CH}}$

$$\sqrt{\left\{ \frac{2 \times 2400000 \times 40}{60 \times 0.2} \right\}}$$

$$\sqrt{\frac{1920000000}{12}}$$

$$= 4000$$

vi. $TC = D.C + \frac{D}{Q}CO + \frac{Q}{2}CH$

$$(2400000 \times 60) + \left(\frac{4000}{2} \times 60 \times 0.2 \right) + \left(\frac{2400000}{4000} \times 40 \right) = 144,048,000$$

(b) $EOQ = 5000$

$$(2400000 \times 60) + \left(\frac{5000}{2} \times 60 \times 0.2 \right) + \left(\frac{2400000}{5000} \times 40 \right) = 144,049,200$$

$COST\ SAVINGS = 144,049,200 - 144,048,000 = 1,200$

(c) Limitation of EOQ – Give the assumptions of EOQ.

EOQ WITH TRADE DISCOUNT

Discounts are offered on large quantities ordered.

Types of quantity discount

1. Single discount offer
2. Multiple discount offer.

Single discount offer

PROCUDURES

1. Calculate the EOQ and total inventory cost without discount
2. Calculate the EOQ and total inventory cost with discount
3. Compare cost with and without discount
4. Make a decision

ILLUSTRATION

Samaki Ltd. has annual demand of 4000 units per year. The cost per unit is sh.20; cost of placing an order is sh. 500 and the company estimate that the annual inventory cost as a percentage of unit cost is 20%. Lead-time is 3 days and one year has 300 working days.

Assuming Samaki is offered 4% discount on orders of 1500 units and above compute any cost savings. Advise the company on whether to accept or reject the discount offer

Solution

Without discount offer

$$EOQ = \sqrt{\frac{2DCO}{CH}}$$

$$\sqrt{\left\{\frac{2 \times 4000 \times 500}{20\% \times 20}\right\}} = 1000 \text{ units}$$

$$\text{Total cost} = D.C + \frac{D}{Q}CO + \frac{Q}{2}CH$$

$$(4000 \times 20) + \left(\frac{4000}{1000} \times 500\right) + \left(\frac{1000}{2} \times 4\right) = \text{sh. } 84,000$$

With discounts

$$C = 96\% \times 20 = 19.2$$

$$Ch = 20\% \times 19.2 = 3.84$$

$$Q = 1500 \text{ units}$$

$$\text{Total cost} = (4000 \times 19.2) + \left(\frac{4000}{1500} \times 500\right) + \left(\frac{1500}{2} \times 3.84\right) = \text{sh. } 81,013$$

$$\text{Annual cost savings} = 84,000 - 81,013 = \text{Sh. } 2,987$$

Therefore Samaki Ltd should take up the discount offer.

MULTIPLE QUANTITY DISCOUNT

Steps to follow:

1. Compute the EOQ.
2. Compute the total cost associated with the quantity evaluated incorporating the discount
3. Recommend the best order quantity with the least / minimum inventory cost.

N/B the EOQ in step 1 above may fall within the following categories.

category	Treatment
1. Below the range	- Evaluate the least quantity in the range
2. Within the range	- Evaluate the EOQ
3. Above the range	- Ignore the range

Illustration: A company buys 30,000 units in a year with ordering cost of sh. 2,500 per order and holding cost at 20% of the cost of a unit. The supplier has provided the following schedule.

QUANTITY RANGE	PRICE PER UNIT
1 - 3000	21
3001 - 5000	19
5001 - 7000	17
7001 - 9000	15.5
9001 - Above	13.5

Recommend the best inventory policy.

QUANTITY RANGE	PRICE	EOQ $\sqrt{\left\{\frac{2 \times 30,000 \times 2500}{20\% \text{ OF } C}\right\}}$	CATEGORY	TREATMENT
1- 3000	21	5976	above	Ignore the range
3001-5000	19	6283	above	Ignore the range
5001-7000	17	6642	within	Evaluate 6642
7001-9000	15.5	6956	below	Evaluate 7001
9001-above	13.5	7454	below	Evaluate 9001

$$TC = D.C + \frac{D}{Q}CO + \frac{Q}{2}CH$$

$$\text{Total cost for 6642} = (30,000 \times 17) + \left(\frac{30000}{5976} \times 2500\right) + \left(\frac{5976}{2} \times 4.2\right) = 532,583$$

$$\text{Total cost for 7001} = (30,000 \times 15.5) + \left(\frac{30000}{7001} \times 2500\right) + \left(\frac{7001}{2} \times 3.1\right) = 486,564$$

$$\text{Total cost for 9001} = (30,000 \times 13.5) + \left(\frac{30000}{9001} \times 2500\right) + \left(\frac{9001}{2} \times 2.7\right) = 425,484$$

The company should order 9001 units for the least inventory cost.

ECONOMIC BATCH QUANTITY (EBQ)

This is a model for manufacturing firms, which produces components to be used in the production of finished products. EBQ is the quantity to be produced per production run in-order to minimize the total costs.

EBQ MODEL

D = Annual requirement /Demand

Q = EBQ

T = Length of production run in days or any other period.

B = Length of production break

P = Production rate units per day or any other day.

U = Usage rates in units per day or any other period.

Ch = Holding cost per unit.

Cs = Set up cost per set up

V = Variable production cost per unit.

Variable production cost = Annual requirements x cost per unit (D x V)

Set up cost = Number of set ups x cost/set up.

$$= \frac{\text{Annual requirement}}{\text{EBQ}} \times \text{set up cost.}$$

$$= \frac{D}{Q} \times Cs$$

Total cost = Variable production cost. + Set up costs + Holding costs.

$$EBQ = \sqrt{\frac{2DCs}{\left(1 - \frac{u}{p}\right)ch}}$$

Where;

U = usage rates units per day or any other period.

P = production rate in units per day or any other day.

C_s = set up cost at set up.

C_h = holding cost per unit

D = Annual requirement/Demand

The Total cost at the EBQ is expressed as follows;

$$TC = DxV + \frac{D}{Q} cs + \frac{Q}{2} \left(1 - \frac{U}{P}\right) Ch$$

ILLUSTRATION

Marine company manufacturers part B2000 on a special machine to be used in a continuous assembly. The following data is given for part B2000.

Production rate = 4000 pieces per day.

Assembly requirement = 1,200 pieces per day

Inventory holding cost = sh. 20 per piece per year

Variable cost of production = sh. 2000 per piece.

Set up cost = sh. 110,000 per set up.

Requisition lead time = 10 working days (one year has 250 working days)

Required: Determine the best production policy for the company and its associated total cost.

$$1. \text{EBQ} = \sqrt{\frac{2DC_s}{\left(1 - \frac{u}{p}\right)ch}}$$

Cost per set up (C_s) = Sh.110, 000

Annual requirements (D) = Daily usage x working days in a year = 1200x250 = 300,000

$P = 4000$

$U = 1200$

$$\text{EBQ} = \sqrt{\frac{2 \times 300,000 \times 110,000}{\left(1 - \frac{1200}{4000}\right)20}} = 68,661 \text{ units}$$

$$2. \text{Number of set ups} = \frac{D}{Q} = 300,000/68661 = 4$$

$$3. \text{Length of production run (t)} = Q/p = 68661/4000 = 17 \text{ days}$$

$$4. \text{Length of break} = \frac{\text{Maximum stock}}{\text{Usage rate}} - \frac{(p-u)t}{u} = \frac{(4000-1200)17}{1200} = 40 \text{ days}$$

$$5. \text{Total cost} = DxV + \frac{D}{Q} cs + \frac{Q}{2} \left(1 - \frac{U}{P}\right) Ch$$

$$300,000 \times 2000 + \frac{300000}{68661} \times 110000 + \frac{68661}{2} \left(1 - \frac{1200}{4000}\right) 20 =$$

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$$6. \text{Re-order level} = \text{Daily usage} \times \text{lead time} = 1200 \times 10 = \underline{12000 \text{ units}}$$

QUALITATIVE MODELS OF STOCK CONTROL

It ensures efficient utilization of the stock/ materials. They include:

JUST IN TIME SYSTEM (JIT)

Toyota Motor Company developed this system in Japan. The aim is manufacture the required items of high quality at the time they are required. It aims at perusing excellence at all stages of production with a promise of continuous improvement.

ADVANTAGES/FEATURES

1. Emphasize on the perfect quality
2. Elimination of non-value added activities on the product
3. There is 100% on time delivery
4. It is a demand-pull manufacturing system i.e. items are manufactured at the request of the customer.
5. It normally involve a short set up time i.e. the assembling period for the products is very short.
6. There is no opening and closing stock for the items.

DISADVANTAGES

1. It is not applicable for the items that are perishable or are needed urgently.
2. It is normally affected by outdated technology.
3. Its affected by the machine breakdown since 90% of the work is done by machines, which are likely to breakdown and affect operations.

1. ABC ANALYSIS (Pareto Analysis)

- It's a system which groups items into three groups depending on their values as follows
 - A items
- They are few items in number but they are of high values in the business compared to B and C items.
- A company will always ensure that all these items are available all the time because their contribution is high in terms of profits when they are sold. The control measures put in place for this items is strict.
 - B item
- They are more than A items in number but of lower value than A items.
- The control measures put in place are not strict as for the A items.
- The company will always keep these items so as to support A items.
 - C items
- They are many in number but of lower value compared to A & B
- The control measures are not strict because the profit realised from the product are very low.

INVENTORY CONTROL

- They are system used to carryout stock taking activities.

- i. Periodic Inventory System/ Physical
 - Stock taking is done at the end of the accounting period
 - It involves the verification of the stock items at the end of the period to estimate the closing balance of the inventory.
- ii. Continuous/ Perpetual Inventory System
 - It is a system of recording the stock balance after receipt/ issue in order to facilitate regular checking to establish the closing stock of the items using methods like FIFO, LIFO, and WEIGHTED average.

MATERIALS RECEIPT AND ISSUES

- It involves the analysis of stock in order to determine the closing balance.
- It involves the following.
 - a) FIFO (First In First Out)
 - Material purchased first should be issued out first.
 - Therefore, the material in the store are the last material that were purchased.
 - It normally involves the preparation of stores ledger in order to determine the value of the closing balance.

NOV 2015 Q 3b

Store ledger card

Date	Receipts			issues			Balances	
	QTY	CPU	AMT	QTY	CPU	AMT	QTY	AMT
1 ST JULY							2000	100,000
3 RD JULY	600	60	36000				2600	136000
5 TH JULY				1600	50	80000	1000	56000
7 TH JULY	1000	70	70000				2000	126000
9 TH JULY	200	50	10000				2200	136000
12 TH JULY				400	50	20000	1800	116000
15 TH JULY	100	50	5000				1900	121000
18 TH JULY	2400	80	192000				4300	313000
20 TH JULY				600 <u>600</u> <u>1200</u>	60 70	36000 <u>42000</u> <u>78000</u>	3100	235000
21 ST JULY				400 <u>100</u> <u>500</u>	70 50	28000 <u>5000</u> <u>33000</u>	2600	202000
25 th JULY	100	45	4500				2700	206500
28 TH JULY				20	50	1000	2680	205500
29 TH JULY				80 100 <u>420</u> <u>600</u>	50 50 80	4000 5000 <u>33600</u> <u>42600</u>	2080	162900
31 ST JULY				200	80	16000	1880	146900

ADVANTAGES OF FIFO

1. It is based on realistic assumption that materials are issued in the order in which they were received.
2. Materials are issued at the actual cost therefore; there is no unrealised profits/loss, which will arise from the operation of this method.
3. It is easy to understand and simple to operate.
4. The valuation of the closing stock is at cost and it will reflect the actual cost that was incurred on the materials.

DISADVANTAGES

1. Materials are issued to production at the previous cost and therefore the cost of production may not reflect the current economic factors affecting the operations.
2. When prices are subject to frequent changes this method involves complicated adjustments in-order to reflect the current

LIFO

It is based on the assumption that materials which were received last are first to be issued out.
The closing stock is valued at the price, which was last paid.

June 2008 Q 1b

Store ledger card FIFO

Date	Receipts			issues			Balances	
March	QTY	CPU	AMT	QTY	CPU	AMT	QTY	AMT
1 st							2500	90000
3 rd				350	36	12600	2150	77400
4 th				500	36	18000	1650	59400
13 th	1000	38	38000				2650	97400
14 th	75	36	2700				2725	100100
16 th				75 <u>325</u> <u>400</u>	36 38	2700 <u>12350</u> <u>15050</u>	2325	85050
20 th	1200	39	46800				3525	131850
22 nd				50	39	1950	3475	129900
24 th				900	39	35100	2575	94800
25 th	1600	40	64000				4175	158800
26 th				1600 250	40 39	64000 9750		

				<u>50</u> <u>1900</u>	38	<u>1900</u> <u>75650</u>	2275	83150
27 th	175	39	6825				2450	89975
28 th	500	38	19000				2950	108975

Sales: $(350 \times 46) + (500 \times 45) + (400 \times 46) + (900 \times 43) + (1900 \times 44) = 179,300$

Purchases = 167,800

Return inwards = $75 @ 46 = 3450$

$175 @ 43 = 7525$

10975

Income statement

sales		179300
returns inwards		(10975)
net sales		168325
less cost of sales		
opening stock	90,000	
purchases	167800	
closing stock	(108975)	(148825)
gross profit		19500
less: expenses		
operating expenses:	4500	
shortage	<u>1950</u>	<u>(6450)</u>
net profit		<u>13050</u>

Advantages of LIFO

1. Material are issued to the production at latest price paid and therefore it takes into consideration the current economic factors affecting the production.
2. It does not lead into unrealized profits/losses since materials are issued at the actual cost in which they were acquired.
3. It is simple and easy to operate

Disadvantages LIFO

1. It is not realistic, as it does not follow the physical flow of the materials.
2. The closing stock is valued at the old price and therefore it does not present the current economic value of stock in the market.
3. It is cumbersome when prices are subject to frequent fluctuations.

WEIGHTED AVERAGE METHOD

It considers the quantity of the materials in the store when calculating the average price.

The issue price is computed using the total cost of material and divided by the number of units. The issue prices remains stable it is much better than LIFO and FIFO because it uses the average price when issuing out the stock

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Store ledger card- Weighted average

Date	Receipts			issues			Balances	
JULY	QTY	CPU	AMT	QTY	CPU	AMT	QTY	AMT
1 ST							2000	100,000
3 RD	600	60	36000				2600	136000
5 TH				1600	52.3	83680	1000	52320
7 TH	1000	70	70000				2000	122320
9 TH	200	52.3	10460				2200	132780
12 TH				400	60.4	24160	1800	108620
15 TH	100	60.4	6040				1900	114660
18 TH	2400	80	192000				4300	306660
20 TH				1200	71.3	85560	3100	221100
21 ST				500	71.3	35650	2600	185450
25 TH	100	45	4500				2700	189950
28 TH				20	70.3	1406	2680	188544
29 TH				600	70.3	42180	2080	146364
31 ST				200	70.3	14060	1880	132304

HOW TO OBTAIN ISSUE PRICES

$$5^{\text{TH}} = 136000/2600=52.3$$

$$12^{\text{TH}} = 132780/2200=60.4$$

SIMPLE AVERAGE METHOD

Under this method, the average price is calculated by adding all the prices, which are in the store, and dividing by the number of the prices. It takes into consideration the FIFO method when issuing stock in the store.

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Store ledger card- Simple average method

Date	Receipts			issues			Balances	
JULY	QTY	CPU	AMT	QTY	CPU	AMT	QTY	AMT
1 ST							2000	100,000
3 RD	600	60	36000				2600	136000
5 TH				1600	55	88000	1000	48000
7 TH	1000	70	70000				2000	118000
9 TH	200	55	11000				2200	129000
12 TH				400	60	24000	1800	105000
15 TH	100	60	6000				1900	111000
18 TH	2400	80	192000				4300	303000
20 TH				1200	70	84000	3100	219000
21 ST				500	75	37500	2600	181500
25 TH	100	45	4500				2700	186000
28 TH				20	62.5	1250	2680	184750
29 TH				600	62.5	37500	2080	147250
31 ST				200	62.5	12500	1880	134750

How to obtain the issue prices.

$$5^{\text{th}} - 50+6 / 2 = 55$$

$$12^{\text{th}} = 60+50+70/3 = 60$$

$$20^{\text{th}} = 60+$$

