CHAPTER - 7

Management of Working Capital

UNIT – I

INTRODUCTION TO WORKING CAPITAL MANAGEMENT

1. ESTIMATING WORKING CAPITAL NEEDS

Operating cycle is one of the most reliable methods of Computation of Working Capital.

However, other methods like ratio of sales and ratio of fixed investment may also be used to determine the Working Capital requirements. These methods are briefly explained as follows:

(i) **CURRENT ASSETS HOLDING PERIOD:**

- ☑ To estimate working capital needs based on the average holding period of current assets and relating them to costs based on the company's experience in the previous year. This method is essentially based on the Operating Cycle Concept.

(ii) **RATIO OF SALES:**

- ☑ To estimate working capital needs as a ratio of sales on the assumption that current assets change with changes in sales.

(iii) **RATIO OF FIXED INVESTMENTS:**

- ☑ To estimate Working Capital requirements as a percentage of fixed investments.

A number of factors will, however, be impacting the choice of method of estimating Working Capital.

Factors such as seasonal fluctuations, accurate sales forecast, investment cost and variability in sales price would generally be considered.

The production cycle and credit and collection policies of the firm will have an impact on Working Capital requirements.

Therefore, they should be given due weightage in projecting Working Capital requirements.

2. OPERATING OR WORKING CAPITAL CYCLE

A useful tool for managing working capital is the operating cycle.

The operating cycle analyses the accounts receivable, inventory and accounts payable cycles in terms of number of days.

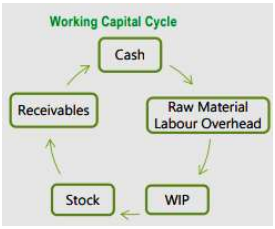
For example:

- Accounts receivables are analyzed by the average number of days it takes to collect an account.
- Inventory is analyzed by the average number of days it takes to turn over the sale of a product (from the point it comes in the store to the point it is converted to cash or an account receivable).
- Accounts payables are analyzed by the average number of days it takes to pay a supplier invoice.

OPERATING/WORKING CAPITAL CYCLE DEFINITION

- Working Capital cycle indicates the length of time between a company's paying for materials, entering into stock and receiving the cash from sales of finished goods.
- It can be determined by adding the number of days required for each stage in the cycle.
- For example, a company holds raw materials on an average for 60 days, it gets credit from the supplier for 15 days, production process needs 15 days, finished goods are held for 30 days and 30 days credit is extended to debtors.

The total of all these, 120 days, i.e., 60 - 15 + 15 + 30 + 30 days is the total working capital cycle.



- Most businesses cannot finance the operating cycle (accounts receivable days + inventory days) with accounts payable financing alone.
- Consequently, working capital financing is needed.
- This shortfall is typically covered by the net profits generated internally or by externally borrowed funds or by a combination of the two.
- Good management of working capital will generate cash which will help improve profits and reduce risks.
- Bear in mind that the cost of providing credit to customers and holding stocks can represent a substantial proportion of a firm's total profits.
- Each component of working capital (namely inventory, receivables and payables) has two dimensions Time and Money.
- When it comes to managing working capital then time is money.
- If you can get money to move faster around the cycle (e.g. collect amount due from debtors more quickly) or reduce the amount of money tied up (e.g. reduce inventory levels relative to sales), the business will generate more cash or it will need to borrow less money to fund working capital.
- Similarly, if you can negotiate improved terms with suppliers e.g. get longer credit or an increased credit limit; you are effectively creating free finance to help fund future sales.

If you....	Then....
Collect receivables (debtors) faster	You release cash from the cycle
Collect receivables (debtors) slower	Your receivables soak up cash.
Get better credit (in terms of duration or amount) from suppliers.	You increase your cash resources.
Shift inventory (stocks) faster	You free up cash.
Move inventory (stocks) slower.	You consume more cash.

The duration of working capital cycle may vary depending on the nature of the business.
In the form of an equation, the operating cycle process can be expressed as follows:

Operating Cycle = R + W + F + D - C

Where,

R = Raw material storage period
W = Work-in-progress inventory* holding period
F = Finished goods storage period
D = Receivables (Debtors) collection period.
C = Credit period allowed by suppliers (Creditors).

The various components of Operating Cycle may be calculated as shown below:

(1)	Raw Material Storage Period	= Average stock of raw material / Average Cost of Raw Material Consumption per day
(2)	Work-in-Progress inventory holding period	= Average Work-in-progress inventory / Average Cost of Production per day
(3)	Finished Goods storage period	= Average stock of finished goods / Average Cost of Goods Sold per day
(4)	Receivables (Debtors) collection period	= Average Receivables / Average Credit Sales per day
(5)	Credit period allowed by suppliers (Creditors)	= Average Payables / Average Credit Purchases per day

2.1 WORKING CAPITAL BASED ON OPERATING CYCLE

One of the methods for forecasting working capital requirement is based on the concept of operating cycle.

PROBLEM : 1

From the following information of XYZ Ltd., you are required to CALCULATE:

a) Net operating cycle period.

b) Number of operating cycles in a year

		₹
(i)	Raw material inventory consumed during the year	6,00,000
(ii)	Average stock of raw material	50,000
(iii)	Work-in-progress inventory	5,00,000
(iv)	Average work-in-progress inventory	30,000
(v)	Cost of goods sold during the year	8,00,000
(vi)	Average finished goods stock held	40,000
(vii)	Average collection period from debtors	45 days
(viii)	Average credit period availed	30 days
(ix)	No. of days in a year	360 days

(Study Material)

SOLUTION : 1

a) Calculation of Net Operating Cycle period of XYZ Ltd.

$$\text{Raw Material Storage period (R)} = \frac{\text{Average stock of raw material}}{\text{Average Cost of raw material Consumption per day}}$$

$$= \frac{₹50,000}{₹6,00,000 \div 360 \text{ days}} = \frac{₹50,000}{1,667} = 30\ days$$

$$\text{Work-in-progress inventory holding period (W)} = \frac{\text{AverageWork -in-progressinventory}}{\text{Average Cost of Production per day}}$$

$$= \frac{₹30,000}{₹5,00,000 \div 360 \text{ days}} = \frac{₹30,000}{1,389} = 22\ days$$

$$\text{Finished Goods storage period (F)} = \frac{= \text{ Average stock of finished goods}}{\text{Average Cost of Goods Sold per day}}$$

$$= \frac{₹40,000}{₹8,00,000 \div 360 \text{ days}} = \frac{₹40,000}{2,222} = 18\ days$$

Receivables (Debtors) collection period (D) = 45 days

Credit Period allowed by creditors (C) = 30 days

Net Operating Cycle = R + W + F+ D – C= 30 + 22 + 18 + 45 – 30 = 85 days

(b) Number of Operating Cycles in a year $= \frac{\text{No.of days in a year}}{\text{Operating Cycle period}}$

$$= \frac{360 \text{ days}}{85 \text{ days}} = 4.23 \text{ times}$$

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2.2 ESTIMATION OF AMOUNT OF DIFFERENT COMPONENTS OF CURRENT ASSETS AND CURRENT LIABILITIES

- The various constituents of current assets and current liabilities have a direct bearing on the computation of working capital and the operating cycle.

- The holding period of various constituents of Current Assets and Current Liabilities cycle may either contract or expand the net operating cycle period.
- Shorter the operating cycle period, lower will be the requirement of working capital and vice-versa.

ESTIMATION OF CURRENT ASSETS

The estimates of various components of gross working capital or current assets may be made as follows:

(i) RAW MATERIALS INVENTORY: The funds to be invested in raw materials inventory may be estimated on the basis of production budget, the estimated cost per unit and average holding period of raw material inventory by using the following formula:

$$\frac{\text{Estimated Production (units)}}{\text{12 months / 365 days *}} \times \text{Estimated cost per unit} \times \text{Average raw material storage period}$$

(ii) Work-in-Progress Inventory: The funds to be invested in work-in-progress can be estimated by the following formula:

$$\frac{\text{Estimated Production (units)}}{\text{12 months / 365 days *}} \times \text{Estimated WIP cost per unit} \times \text{Average WIP holding period}$$

(iii) Finished Goods: The funds to be invested in finished goods inventory can be estimated with the help of following formula:

$$\frac{\text{Estimated Production (units)}}{\text{12 months / 365 days *}} \times \text{Estimated cost of producton per unit} \times \text{Average finished goods storage per}$$

(iv) **Receivables (Debtors):** Funds to be invested in trade receivables (debtors) may be estimated with the help of following formula:

$$\frac{\text{Estimated Credit sales (units)}}{\text{12 months / 365 days *}} \times \text{Estimated cost of sales (Excl. Dep.) per unit} \times \text{Average receivable collection peri}$$

(v) **Cash and Cash equivalents:** Minimum desired Cash and Bank balance to be maintained by the firm has to be added in the current assets for the computation of working capital.

ESTIMATION OF CURRENT LIABILITIES

- Current liabilities are deducted from the current assets to get working capital.
- Hence, the amount of working capital is lowered to the extent of current liabilities (other than bank credit) arising in the normal course of business.
- The important current liabilities like trade payables, wages and overheads can be estimated as follows:

(i) TRADE PAYABLES: Trade payable can be estimated on the basis of material purchase budget and the credit purchase by using following formula:

$$\frac{\text{Estimated credit purchase}}{\text{12 months / 365 days *}} \times \text{Credit period allowed by suppliers}$$

(ii) DIRECT WAGES: It is estimated with the help of direct wages budget by using following formula:

$$\frac{\text{Estimated labour hours} \times \text{wages rate per hour}}{\text{12 months / 365 days *}} \times \text{Average time lag in payment of wages}$$

(iii) OVERHEADS (OTHER THAN DEPRECIATION AND AMORTIZATION): It may be estimated with the help of following formula:

$$\frac{\text{Estimated Overheads}}{\text{12 months / 360 days *}} \times \text{Average time lag in payment of overheads}$$

**Number of days in a year may be taken as 365 or 360 days.*

ESTIMATION OF WORKING CAPITAL REQUIREMENTS

		Amount (₹)	Amount (₹)	Amount (₹)
I.	**Current Assets:**			
	Inventories:			
	➡ Raw Materials	---		
	➡ Work-in-process	---		
	➡ Finished goods	---	---	
	Receivables:			
	➡ Trade debtors	---		
	➡ Bills	---	---	
	Minimum Cash Balance		---	
	Gross Working Capital		---	---
II.	**Current Liabilities:**			
	Trade Payables		---	
	Bills Payables		---	
	Wages Payables		---	
	Payables for overheads		---	---
III.	**Excess of Current Assets over Current Liabilities [I - II]**			—
IV.	Safety Margin			---
V.	**Net Working Capital [III + IV]**			---

IMPORTANT POINTS TO BE KEPT IN MIND:

- **Raw material purchases = Raw material consumption + closing stock of raw material - opening stock of raw material**
- **In case opening and closing stock of raw material are nil or equal, raw material consumption is same as raw material purchases.**
- **In the absence of information, assume all purchase and sales are on credit basis.**
- **In the case of selling overheads, the yearly sales volume is considered instead of yearly production.**

PROBLEM : 2

- **On 1st January, the Managing Director of Naureen Ltd. wishes to know the amount of working capital that will be required during the year.**
- **From the following information, PREPARE the working capital requirements forecast.**
- **Production during the previous year was 60,000 units. It is planned that this level of activity would be maintained during the present year.**
- **The expected ratios of the cost to selling prices are Raw materials 60%, Direct wages 10% and Overheads 20%.**
- **Raw materials are expected to remain in store for an average of 2 months before issue to production.**
- **Each unit is expected to be in process for one month, the raw materials being fed into the pipeline immediately and the labour and overhead costs accruing evenly during the month.**
- **Finished goods will stay in the warehouse awaiting dispatch to customers for approximately 3 months.**
- **Credit allowed by creditors is 2 months from the date of delivery of raw material. Credit allowed to debtors is 3 months from the date of dispatch.**
- **Selling price is '5 per unit.**
- **There is a regular production and sales cycle.**
- **Wages and overheads are paid on the 1st of each month for the previous month**

- **The company normally keeps cash in hand to the extent of ₹20,000.**

(Similar Question in Nov. 2021 – MTP – 10 Marks)

SOLUTION : 2

Working Notes:

1. **Raw material inventory:** The cost of materials for the whole year is 60% of the Sales value.

Hence it is 60,000 units × ₹5 × $\frac{60}{100}$ = ₹1,80,000 . The monthly consumption of raw material would be ₹15,000. Raw material requirements would be for two months; hence raw materials in stock would be ₹30,000.

2. **Work-in-process:** (Students may give special attention to this point). It is stated that each unit of production is expected to be in process for one month).

		(₹)
(a)	Raw materials in work-in-process (being one month's raw material requirements)	15,000
(b)	Labour costs in work-in-process (It is stated that it accrues evenly during the month. Thus, on the first day of each month it would be zero and on the last day of month the work-in-process would include one month's labour costs. On an average therefore, it would be equivalent to 1V of the month's labour costs) $\left(\frac{10\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 0.5 \text{ month}\right)$	1,250
(c)	Overheads For ½ month as explained above $\left(\frac{20\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 0.5 \text{ month}\right)$	2,500
	Total work-in-process	18,750

3. **Finished goods inventory:** (3 month's cost of production)

Raw materials $\left(\frac{60\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 3 \text{ month}\right)$	45,000
Labour $\left(\frac{10\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 3 \text{ month}\right)$	7,500
Overheads $\left(\frac{20\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 3 \text{ month}\right)$	15,000
	67,500
Alternatively, (60,000 units x ₹5 x 90%) x 3/12	67,500

4. **Debtors:** The total cost of sales = 2,70,000.

Therefore, debtors = ₹2,70,000 × $\frac{3}{12}$ = ₹67,500

Where, **Total Cost of Sales** = RM + Wages + Overheads + Opening Finished goods inventory - Closing finished goods inventory.

= ₹1,80,000 + ₹30,000 + ₹60,000 + ₹67,500 - ₹67,500 = ₹2,70,000.

5. **Creditors:** Suppliers allow a two months' credit period. Hence, the average amount of creditors would be two months consumption of raw materials i.e.

$\left(\frac{60\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 2 \text{ month}\right)$ = ₹30,000.

6. Direct Wages payable:

$$\left(\frac{60\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 2 \text{ month}\right)$$

7. Overheads Payable:

$$\left(\frac{20\% \text{ of } (60{,}000 \times ₹5)}{12 \text{ Months}} \times 1 \text{ month}\right) = ₹5{,}500.$$

Here it has been assumed that inventory level is uniform throughout the year, therefore opening inventory equals closing inventory.

Statement of Working Capital Required

	(₹)	(₹)
Current Assets or Gross Working Capital:		
Raw materials inventory (Refer to working note 1)	30,000	
Working-in-process (Refer to working note 2)	18,750	
Finished goods inventory (Refer to working note 3)	67,500	
Debtors (Refer to working note 4)	67,500	
Cash	20,000	2,03,750
Current Liabilities:		
Creditors (Refer to working note 5)	30,000	
Direct wages payable (Refer to working note 6)	2,500	
Overheads payable (Refer to working note 7)	5,000	(37,500)
Estimated working capital requirements		1,66,250

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2.3 Working Capital Requirement Estimation based on Cash Cost

- We have already seen that working capital is the difference between current assets and current liabilities.
- To estimate requirements of working capital, we have to forecast the amount required for each item of current assets and current liabilities.
- In practice another approach may also be useful in estimating working capital requirements.
- This approach is based on the fact that in **the case of current assets, like sundry debtors and finished goods, etc., the exact amount of funds blocked is less than the amount of such current assets.**

For example:

- If we have sundry debtors worth ₹1 lakh and our cost of production is ₹75,000, the actual amount of funds blocked in sundry debtors is ₹75,000 the cost of sundry debtors, the rest (₹25,000) is profit.
- Again, some of the cost items also are non-cash costs; depreciation is a non-cash cost item. Suppose out of ₹75,000, ₹5,000 is depreciation; then it is obvious that the actual funds blocked in terms of sundry debtors totaling ₹1 lakh is only ₹70,000. In other words, ₹70,000 is the amount of funds required to finance sundry debtors worth ₹1 lakh.
- Similarly, in the case of finished goods which are valued at cost, non-cash costs may be excluded to work out the amount of funds blocked.

Many experts, therefore, calculate the working capital requirements by working out the cash costs of finished goods and sundry debtors.

Under this approach, the debtors are calculated not as a percentage of sales value but as a percentage of cash costs. Similarly, finished goods are valued according to cash costs.

PROBLEM : 3

The following annual figures relate to XYZ Co.:

	₹
Sales (at two months' credit)	36,00,000
Materials consumed (suppliers extend two months' credit)	9,00,000
Wages paid (1 month lag in payment)	7,20,000
Cash manufacturing expenses (expenses are paid one month in arrear)	9,60,000
Administrative expenses (1 month lag in payment)	2,40,000
Sales promotion expenses (paid quarterly in advance)	1,20,000

The company sells its products on gross profit of 25%. Depreciation is considered as a part of the cost of production. It keeps one month's stock each of raw materials and finished goods, and a cash balance of ₹1,00,000.

Assuming a 20% safety margin, COMPUTE the working capital requirements of the company on cash cost basis. Ignore work-in-process. (Similar Question in April 2022 – MTP - 10 Marks + Study Material)

SOLUTION : 3

Statement of Working Capital requirements (cash cost basis)

		(₹)	(₹)
A.	**Current Assets**		
	Inventory:		
	Raw materials $\left(\frac{₹9,00,000}{12 months} \times 1 \text{ month}\right)$	75,000	
	Finished Goods $\left(\frac{₹25,80,000}{12 months} \times 1 \text{ month}\right)$	2,15,000	
	Receivables (Debtors) $\left(\frac{₹25,80,000}{12 months} \times 2 \text{ month}\right)$	4,90,000	
	Sales Promotion expenses paid in advance $\left(\frac{₹1,20,000}{12 \text{ months}} \times 3 \text{ month}\right)$	30,000	
	Cash balance	1,00,000	9,10,000
	Gross Working Capital		9,10,000
B.	**Current Liabilities:**		
	Payables :		
	- Creditors for materials $\left(\frac{₹25,80,000}{12 months} \times 2 \text{ month}\right)$	1,50,000	
	Wages outstanding $\left(\frac{₹7,20,000}{12 \text{ months}} \times 1 \text{ month}\right)$	60,000	
	Manufacturing expenses outstanding $\left(\frac{₹9,60,000}{12 \text{ months}} \times 1 \text{ month}\right)$	80,000	
	Administrative expenses outstanding $\left(\frac{₹2,40,000}{12 \text{ months}} \times 1 \text{ month}\right)$	20,000	3,10,000
	Net working capital (A - B)		6,00,000
	Add: Safety margin @ 20%		1,20,000
	Total Working Capital requirements		7,20,000

Working Notes:

(i)	**Computation of Annual Cash Cost of Production**	**(₹)**
	Material consumed	9,00,000
	Wages	7,20,000
	Manufacturing expenses	9,60,000
	Total cash cost of production	25,80,000
(ii)	**Computation of Annual Cash Cost of Sales:**	**(₹)**
	Total Cash cost of production as in (i) above	25,80,000

	Administrative Expenses	2,40,000
	Sales promotion expenses	1,20,000
	Total cash cost of sales	29,40,000

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PROBLEM 4 :

Following information is forecasted by the Puja Limited for the year ending 31st March, 20X8:

	Balance as at 1st April, 20X7 (₹)	Balance as at 31st March, 20X8 (₹)
Raw Material	**45,000**	**65,356**
Work-in-progress	**35,000**	**51,300**
Finished goods	**60,181**	**70,175**

SOLUTION : 4

Working Notes:

1. Raw Material Storage period (R) = $\frac{\text{Average stock of raw material}}{\text{Annual Consumption of raw material}}$

$$= \frac{\frac{₹45,000 + ₹65,356}{2}}{₹3,79,644} \times 365$$

= 53 days.

Annual Consumption of Raw Material = Opening Stock + Purchases- Closing Stock

= ₹45,000 + ₹4,00,000 - ₹65,356

= ₹3,79,644

2. Work-in-Progress (WIP) Conversion Period (W)

WIP Conversion Period = $\frac{\text{Average stock of WIP}}{\text{Annual Cost of Production}}$

$$= \frac{\frac{₹35,000 + ₹51,300}{2}}{₹7,50,000} \times 365$$

= 21 days.

3. Finished Stock Storage Period (F)

$$= \frac{\text{Average Stock of Finished Goods}}{\text{Cost of Goods Sold}} \times 365$$

$$= \frac{₹65,178}{₹9,15,000} = 26 \text{ days.}$$

$$\text{Average Stock} = \frac{₹60,181 + ₹70,175}{2} = ₹65,178.$$

4. Debtors Collection Period (D)

$$= \frac{\text{Average Stock of Finished Goods}}{\text{Cost of Goods Sold}} \times 365$$

$$= \frac{\text{Average Debtors}}{\text{Annual Credit Sales}} \times 365 \text{ Days}$$

$$= \frac{₹1,23,561.50}{₹11,00,000} = 41 \text{ days.}$$

$$\text{Average Stock} = \frac{₹1,12,123 + ₹1,35,000}{2} = ₹1,23,561.50$$

5. Creditors Payment Period (C)

$$\frac{\text{Average debtors}}{\text{Annual Net Credit Purchases}} \times 365$$

$$= \frac{\left(\frac{₹50,079 + ₹70,469}{2}\right)}{₹4,00,000} \times 365$$

= 55 days.

(i) Operating Cycle Period

= R + W + F+ D – C

= 53 + 21 + 26 + 41 – 55

= 86 days

(ii) Number of Operating Cycles in the Year

$$= \frac{365}{\text{Operating Cycle Period}} \times \frac{365}{86} = 4,244$$

(iii) Amount of Working Capital Required

$$= \frac{\text{Annual Operating Cost}}{\text{Number of Operatng Cycles}} \times \frac{₹9,50,000}{4.244} = ₹2,23,845.42$$

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CHAPTER - 7

Management of Working Capital

UNIT - II

TREASURY AND CASH MANAGEMENT

3. CASH BUDGET

Cash Budget is the most significant device to plan for and control cash receipts and payments.

This represents cash requirements of business during the budget period.

The various PURPOSES OF CASH BUDGETS are:

- **Coordinate the timings of cash needs.** It identifies the period(s) when there might either be a shortage of cash or an abnormally large cash requirement;
- It also helps **to pinpoint period(s) when there is likely to be excess cash;**
- It **enables firm which has sufficient cash to take advantage like cash discounts** on its accounts payable; and
- Lastly it **helps to plan/arrange adequately needed funds** (avoiding excess/shortage of cash) on favorable terms.

On the basis of cash budget, the **firm can decide to invest surplus cash in marketable securities** and earn profits. On the contrary, any **shortages can also be managed by making overdraft or credit arrangements** with banks.

MAIN COMPONENTS OF CASH BUDGET

Preparation of cash budget involves the following steps:-

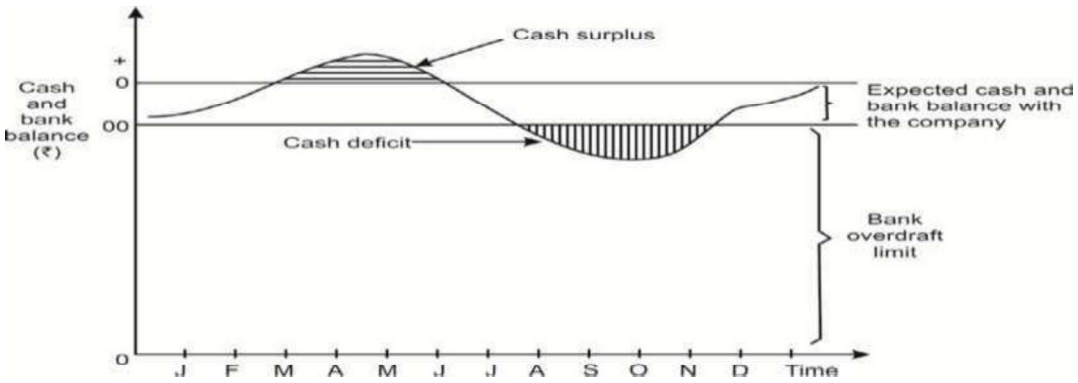
(a) **Selection of the period of time to be covered by the budget.** It also defines the planning horizon.

(b) **Selection of factors that have a bearing on cash flows.** The factors that generate cash flows are generally divided into following two categories:-

(i) Operating (cash flows generated by operations of the firm); and

(ii) Financial (cash flows generated by financial activities of the firm).

The following figure highlights the cash surplus and cash shortage position over the period of cash budget for preplanning to take corrective and necessary steps.



4. METHODS OF CASH FLOW BUDGETING

A cash budget can be prepared in the following ways:

1. **Receipts and Payments Method:**
   - In this method all the expected receipts and payments for budget period are considered.
   - All the cash inflow and outflow of all functional budgets including capital expenditure budgets are considered.

- Accruals and adjustments in accounts will not affect the cash flow budget.
- Anticipated cash inflow is added to the opening balance of cash and all cash payments are deducted from this to arrive at the closing balance of cash.
- This method is commonly used in business organizations.

2. **Adjusted Income Method:**
   - In this method the annual cash flows are calculated by adjusting the sales revenue and cost figures for delays in receipts and payments (change in debtors and creditors) and eliminating non-cash items such as depreciation.
3. **Adjusted Balance Sheet Method:**
   - In this method, the budgeted balance sheet is predicted by expressing each type of asset (except cash & bank) and short-term liabilities as percentage of the expected sales.
   - The profit is also calculated as a percentage of sales, so that the increase in owner's equity can be forecasted.
   - Known adjustments, may be made to long-term liabilities and the balance sheet will then show if additional finance is needed (if budgeted assets exceed budgeted liabilities) or if there will be a positive cash balance (if budgeted liabilities exceed budgeted assets).

It is important to note that the capital budget will also be considered in the preparation of cash flow budget because the annual budget may disclose a need for new capital investments and also, the costs and revenues of any new projects coming on stream will need to be incorporated in the short-term budgets.

The Cash Budget can be prepared for short period or for long period.

4.1 CASH BUDGET FOR SHORT PERIOD

Preparation of cash budget month by month would require the following estimates:

(a) As regards receipts:

(1) Receipts from debtors;

(2) Cash Sales; and

(3) Any other source of receipts of cash (say, dividend from a subsidiary company)

(b) As regards payments:

(1) Payments to be made for purchases;

(2) Payments to be made for expenses;

(3) Payments that are made periodically but not every month;

(i) Debenture interest;

(ii) Income tax paid in advance;

(iii) Sales tax or GST etc.

(4) Special payments to be made in a particular month, for example, dividends to shareholders, redemption of debentures, repayments of loan, payment of assets acquired, etc.

Format of Cash Budget

_____Co. Ltd.

Cash Budget

_____Period

	Month 1	Month 2	Month 3		Month 12
Receipts:					
1. Opening balance					
2. Collection from debtors					
3. Cash sales					
4. Loans from banks					

5. Share capital					
6. Miscellaneous receipts					
7. Other items					
Total					
Payments:					
1. Payments to creditors					
2. Wages					
3. Overheads					
(a)					
(b)					
(c)					
4. Interest					
5. Dividend					
6. Corporate tax					
7. Capital expenditure					
8. Other items					
Total					
Closing balance					
[Surplus (+)/Shortfall (-)]					

PROBLEM : 1

PREPARE monthly cash budget for six months beginning from April 2021 on the basis of the following information:

(i) Estimated monthly sales are as follows:

	₹		₹
January	1,00,000	June	80,000
February	1,20,000	July	1,00,000
March	1,40,000	August	80,000
April	80,000	September	60,000
May	60,000	October	1,00,000

(ii) Wages and salaries are estimated to be payable as follows:-

	₹		₹
April	9,000	July	10,000
May	8,000	August	9,000
June	10,000	September	9,000

(iii) Of the sales, 80% is on credit and 20% for cash. 75% of the credit sales are collected within one month after sale and the balance in two months after sale. There are no bad debt losses.

(iv) Purchases amount to 80% of sales and are made on credit and paid for in the month preceding the sales.

(v) The firm has 10% debentures of ₹ 1,20,000. Interest on these has to be paid quarterly in January, April and so on.

(vi) The firm is to make an advance payment of tax of ₹5,000 in July, 2021.

(vii) The firm had a cash balance of ₹ 20,000 on April 1, 2021, which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary investments / liquidation of temporary investments or temporary borrowings at the end of each month (interest on these to be ignored).

(Study Material + Oct. 2019 MTP – 10 Marks + Similar Question in March 2021 MTP – 10 Marks)

SOLUTION : 1

Workings:

Collection from debtors: (Amount in ₹)

	Feb.	March	April	May	June	July	August	Sept.
Total sales	1,20,000	1,40,000	80,000	60,000	80,000	1,00,000	80,000	60,000
Credit sales (80% of total sales)	96,000	1,12,000	64,000	48,000	64,000	80,000	64,000	48,000
Collections:								
One month		72,000	84,000	48,000	36,000	48,000	60,000	48,000
Two months			24,000	28,000	16,000	12,000	16,000	20,000
Total collections			1,08,000	76,000	52,000	60,000	76,000	68,000

Monthly Cash Budget for Six months, April to September, 2021 (Amount in ₹)

	April	May	June	July	August	Sept.
Receipts:						
Opening balance	20,000	20,000	20,000	20,000	20,000	20,000
Cash sales	16,000	12,000	16,000	20,000	16,000	12,000
Collection from debtors	1,08,000	76,000	52,000	60,000	76,000	68,000
Total cash available (A)	1,44,000	1,08,000	88,000	1,00,000	1,12,000	1,00,000
Payments:						
Purchases	48,000	64,000	80,000	64,000	48,000	80,000
Wages & salaries	9,000	8,000	10,000	10,000	9,000	9,000
Interest on debentures	3,000	---	---	3,000	---	---
Tax payment	---	---	---	5,000	---	---
Total payments (B)	60,000	72,000	90,000	82,000	57,000	89,000
Minimum cash balance desired	20,000	20,000	20,000	20,000	20,000	20,000
Total cash needed (C)	80,000	92,000	1,10,000	1,02,000	77,000	1,09,000
Surplus - deficit (A-C)	64,000	16,000	(22,000)	(2,000)	35,000	(9,000)
Investment/financing						
Temporary Investments	(64,000)	(16,000)			(35,000)	
Liquidation of temporary investments or temporary borrowings			22,000	2,000		9,000
Total effect of investment/financing (D)	(64,000)	(16,000)	22,000	2,000	(35,000)	9,000
Closing cash balance (A+D-B)	20,000	20,000	20,000	20,000	20,000	20,000

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4.2 CASH BUDGET FOR LONG PERIOD

Long-range cash forecast often resemble the projected sources and application of funds statement. The following procedure may be adopted to prepare long-range cash forecasts:

(i) Take the cash at bank and in the beginning of the year

(ii) Add:

(a) Trading profit (before tax) expected to be earned;

(b) Depreciation and other development expenses incurred to be written off;

(c) Sale proceeds of assets;

(d) Proceeds of fresh issue of shares or debentures; and

(e) Reduction in working capital that is current assets (except cash) less current liabilities.

(iii) Deduct:

(a) Dividends to be paid.

(b) Cost of assets to be purchased.

(c) Taxes to be paid.

(d) Debentures or preference shares to be redeemed.

(e) Increase in working capital that is current assets (except cash) less current liabilities.

PROBLEM : 2 You are given below the Profit & Loss Accounts for two years for a company:

Profit and Loss Account

	Year 1	Year 2		Year 1	Year 2
	₹	₹		₹	₹
To Opening stock	80,00,000	1,00,00,000	By Sales	8,00,00,000	10,00,00,000
To Raw materials	3,00,00,000	4,00,00,000	By Closing stock	1,00,00,000	1,50,00,000
To Stores	1,00,00,000	1,20,00,000	By Misc. Income	10,00,000	10,00,000
To Manufacturing Expenses	1,00,00,000	1,60,00,000			
To Other Expenses	1,00,00,000	1,00,00,000			
To Depreciation	1,00,00,000	1,00,00,000			
To Net Profit	1,30,00,000	1,80,00,000		-	-
	9,10,00,000	11,60,00,000		9,10,00,000	11,60,00,000

Sales are expected to be ₹ 12,00,00,000 in year 3.

As a result, other expenses will increase by ₹ 50,00,000 besides other charges. Only raw materials are in stock. Assume sales and purchases are in cash terms and the closing stock is expected to go up by the same amount as between year 1 and 2. You may assume that no dividend is being paid. The Company can use 75% of the cash generated to service a loan. COMPUTE how much cash from operations will be available in year 3 for the purpose? Ignore income tax. (Study Material + Similar Question in May 2022 - RTP)

SOLUTION : 2

Projected Profit and Loss Account for the year 3

	Year 2 Actual (₹ in lakhs)	Year 3 Projected (₹ in lakhs)		Year 2 Actual (₹ in lakhs)	Year 3 Projected (₹ in lakhs)
To Materials consumed	350	420	By Sales	1,000	1,200
To Stores	120	144	By Misc. Income	10	10
To Mfg. Expenses	160	192			
To Other expenses	100	150			
To Depreciation	100	100			
To Net profit	180	204			
	1,010	1,210		1,010	1,210

Cash Flow:

	(₹ in lakhs)
Profit	204
Add: Depreciation	100
	304
Less: Cash required for increase in stock	50
Net cash inflow	254

Available for servicing the loan: 75% of ₹ 2,54,00,000 or ₹ 1,90,50,000

Working Notes:

(i) Material consumed in year 2: 35% of sales.

Likely consumption in year 3: ₹ 1,200x $\frac{35}{100}$ or ₹ 420 (lakhs)

(ii) Stores are 12% of sales, as in year 2.

(iii) Manufacturing expenses are 16% of sales.

Note: The above also shows how a projected profit and loss account is prepared.

5 CASH MANAGEMENT MODELS

- In recent years several types of mathematical models have been developed which helps to determine the optimum cash balance to be carried by a business organization.
- The purpose of all these models is to ensure that cash does not remain idle unnecessarily and at the same time the firm is not confronted with a situation of cash shortage.

All these models can be put in two categories:

1. Inventory type models; and
2. Stochastic models.

- Inventory type models have been constructed to aid the finance manager to determine optimum cash balance of his firm.
- William J. Baumol's economic order quantity model applies equally to cash management problems under conditions of certainty or where the cash flows are predictable.
- However, in a situation where the EOQ Model is not applicable, stochastic model of cash management helps in determining the optimum level of cash balance.
- It happens when the demand for cash is stochastic and not known in advance.

5.1 WILLIAM J. BAUMOL'S ECONOMIC ORDER QUANTITY MODEL, (1952)

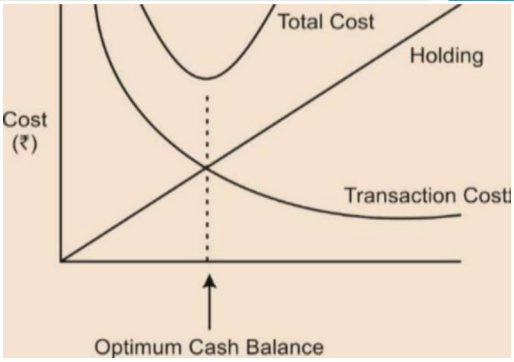
- According to this model, **optimum cash level is that level of cash where the carrying costs and transactions costs are the minimum.**
- The carrying costs refer to the cost of holding cash, namely, the opportunity cost or interest foregone on marketable securities.
- The transaction costs refer to the cost involved in getting the marketable securities converted into cash.
- This happens when the firm falls short of cash and has to sell the securities resulting in clerical, brokerage, registration and other costs.
- The optimum cash balance according to this model will be that point where these two costs are minimum.

The formula for determining optimum cash balance is:

$$C = \sqrt{\frac{2U \times P}{S}}$$

Where, C = Optimum cash balance
U = Annual (or monthly) cash disbursement
P = Fixed cost per transaction.
S = Opportunity cost of one rupee p.a. (or p.m.)

This can be explained with the following diagram:



Assumptions: The model is based on the following assumptions:

(i) **Certainty :** Cash needs of the firm are known with certainty.

(ii) **Uniform Cash Flows:** The cash is used uniformly over a period of time and it is also known with certainty.

(iii) **Fixed Holding Costs.:** The holding cost is known and it is constant.

(iv) **Fixed Transaction Costs:** The transaction cost also remains constant.

(v) **Free marketability:** Short-term instruments can be freely traded. The firm can invest them at anytime and sell off / dispose investments at any time.

PROBLEM : 3

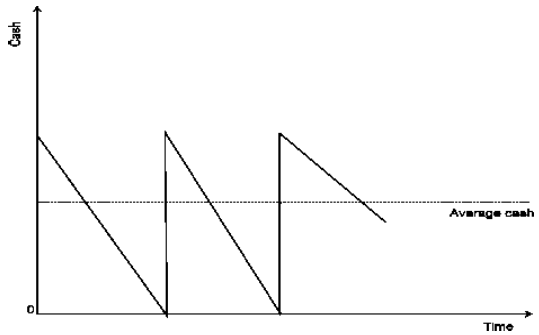
A firm maintains a separate account for cash disbursement. Total disbursement are ₹ 1,05,000 per month or ₹ 12,60,000 per year. Administrative and transaction cost of transferring cash to disbursement account is ₹ 20 per transfer. Marketable securities yield is 8% per annum.

DETERMINE the optimum cash balance according to William J. Baumol model.

(Study Material + Oct. 2019 – MTP – 2 Marks)

SOLUTION : 3

The optimum cash balance $C=\sqrt{\frac{2 \times ₹\,12,60,000 \times ₹\,20}{0.08}}$



Limitation of Baumol Model

The limitation of the Baumol's model is that it does not allow the cash flows to fluctuate. Firms in practice do not use their cash balance uniformly nor are they able to predict daily cash inflows and outflows. The Miller-Orr (MO) model, as discussed below, overcomes this shortcoming and allows for daily cash flow variation.

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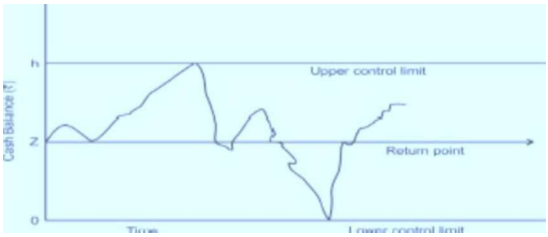
5.2 MILLER-ORR CASH MANAGEMENT MODEL (1966)

- According to this model the net **cash flow is completely stochastic.**
- When changes in cash balance occur randomly the application of control theory serves a useful purpose.
- The Miller-Orr model is one of such control limit models.
- This model is designed to determine the time and size of transfers between an investment account and cash account.

- In this model control limits are set for cash balances.
- These limits may consist of h as upper limit, z as the return point; and zero as the lower limit.
  - ☑ When the cash balance reaches the upper limit, the transfer of cash equal to h - z is invested in marketable securities account.
  - ☑ When it touches the lower limit, a transfer from marketable securities account to cash account is made.
  - ☑ During the period when cash balance stays between (h, z) and (z, 0) i.e. high and low limits no transactions between cash and marketable securities account is made.
- The high and low limits of cash balance are set up on the basis of fixed cost associated with the securities transactions, the opportunity cost of holding cash and the degree of likely fluctuations in cash balances.
- These limits satisfy the demands for cash at the lowest possible total costs. The following diagram illustrates the Miller-Orr model.



- The MO Model is more realistic since it allows variations in cash balance within lower and upper limits.
- The finance manager can set the limits according to the firm's liquidity requirements i.e., maintaining minimum and maximum cash balance.

PROBLEM : 4

The following information is available in respect of Sai trading company:

(i) **On an average, debtors are collected after 45 days; inventories have an average holding period of 75 days and creditor's payment period on an average is 30 days.**

(ii) **The firm spends a total of ₹ 120 lakhs annually at a constant rate.**

(iii) **It can earn 10 per cent on investments.**

From the above information, you are required to CALCULATE:

(a) **The cash cycle and cash turnover,**

(b) **Minimum amounts of cash to be maintained to meet payments as they become due,**

(c) **Savings by reducing the average inventory holding period by 30 days.** **(Study Material)**

SOLUTION : 4

(a) Cash cycle = 45 days + 75 days - 30 days = 90 days (3 months)

Cash turnover = 12 months (360 days)/3 months (90 days) = 4.

(b) Minimum operating cash = Total operating annual outlay/cash turnover, that is, ₹ 120 lakhs/4 = ₹ 30 lakhs.

(c) Cash cycle = 45 days + 45 days - 30 days = 60 days (2 months).

Cash turnover = 12 months (360 days)/2 months (60 days) = 6.

Minimum operating cash = ₹ 120 lakhs/6 = ₹ 20 lakhs.

Reduction in investments = ₹ 30 lakhs - ₹ 20 lakhs = ₹ 10 lakhs.

Savings = 0.10 x ₹ 10 lakhs = ₹1 lakh.

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QUESTION : 5

K Ltd. has a Quarterly cash outflow of ₹ 9,00,000 arising uniformly during the Quarter. The company has an Investment portfolio of Marketable Securities. It plans to meet the demands for cash by periodically selling marketable securities. The marketable securities are generating a return of 12% p.a. Transaction cost of converting investments to cash is ₹ 60. The company uses Baumol model to find out the optimal transaction size

for converting marketable securities into cash.

Consider 360 days in a year.

You are required to calculate

(i) **Company's average cash balance,**

(ii) **Number of conversions each year and**

(iii) **Time interval between two conversions.** **(Nov. 2022 Exam - 5 Marks)**

SOLUTION : 5

Quarterly Cash Outflow = Rs 9,00,000

Annual Cash Outflows (A) = 9,00,000 x 4

= Rs 36,00,000

Transaction cost per transaction (T) = Rs 60

Opportunity Cost p.a. (I) = 12%

As per Baumol model,

STEP 1 : Optimum Cash Balance $= \sqrt{\frac{2\,AT}{I}}$

$= \sqrt{\frac{2 \times 36,00,000 \times 60}{12\%}}$

= Rs 60,000

STEP 2 : Average Cash Balance $= \frac{\text{Optimum Cash Balance}}{2}$

$= \frac{60,000}{2}$

= Rs 30,000

STEP 3 : No. of Conversions each year $= \frac{\text{Annual Cash Outflow}}{\text{Optimum Cash Balance}}$

$= \frac{36,00,000}{60,000}$

= 60

STEP 4 : Time Interval Between Two Conversion

$= \frac{360}{60}$

= 6 Days

CHAPTER - 7

Management of Working Capital

UNIT - III

MANAGEMENT OF RECEIVABLES

6. APPROACHES TO EVALUATION OF CREDIT POLICIES

- There are basically two methods of evaluating the credit policies to be adopted by a Company - Total Approach and Incremental Approach.
- The formats for the two approaches are given as under:
- Statement showing the Evaluation of Credit Policies (based on Total Approach)

Particulars	Present Policy	Proposed Policy I	Proposed Policy II	Proposed Policy III
	₹	₹	₹	₹
A. Expected Profit:				
(a) Credit Sales	.....	.....	.....	.....
(b) Total Cost other than Bad Debts				
(i) Variable Costs	.....	.....	.....	.....
(ii) Fixed Costs	.....	.....	.....	.....
	.....	.....	.....	.....
(c) Bad Debts	.....	.....	.....	.....
(d) Cash discount	.....	.....	.....	.....
(e) Expected Net Profit before Tax (a-b-c-d)	.....	.....	.....	.....
(f) Less: Tax	.....	.....	.....	.....
(g) Expected Profit after Tax	.....	.....	.....	.....
B. Opportunity Cost of Investments in Receivables locked up in Collection Period	.....	.....	.....	.....
Net Benefits (A - B)	.....	.....	.....	.....

Advise: The Policy should be adopted since the net benefits under this policy are higher as compared to other policies.

Here

(i) Total Fixed Cost = [Average Cost per unit - Variable Cost per unit] x No. of units sold on credit under Present Policy

(ii) Opportunity Cost = Total Cost of Credit Sales x

$$\frac{\text{Collection period (Days)}}{365(\text{or } 360)} \times \frac{\text{Required Rate of Return}}{10}$$

Statement showing the Evaluation of Credit Policies (based on Incremental Approach)

Particulars	Present Policy days	Proposed Policy I days	Proposed Policy II days	Proposed Policy III days
A. Incremental Expected Profit:				
Credit Sales	.....	.....	.....	.....
(a) Incremental Credit Sales	.....	.....	.....	.....

(b) Less: Incremental Costs of Credit Sales				
(i) Variable Costs	.....	.....	.....	.....
(ii) Fixed Costs	.....	.....	.....	.....
(c) Incremental Bad Debt Losses	.....	.....	.....	.....
(d) Incremental Cash Discount	.....	.....	.....	.....
(e) Incremental Expected Profit (a-b-c-d)	.....	.....	.....	.....
(f) Less: Tax	.....	.....	.....	.....
(g) Incremental Expected Profit after Tax	.....	.....	.....	.....
B. Required Return on Incremental Investments:				
(a) Cost of Credit Sales	.....	.....	.....	.....
(b) Collection Period (in days)	.....	.....	.....	.....
(c) Investment in Receivable (a x b/365 or 360)	.....	.....	.....	.....
(d) Incremental Investment in Receivables	.....	.....	.....	.....
(e) Required Rate of Return (in %)	.....	.....	.....	.....
(f) Required Return on Incremental Investments (d x e)	.....	.....	.....	.....
Incremental Net Benefits (A - B)	.....	.....	.....	.....

Advise: The Policy.....should be adopted since net benefits under this policy are higher as compared to other policies.

Here:

(i) Total Fixed Cost = [Average Cost per unit - Variable Cost per unit] x No. of units sold on credit under Present Policy

(ii) Opportunity Cost = Total Cost of Credit Sales x

$$\frac{\text{Collection period (Days)}}{365(\text{or } 360)} \times \frac{\text{Required Rate of Return}}{100}$$

PROBLEM : 1

A trader whose current sales are in the region of ₹ 6 lakhs per annum and an average collection period of 30 days wants to pursue a more liberal policy to improve sales. A study made by a management consultant reveals the following information:-

Credit Policy	Increase in collection period	Increase in sales	Present default anticipated
A	10 days	₹ 30,000	1.5%
B	20 days	₹ 48,000	2%
C	30 days	₹ 75,000	3%
D	45 days	₹ 90,000	4%

The selling price per unit is ₹3. Average cost per unit is ₹ 2.25 and variable costs per unit are ₹ 2. The current bad debt loss is 1%. Required return on additional investment is 20%. Assume a 360 days year.

ANALYSE which of the above policies would you recommend for adoption?

(Study Material + Nov. 2020 - RTP)

SOLUTION : 1

A. Statement showing the Evaluation of Debtors Policies (Total Approach)

Particulars		Present Policy 30 days	Proposed Policy A 40 days	Proposed Policy B 50 days	Proposed Policy C 60 days	Proposed Policy D 75 days
		₹	₹	₹	₹	₹
A.	**Expected Profit:**					
	(a) Credit Sales	6,00,000	6,30,000	6,48,000	6,75,000	6,90,000
	(b) Total Cost other than Bad Debts					
	(i) Variable Costs [Sales x 2/ 3]	4,00,000	4,20,000	4,32,000	4,50,000	4,60,000
	(ii) Fixed Costs	50,000	50,000	50,000	50,000	50,000
		4,50,000	4,70,000	4,82,000	5,00,000	5,10,000
	(c) Bad Debts	6,000	9,450	12,960	20,250	27,600
	(d) Expected Profit [(a) - (b) - (c)]	1,44,000	1,50,550	1,53,040	1,54,750	1,52,400
B.	**Opportunity Cost of Investments in Receivables**	7,500	10,444	13,389	16,667	21,250
C.	**Net Benefits (A - B)**	1,36,500	1,40,106	1,39,651	1,38,083	1,31,150

Recommendation: The Proposed Policy A (i.e. increase in collection period by 10 days or total 40 days) should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Notes:

1. **Calculation of Fixed Cost =** [Average Cost per unit - Variable Cost per unit] x No. of Units sold
   = [₹ 2.25 - ₹ 2.00] x (₹ 6,00,000/3)
   = ₹ 0.25 x 2,00,000 = ₹ 50,000

2. **Calculation of Opportunity Cost of Average Investments**

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$\text{Present Policy} = 4,50,000 \times \frac{30}{360} \times \frac{10}{100} = 7,500$$

$$\text{Policy A} = 4,70,000 \times \frac{40}{360} \times \frac{20}{100} = 10,444$$

$$\text{Policy B} = 4,82,000 \times \frac{50}{360} \times \frac{20}{100} = 13,389$$

$$\text{Policy C} = 5,00,000 \times \frac{60}{360} \times \frac{20}{100} = 16,667$$

$$\text{Policy D} = 5,10,000 \times \frac{75}{360} \times \frac{20}{100} = 21,250$$

B. Another method of solving the problem is Incremental Approach. Here we assume that sales are all credit sales.

Particulars		Present Policy 30 days	Proposed Policy A 40 days	Proposed Policy B 50 days	Proposed Policy C 60 days	Proposed Policy D 75 days
		₹	₹	₹	₹	₹
A.	**Incremental Expected Profit:**					
	(a) Incremental Credit Sales	—	30,000	48,000	75,000	90,000
	(b) Incremental Costs					
	(i) Variable Costs	---	20,000	32,000	50,000	60,000
	(ii) Fixed Costs	---	-	-	-	-
	(c) Incremental Bad Debt Losses	—	3,450	6,960	14,250	21,600

	(d) Incremental Expected Profit (a-b-c)]		6,550	9,040	10,750	8,400
B.	**Required Return on Incremental Investments:**					
	(a) Cost of Credit Sales	4,50,000	4,70,000	4,82,000	5,00,000	5,10,000
	(b) Collection period	30	40	50	60	75
	(c) Investment in Receivable (a x b/360)	37,500	52,222	66,944	83,333	1,06,250
	(d) Incremental Investment in Receivables		14,722	29,444	45,833	68,750
	(e) Required Rate of Return (in %)		20	20	20	20
	(f) Required Return on Incremental Investments (dx e)		2,944	5,889	9,167	13,750
C.	**Net Benefits (A - B)**	**---**	**3,606**	**3,151**	**1,583**	**- 5,350**

Recommendation: The Proposed Policy A should be adopted since the net benefits under this policy are higher than those under other policies.

(c) Another method of solving the problem is by computing the Expected Rate of Return.

$$\text{Expected Rate of Return} = \frac{\text{Incremental Expected Profit}}{\text{Incremental Investment in Receivables}} \times 100$$

$$\text{For Policy A} = \frac{₹\ 6,550}{₹\ 14,722} \times 100 = 44.49\%$$

$$\text{For Policy B} = \frac{₹\ 9,040}{₹\ 29,444} \times 100 = 30.70\%$$

$$\text{For Policy C} = \frac{₹\ 10,750}{₹\ 45,833} \times 100 = 23.45\%$$

$$\text{For Policy D} = \frac{₹\ 8,400}{₹\ 68,750} \times 100 = 12.22\%$$

Recommendation: The Proposed Policy A should be adopted since the Expected Rate of Return (44.49%) is more than the Required Rate of Return (20%) and is highest among the given policies compared.

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PROBLEM : 2

XYZ Corporation is considering relaxing its present credit policy and is in the process of evaluating two proposed policies. Currently, the firm has annual credit sales of ₹ 50 lakhs and accounts receivable turnover ratio of 4 times a year. The current level of loss due to bad debts is ₹ 1,50,000. The firm is required to give a return of 25% on the investment in new accounts receivables. The company's variable costs are 70% of the selling price. Given the following information, IDENTIFY which is the better option?

(Amount in ₹)

	Present Policy	Policy Option I	Policy Option II
Annual credit sales	50,00,000	60,00,000	67,50,000
Accounts receivable turnover ratio	4 times	3 times	2.4 times
Bad debt losses	1,50,000	3,00,000	4,50,000

(Study Material + Oct. 2018 – MTP – 10 Marks + Similar Question in April 2021 & Oct. 2022 – MTP – 10 Marks)

SOLUTION : 2

Statement showing the Evaluation of Debtors Policies

	Particulars	Present Policy	Proposed Policy I	Proposed Policy II
A	**Expected Profit:**			
	(a) Credit Sales	50,00,000	60,00,000	67,50,000
	(b) Total Cost other than Bad Debts:			
	(i) Variable Costs	35,00,000	42,00,000	47,25,000
	(c) Bad Debts	1,50,000	3,00,000	4,50,000
	(d) Expected Profit [(a) - (b) - (c)]	13,50,000	15,00,000	15,75,000
B	**Opportunity Cost of Investments in Receivables**	2,18,750	3,50,000	4,92,188
C	**Net Benefits (A - B)**	11,31,250	11,50,000	10,82,812

Recommendation: The Proposed Policy I should be adopted since the net benefits under this policy are higher as compared to other policies.

Working Note: Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{12} \times \frac{\text{Rate of Return}}{100}$$

Collection Period in months = 12 / Accounts Receivable Turnover Ratio

Present Policy = ₹ 35,00,000 x 3/12 x 25% = ₹ 2,18,750

Proposed Policy I = ₹ 42,00,000 x 4/12 x 25% = ₹ 3,50,000

Proposed Policy II = ₹ 47,25,000 x 5/12 x 25% = ₹ 4,92,188

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PROBLEM : 3

A company is presently having credit sales of ₹ 12 lakh. The existing credit terms are 1/10, net 45 days and average collection period is 30 days. The current bad debts loss is 1.5%. In order to accelerate the collection process further as also to increase sales, the company is contemplating liberalization of its existing credit terms to 2/10, net 45 days. It is expected that sales are likely to increase by 1/3 of existing sales, bad debts increase to 2% of sales and average collection period to decline to 20 days. The contribution to sales ratio of the company is 22% and opportunity cost of investment in receivables is 15 percent (pre-tax). 50 per cent and 80 percent of customers in terms of sales revenue are expected to avail cash discount under existing and liberalization scheme respectively. The tax rate is 30%.

ADVISE, should the company change its credit terms? (Assume 360 days in a year). **(Study Material)**

SOLUTION : 3

Working Notes:

I. Calculation of Cash Discount

Cash Discount = Total credit sales x % of customers who take up discount x Rate

$$\text{Present Policy} = \frac{12,00,000 \times 50 \times .01}{100} = ` 6,000$$

Proposed Policy = 16,00,000 x 0.80 x 0.02 = ₹ 25,600

II. Opportunity Cost of Investment in Receivables

Present Policy = 9,36,000 x (30/360) x (70% of 15)/100 = 78,000 x 10.5/100 = ₹ 8,190

Proposed Policy = 12,48,000 x (20/360) x 10.50/100 = ₹ 7,280

Statement showing Evaluation of Credit Policies

Particulars	Present Policy	Proposed Policy
Credit Sales	12,00,000	16,00,000
Variable Cost @ 78%* of sales	9,36,000	12,48,000
Bad Debts @ 1.5% and 2%	18,000	32,000

Cash Discount	6,000	25,600
Profit before tax	2,40,000	2,94,400
Tax @ 30%	72,000	88,320
Profit after Tax	1,68,000	2,06,080
Opportunity Cost of Investment in Receivables	8,190	7,280
Net Profit	1,59,810	1,98,800

*Only relevant or variable costs are considered for calculating the opportunity costs on the funds blocked in receivables. Since 22% is contribution, hence the relevant costs are taken to be 78% of the respective sales.

Advise: Proposed policy should be adopted since the net benefit is increased by (₹ 1,98,800 - 1,59,810) ₹ 38,990.

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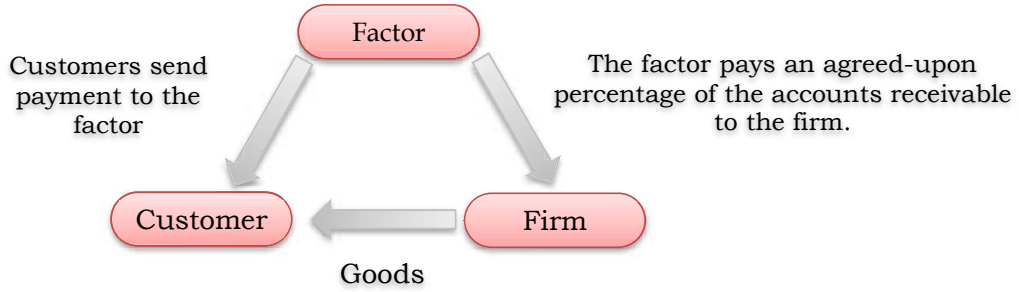
7. FINANCING RECEIVABLES

7.1 PLEDGING AND FACTORING

Pledging of accounts receivables and Factoring have emerged as the important sources of financing of accounts receivables now-a-days.

(i) **Pledging:** This refers to the use of a firm's receivable to secure a short term loan. After cash, a firm's receivables can be termed as its most liquid assets and this serve as prime collateral for a secured loan. The lender scrutinizes the quality of the account receivables, selects acceptable accounts, creates a lien on the collateral and fixes the percentage of financing receivables which ranges around 50 to 90%. The major advantage of pledging accounts receivables is the ease and flexibility it provides to the borrower. Moreover, financing is done regularly. This, however, suffers on account of high cost of financing. Also being a loan, it leaves an impact on the debt equity ratio as well by increasing the amount of debt.

(ii) **Factoring:** Factoring is a relatively new concept in financing of accounts receivables. This refers to outright sale of accounts receivables to a factor or a financial agency. A factor is a firm that acquires the receivables of other firms. The factoring lays down the conditions of the sale in a factoring agreement. The factoring agency bears the risk of collection and services the accounts for a fee.



- Factoring arrangement can be either on a recourse basis or on a non-recourse basis:
  - **Recourse:** In case factor is unable to collect the amount from receivables then, factor can turn back the same to the organization for resolution (which generally is by replacing those receivables with new receivables)
  - **Non-Recourse:** The factor bears the ultimate risk of loss in case of default and hence in such cases they charge higher commission.
- There are a number of financial institutions providing factoring services in India. Some commercial banks and other financial agencies provide this service.
- The biggest advantages of factoring are the immediate conversion of receivables into cash and predicted pattern of cash flows.
- Financing receivables with the help of factoring can help a company having liquidity **without creating a net liability on its financial condition and hence no impact on debt equity ratio.**

- Besides, factoring is a flexible financial tool providing timely funds, efficient record keepings and effective management of the collection process.
- This is not considered as a loan.
- There is no debt repayment and hence no compromise to balance sheet, no long-term agreements or delays associated with other methods of raising capital.
- Factoring allows the firm to use cash for the growth needs of business.
- The basic format of evaluating factoring proposal is given as under:
- Statement showing the Evaluation of Factoring Proposal

Particulars		₹
A.	**Annual Savings (Benefit) on taking Factoring Service**	.....
	Cost of credit administration saved	
	Bad debts avoided	
	Interest saved due to reduction in average collection period (Wherever applicable) [Cost of Annual Credit Sales x Rate of Interest x (Present Collection Period - New Collection Period)/360* days]	.....
	Total	**.....**
B.	**Annual Cost of Factoring to the Firm:**	.....
	Factoring Commission [Annual credit Sales x % of Commission (or calculated annually)]	.....
	Interest Charged by Factor on advance (or calculated annually) [Amount available for advance or (Annual Credit Sales - Factoring Commission - Factoring Reserve)] $\times \frac{\text{Collection Period (days)}}{360*}$ x Rate of Interest	.....
	Total	.....
C.	**Net Annual Benefits/Cost of Factoring to the Firm:**	**A-B**
	Rate of Effective Cost of Factoring to the Firm $= \frac{\text{Net Annual cost of Factoring}}{\text{Amount available for advance}} \times 100$ or $= \frac{\text{Net annual Cost of Factoring}}{\text{Advances to be paid}} \times 100$ Advances to be paid = (Amount available for advance - Interest deducted by factor)	

*1 Year is taken as 360 days

Advise:

(1) The company should avail Factoring services if rate of effective Cost of Factoring to the firm is less than the existing cost of borrowing or if availing services of factoring results in to positive Net Annual Benefits.

(2) The company should not avail Factoring services if the Rate of Effective Cost of Factoring to the Firm is more than the existing cost of borrowing.

PROBLEM : 4

A Factoring firm has credit sales of ₹ 360 lakhs and its average collection period is 30 days. The financial controller estimates, bad debt losses are around 2% of credit sales. The firm spends ₹ 1,40,000 annually on debtors administration. This cost comprises of telephonic and fax bills along with salaries of staff members. These are the avoidable costs. A Factoring firm has offered to buy the firm's receivables. The factor will charge 1% commission and will pay an advance against receivables on an interest @15% p.a. after withholding 10% as reserve. ANALYSE what should the firm do?

Assume 360 days in a year. **(Study Material)**

SOLUTION : 4

Working notes:

Average level of receivables = ₹ 360 lakhs x $\frac{30}{360}$ = 30 lakhs

Factoring Commission = 1% of ₹ 30,00,000	= ₹ 30,000
Reserve = 10% of ₹ 30,00,000	= ₹ 3,00,000
Total (i)	= ₹ 3,30,000
Thus, the amount available for advance is	
Average level of receivables	= ₹ 30,00,000
Less: Total (i) from above	= ₹ 3,30,000
(ii)	= ₹ 26,70,000
Less: Interest @ 15% p.a. for 30 days	= ₹ 33,375
Net Amount of Advance available.	= ₹ 26,36,625

Evaluation of Factoring Proposal

	Particulars	₹	₹
A.	**Savings (Benefit) to the firm**		
	Cost of Credit administration	₹ 1,40,000	₹ 1,40,000
	Cost of bad-debt losses	(0.02 x 360 lakhs)	₹ 7,20,000
	Total		₹ 8,60,000
B.	**Cost to the Firm:**		
	Factoring Commission [Annual credit Sales x % of Commission (or calculated annually)]	` 30,000 x $\frac{360}{30}$	₹ 3,60,000
	Interest Charges	` 33,375 x $\frac{360}{30}$	₹ 4,00,500
	Total		₹ 7,60,500
C.	Net Benefits to the Firm: (A-B)		₹ 99,500

Advice: Since the savings to the firm exceeds the cost to the firm on account of factoring, therefore, the proposal is acceptable.

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CHAPTER - 7

Management of Working Capital

UNIT - IV

MANAGEMENT OF PAYABLES (CREDITORS)

8. COST AND BENEFITS OF TRADE CREDIT

(a) Cost of Availing Trade Credit

Normally it is considered that the trade credit does not carry any cost.

However, it carries the following costs:

(i) **Price:** There is often a discount on the price that the firm undergoes when it uses trade credit, since it can take advantage of the discount only if it pays immediately. This discount can translate into a high implicit cost.

(ii) **Loss of goodwill:** If the credit is overstepped, suppliers may discriminate against delinquent customers if supplies become short. As with the effect of any loss of goodwill, it depends very much on the relative market strengths of the parties involved.

(iii) **Cost of managing:** Management of creditors involves administrative and accounting costs that would otherwise be incurred.

(iv) **Conditions:** Sometimes most of the suppliers insist that for availing the credit facility the order should be of some minimum size or even on regular basis.

(b) Cost of Not Taking Trade Credit

On the other hand, the costs of not availing credit facilities are as under:

(i) **Impact of Inflation:** If inflation persists then the borrowers are favored over the lenders as they were better off to pay the fixed outstanding amount later than sooner. Also, the subsequent transactions shall be at higher prices.

(ii) **Interest:** Trade credit is a type of interest free loan, therefore failure to avail this facility has an interest cost. This cost is further increased if interest rates are higher.

(iii) **Inconvenience:** Sometimes it may also cause inconvenience to the supplier if the supplier is geared to the deferred payment.

9. COMPUTATION OF COST OF PAYABLES

- By using the trade credit judiciously, a firm can reduce the effect of growth or burden on investments in Working Capital.
- Now question arises how to calculate the cost of not taking the discount.
- The following equation can be used to calculate nominal cost, on an annual basis of not taking the discount:

$$\frac{d}{100-d} \times \frac{365 \text{ days}}{t}$$

- However, the above formula does not take into account the compounding effect and therefore, the cost of credit shall be even higher. The cost of lost cash discount can be estimated by the formula:

$$\left(\frac{100}{100-d}\right)^{\frac{365}{t}} - 1$$

Where,

d = Size of discount i.e. for 6% discount, d = 6

t = The reduction in the payment period in days, necessary to obtain the early discount or Days Credit Outstanding - Discount Period.

PROBLEM : 1

Suppose ABC Ltd. has been offered credit terms from its major supplier of 2/10, net 45. Hence the company has the choice of paying ₹ 10 per ₹ 100 or to invest '98 for an additional 35 days and eventually pay the supplier ₹ 100 per ₹ 100. The decision as to whether the discount should be accepted depends on the opportunity cost of investing '98 for 35 days. ANALYSE what should the company do?

(Study Material)

SOLUTION : 1

If the company does not avail the cash discount and pays the amount after 45 days, the implied cost of interest per annum would be approximately:

$$\left(\frac{100}{100-2}\right)^{\frac{365}{35}} -1 = 23.5\%$$

Now let us assume that ABC Ltd. can invest the additional cash and can obtain an annual return of 25% and if the amount of invoice is ₹ 10,000. The alternatives are as follows:

	Refuse discount	Accept discount
	₹	₹
Payment to supplier	10,000	9,800
Return from investing ₹ 9,800 between day 10 and day 45: $\frac{35}{365}$ x ₹ 9,800 x 25%	(235)	
Net Cost	9,765	9,800

Advise: Thus, it is better for the company to refuse the discount, as return on cash retained is more than the saving on account of discount.

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CHAPTER - 7

Management of Working Capital

UNIT - V

FINANCING OF WORKING CAPITAL

10. SPONTANEOUS SOURCES OF FINANCE

(a) **Trade Credit:**

- Trade credit is a spontaneous source of finance which is normally extended to the purchaser organization by the sellers or services providers.
- This source of financing working capital is more important since it contributes to about one-third of the total short-term requirements.
- The dependence on this source is higher due to lesser cost of finance as compared with other sources.
- Trade credit is guaranteed when a company acquires supplies, merchandise or materials and does not pay immediately.
- If a buyer is able to get the credit without completing much formality, it is termed as 'open account trade credit.'

(b) **Bills Payable:**

- On the other hand, in the case of "Bills Payable" the purchaser will have to give a written promise to pay the amount of the bill/invoice either on demand or at a fixed future date to the seller or the bearer of the note.
- Due to its simplicity, easy availability and lesser explicit cost, the dependence on this source is much more in all small or big organizations.
- Especially, for small enterprises this form of credit is more helpful to small and medium enterprises. The amount of such financing depends on the volume of purchases and the payment timing.

(c) **Accrued Expenses:**

- Another spontaneous source of short-term financing is the accrued expenses or the outstanding expenses liabilities.
- The accrued expenses refer to the services availed by the firm, but the payment for which has yet to be made.
- It is a built in and an automatic source of finance as most of the services like wages, salaries, taxes, duties etc., are paid at the end of the period. The accrued expenses represent an interest free source of finance.
- There is no explicit or implicit cost associated with the accrued expenses and the firm can ensure liquidity by accruing these expenses.

11. MAXIMUM PERMISSIBLE BANK FINANCE (MPBF)- TANDON COMMITTEE

The Reserve Bank of India set up in 1974 a study group under the chairmanship of Mr. P.L. Tandon, popularly referred to as The Tandon Committee.

Recommendations of the Committee

(1) A proper fund discipline has to be observed by the borrowers. They should supply to the banker information regarding his operational plans well in advance. The banker must carry out a realistic appraisal of such plans.

(2) The main function of the banker as a lender is to supplement the borrower's resources to carry on acceptable level of current assets. This has two implications: (a) current assets must be reasonable and based on norms, and a part of funds requirement for carrying out current assets must be financed from

long term funds.

(3) The bank should know the end use of bank credit so that it is used only for purposes for which it was made available.

(4) The bank should follow inventory and receivable norms and also leading norms. It has suggested inventory and receivable norms for fifteen major industries. It has also suggested three lending norms which are as follows:

Lending Norms

1st Method	
Total current assets required	xxx
Less: Current Liabilities	xxx
Working Capital Gap	xxx
Less: 25% from Long-term sources	xxx
Maximum permissible bank borrowings	xxx
2nd Method	
Current assets required	xxx
Less: 25% to be provided term long-term funds	xxx
	xxx
Less: Current Liabilities	xxx
Maximum permissible bank borrowings	xxx
3rd Method	
Current assets	xxx
Less: Core Current assets	xxx
	xxx
Less: 25% to be provided from long-term funds	xxx
	xxx
Less: Current Liabilities	xxx
Maximum permissible bank borrowings	xxx

(i) The borrower has to contribute a minimum of 25% of working capital gap from long term funds.

MPBF = 75% of [Current Assets Less Current Liabilities] i.e. 75% of Net Working Capital

(ii) The borrower has to contribute a minimum of 25% of the total current assets from long term funds.

MPBF = [75% of Current Assets] Less Current Liabilities

(iii) The borrower has to contribute the entire hard core current assets and a minimum of 25% of the balance of the current assets from long term funds.

MPBF = [75% of Soft Core Current Assets] Less Current Liabilities

- The RBI vide its credit policy (beginning of 1997) scrapped the concept of MPBF (However, this report is sometimes used as a reference). The salient features of new credit system were:
- For borrowers with requirements of upto ₹ 25 lakhs credit limit will be computed after detailed discussions with the borrower, without going into detailed evaluation.
- For borrowers with requirements above ₹ 25 lakhs, but upto ₹ 5 crore, credit limit can be offered upto 20% of the projected gross sales of the borrower.
- For borrowers not falling in the above categories, the cash budget systems may be used to identify the working capital needs.
- **Core current assets** is permanent component of current assets which are required throughout the year for a company to run continuously and to stay viable.
- The term "Core Current Assets" was framed by Tandon Committee while explaining the amount of

stock a company can hold in its current assets. Generally, such assets are financed by long term funds. Sometimes core current assets are also referred to as "Hardcore Working Capital".

- **These assets are not liquid and so when companies are in need of money,** they initially sell off non-core assets (assets which are not important for continuous functioning of a business) to raise money.
- If a company is ready to raise cash by selling its core current assets, then this implies that the company is in dire situation or close to bankruptcy.
- **Examples of Core Current Assets are Raw materials, Work in Progress, Finished Goods, Cash in Hand and at Bank etc.**
- **Examples of Non-Core Assets** are natural resources, bonds, options and so on.

EXAMPLE - 1: From the following data, calculate the maximum permissible bank finance under the three methods suggested by the Tandon Committee:

Liabilities	**₹ in lakhs**
Creditors	120
Other current liabilities	40
Bank borrowing	250
Total	410
Current Assets	**₹ in lakhs**
Raw material	180
Work-in-progress	60
Finished goods	100
Receivables	150
Other current assets	20
Total current assets	510
The total Core Current Assets (CCA) are ₹ 200 lakhs	

SOLUTION

The maximum permissible bank finance for the firm, under three methods may be ascertained as follows:

Method I: = 0.75 (CA - CL)
= 0.75 (510 - 160)
= ₹ 262.50 lakhs

Method II: = 75 CA - CL
= 75 x 510 - 160
= ₹ 222.50 lakhs

Method III: = 75 (CA - CCA) - CL
= 75 (510 - 200) - 160
= ₹ 72.50 lakhs

So, it may be noted that the MPBF decreases gradually from the first method to second method and then to third method. As the firm, has already availed the bank loan of 250 lakhs, it can still avail a loan of ₹ 12.50 lakhs as per the first method. However, as per the second and third method, it is not eligible for additional financing as maximum financing allowed is for ₹ 222.50 lakhs and ₹ 72.50 lakhs only whereas its present bank borrowings are already ₹ 250 lakhs.

APPENDIX

Table A : Present value of one rupee due at the end of n years (To be used in case of single cash flow)

N	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	N
01	.99010	.98039	.97007	.96154	.95238	.94340	.93458	.92593	.91743	.90909	01
02	.98030	.93117	.94260	.92456	.90703	.89000	.87344	.85734	.84168	.82645	02
03	.97059	.94232	.91514	.88900	.86384	.83962	.81630	.79383	.77218	.75131	03
04	.96098	.92385	.88849	.85480	.82270	.79209	.76290	.73503	.70843	.68301	04
05	.95147	.90573	.86261	.82193	.78353	.74726	.71299	.68058	.64993	.62092	05
06	.94204	.88797	.83748	.79031	.74622	.70496	.66634	.60317	.59627	.56447	06
07	.93272	.87056	.81309	.75992	.71068	.66506	.62275	.58349	.54703	.51316	07
08	.92348	.85349	.78941	.73069	.67684	.62741	.58201	.54027	.50187	.46651	08
09	.91434	.83675	.76642	.70259	.64461	.59190	.54393	.50025	.46043	.42410	09
10	.90529	.82035	.74409	.67556	.61391	.55839	.50835	.46319	.42241	.38554	10
11	.89632	.80426	.72242	.64958	.58468	.52679	.47509	.42888	.38753	.35049	11
12	.88745	.78849	.70138	.62460	.55684	.49697	.44401	.39711	.35553	.31863	12
13	.87866	.77303	.68095	.60057	.53032	.46884	.41496	.36770	.32618	.28966	13
14	.86996	.75787	.66112	.57747	.50507	.44230	.38782	.34046	.29925	.26333	14
15	.86135	.74301	.64186	.55526	.48102	.41726	.36245	.31524	.27454	.23939	15
16	.85282	.72845	.62317	.53391	.45811	.39365	.33873	.29189	.25187	.21763	16
17	.84438	.71416	.60502	.51337	.43630	.37136	.31657	.27027	.23107	.19784	17
18	.83602	.70016	.58739	.49363	.41552	.35034	.29586	.25025	.21199	.17986	18
19	.82774	.68643	.57029	.47464	.39573	.33051	.27651	.23171	.19449	.16351	19
20	.81954	.67297	.55367	.45639	.37689	.31180	.25842	.21455	.17843	.14864	20
21	.81143	.65978	.53755	.43883	.35894	.29415	.54151	.19866	.16370	.13513	21
22	.80340	.64684	.52189	.42195	.34185	.27750	.22571	.18394	.15018	.12285	22
23	.79544	.63416	.50669	.40573	.32557	.26180	.21095	.17031	.13778	.11168	23
24	.78757	.62172	.49193	.39012	.31007	.24698	.19715	.15770	.12640	.10153	24
25	.77977	.60953	.47760	.37512	.29530	.23300	.18425	.14602	.11597	.09230	25

TABLE A (CONT.) : PRESENT VALUE OF ONE RUPEE DUE AT THE END OF N YEARS

N	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	N
01	.90090	.89286	.88496	.87719	.86957	.86207	.85470	.84746	.84034	.83333	01
02	.81162	.79719	.78315	.76947	.75614	.74316	.73051	.71818	.70616	.69444	02
03	.73119	.71178	.69305	.67497	.65752	.64066	.62437	.60863	.59342	.57870	03
04	.65873	.63552	.61332	.59208	.57175	.55229	.53365	.51579	.49867	.48225	04
05	.59345	.56743	.54276	.51937	.49718	.47611	.45611	.43711	.41905	.40188	05
06	.53464	.50663	.48032	.45559	.43233	.41044	.38984	.37043	.35214	.33490	06
07	.48166	.45235	.42506	.39964	.37594	.35383	.33320	.31392	.29592	.27908	07
08	.43393	.40388	.37616	.35056	.32690	.30503	.28478	.26604	.24867	.23257	08
09	.39092	.36061	.33288	.30751	.28426	.26295	.24340	.22546	.20897	.19381	09
10	.35218	.32197	.29459	.26974	.24718	.22668	.20804	.19106	.17560	.16151	10
11	.31728	.28748	.26070	.23662	.21494	.19542	.17781	.16192	.14756	.13459	11
12	.28584	.25667	.23071	.20756	.18691	.16846	.15197	.13722	.12400	.11216	12
13	.25751	.22917	.20416	.18207	.16253	.14523	.12989	.11629	.10420	.09346	13
14	.23199	.20462	.18068	.15971	.14133	.12520	.11102	.09855	.08757	.07789	14
15	.20900	.18270	.15989	.14010	.12289	.10793	.09489	.08352	.07359	.06491	15
16	.18829	.16312	.14150	.12289	.10686	.09304	.08110	.07078	.06184	.05409	16
17	.16963	.14564	.12522	.10780	.09293	.08021	.06932	.05998	.05196	.04507	17
18	.15282	.13004	.11081	.09456	.08080	.06914	.05925	.05083	.04367	.03756	18
19	.13768	.11611	.09806	.08295	.07026	.05961	.05064	.04308	.03669	.03130	19
20	.12403	.10367	.08678	.07276	.06110	.05139	.04328	.03651	.03084	.02608	20
21	.11174	.09256	.07680	.06383	.05313	.04430	.03699	.03094	.02591	.02174	21
22	.10067	.08264	.06796	.05599	.04620	.03819	.03162	.02622	.02178	.01811	22
23	.09069	.07379	.06014	.04911	.04017	.03292	.02702	.02222	.01830	.01509	23
24	.08170	.06588	.05322	.04308	.03493	.02838	.02310	.01883	.01538	.01258	24
25	.07361	.05882	.04710	.03779	.03038	.02447	.01974	.01596	.01292	.01048	25

TABLE A (CONT.) : PRESENT VALUE OF ONE RUPEE DUE AT THE END OF N YEARS											
N	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%	N
01	.82645	.81967	.81301	.80645	.80000	.79365	.78740	.78125	.77519	.76923	01
02	.68301	.67186	.66098	.65036	.64000	.62988	.62000	.61035	.60093	.59172	02
03	.56447	.55071	.53738	.52449	.51200	.49991	.48819	.47684	.46583	.45517	03
04	.46651	.45140	.43690	.42297	.40906	.39675	.38440	.37253	.36111	.35013	04
05	.38554	.37000	.35520	.34411	.32768	.31488	.30268	.29104	.27993	.26933	05
06	.31863	.30328	.28878	.27509	.26214	.24991	.23833	.22737	.21700	.20718	06
07	.26333	.24859	.23478	.22184	.20972	.19834	.18766	.17764	.16822	.15937	07
08	.21763	.20376	.19088	.17891	.16777	.15741	.14776	.13878	.13040	.12259	08
09	.17986	.16702	.15519	.14428	.13422	.12493	.11635	.10842	.10109	.09430	09
10	.14864	.13690	.12617	.11635	.10737	.09915	.09161	.08470	.07836	.07254	10
11	.12285	.11221	.10258	.09383	.08590	.07869	.07214	.06617	.06075	.05580	11
12	.10153	.09198	.08339	.07567	.06872	.06245	.05680	.05170	.04709	.04292	12
13	.08391	.07539	.06780	.06103	.05498	.04957	.04472	.04039	.03650	.03302	13
14	.06934	.06180	.05512	.04921	.04398	.03934	.03522	.03155	.02830	.02540	14
15	.05731	.05065	.04481	.03969	.03518	.03122	.02773	.02465	.02194	.01954	15
16	.04736	.04152	.03643	.03201	.02815	.02478	.02183	.01926	.01700	.01503	16
17	.03914	.03403	.02962	.02581	.02252	.01967	.01719	.01505	.01318	.01156	17
18	.03235	.02789	.02408	.02082	.01801	.01561	.01354	.01175	.01022	.00889	18
19	.02673	.02286	.01958	.01679	.01441	.01239	.01066	.00918	.00792	.00684	19
20	.02209	.01874	.01592	.01354	.01153	.00983	.00839	.00717	.00614	.00526	20
21	.01826	.01536	.01294	.01902	.00922	.00780	.00661	.00561	.00476	.00405	21
22	.01509	.01259	.01052	.00880	.00738	.00619	.00520	.00438	.00369	.00311	22
23	.01247	.01032	.00855	.00710	.00590	.00491	.00410	.00342	.00286	.00239	23
24	.01031	.00846	.00695	.00573	.00472	.00390	.00323	.00267	.00222	.00184	24
25	.00852	.00693	.00565	.00462	.00378	.00310	.00254	.00209	.00172	.00142	25

TABLE A (CONT.) : PRESENT VALUE OF ONE RUPEE DUE AT THE END OF N YEARS

N	31%	32%	33%	34%	35%	36%	37%	38%	29%	40%	N
01	.76336	.75758	.75188	.74627	.74074	.73529	.72993	.72464	.71942	.71429	01
02	.58272	.57392	.56532	.55692	.54870	.45066	.53279	.52510	.51757	.51020	02
03	.44482	.43479	.42505	.41561	.40644	.39745	.38890	.38051	.37235	.36443	03
04	.33956	.32939	.31959	.31016	.30107	.29231	.28387	.27573	.26788	.26031	04
05	.25920	.24953	.24029	.23146	.22301	.21493	.20720	.19980	.19272	.18593	05
06	.19787	.18904	.18067	.17273	.16520	.15804	.15124	.14479	.13865	.13281	06
07	.15104	.14321	.13584	.12890	.12237	.11621	.11040	.10492	.09975	.09486	07
08	.11530	.10849	.10214	.09620	.09064	.08545	.08058	.07603	.07176	.06776	08
09	.08802	.08219	.07680	.07179	.06714	.06283	.05882	.05509	.05163	.04840	09
10	.06719	.06227	.05774	.05357	.04973	.04620	.04293	.03992	.03714	.03457	10
11	.05129	.04717	.04341	.03998	.03684	.03397	.03134	.02893	.02672	.02469	11
12	.03915	.03574	.03264	.02984	.02729	.02498	.02887	.02096	.01922	.01764	12
13	.02989	.02707	.02454	.02227	.02021	.01837	.01670	.01519	.01383	.01260	13
14	.02281	.02051	.01845	.01662	.01497	.01350	.01219	.01101	.00995	.00900	14
15	.01742	.01554	.01387	.01240	.01109	.00993	.00890	.00789	.00716	.00643	15
16	.01329	.01177	.01043	.00925	.00822	.00730	.00649	.00578	.00515	.00459	16
17	.01015	.00892	.00784	.00691	.00609	.00537	.00474	.00419	.00370	.00328	17
18	.00775	.00676	.00590	.00515	.00451	.00395	.00346	.00304	.00267	.00234	18
19	.00591	.00512	.00443	.00385	.00334	.00290	.00253	.00220	.00192	.00167	19
20	.00451	.00388	.00333	.00287	.00247	.00213	.00184	.00159	.00138	.00120	20
21	.00345	.00294	.00251	.00214	.00183	.00157	.00135	.00115	.00099	.00085	21
22	.00263	.00223	.00188	.00160	.00136	.00115	.00098	.00084	.00071	.00061	22
23	.00201	.00169	.00142	.00119	.00101	.00085	.00072	.00061	.00051	.00044	23
24	.00153	.00128	.00107	.00089	.00074	.00062	.00052	.00044	.00037	.00031	24
25	.00117	.00097	.00080	.00066	.00055	.00046	.00038	.00032	.00027	.00022	25

TABLE B : PRESENT VALUE OF ONE RUPEE PER YEAR, N YEARS AT R% (TO BE USED IN CASE OF ANNUITY)

Year	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	Year
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	1
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	2
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4868	3
4	3.9020	3.8077	3.7171	3.6299	3.5459	3.4651	3.3872	3.3121	3.2397	3.1699	4
5	4.8535	4.7134	4.5797	4.4518	4.3295	4.2123	4.1002	3.9927	3.8896	3.7908	5
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	6
7	6.7282	6.4720	6.2302	6.0020	5.7863	5.5824	5.3893	5.2064	5.0329	4.8684	7
8	7.6517	7.3254	7.0196	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	8
9	8.5661	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9852	5.7590	9
10	9.4714	8.9825	8.5302	8.1109	7.2717	7.3601	7.0236	6.7101	6.4176	6.1446	10
11	10.3677	9.7868	9.2526	8.7604	8.3064	7.8868	7.4987	7.1389	6.8052	6.4951	11
12	11.2552	10.5753	9.9539	9.3850	8.8632	8.3838	7.9427	7.5361	7.1607	6.8137	12
13	12.1338	11.3483	10.6349	9.9856	9.3935	8.8527	8.3576	7.9038	7.4869	7.1034	13
14	13.0038	12.1062	11.2960	10.5631	9.8986	9.2950	8.7454	8.2442	7.7861	7.3667	14
15	13.8651	12.8492	11.9379	11.1183	10.3796	9.7122	9.1079	8.5595	8.0607	7.6061	15
16	14.7180	13.5777	12.5610	11.6522	10.8377	10.1059	9.4466	8.8514	8.3125	7.8237	16
17	15.5624	14.2918	13.1660	12.1656	11.2740	10.4772	9.7632	9.1216	8.5436	8.0215	17
18	16.3984	14.9920	13.7534	12.6592	11.6895	10.8276	10.0591	9.3719	8.7556	8.2014	18
19	17.2261	15.6784	14.3237	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	19
20	18.0457	16.3514	14.8774	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	20
21	18.8571	17.0111	15.4149	14.0291	12.8211	11.7640	10.8355	10.0168	9.2922	8.6487	21
22	19.6605	17.6580	15.9368	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424	8.7715	22
23	20.4559	18.2921	16.4435	14.8568	13.4885	12.3033	11.2722	10.3710	9.5802	8.8832	23
24	21.2435	18.9139	16.9355	15.2469	13.7986	12.5503	11.4693	10.5287	9.7066	8.9847	24
25	22.0233	19.5234	17.4131	15.6220	14.0939	12.7833	11.6536	10.6748	8.8226	9.0770	25

TABLE B (CONT.) : PRESENT VALUE OF ONE RUPEE DUE AT THE END OF N YEARS

N	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	N
01	.9009	.8929	.8850	.8772	.8696	.8621	.8547	.8475	.8403	.8333	01
02	1.7125	1.6901	1.6681	1.6467	1.6257	1.6052	1.5852	1.5656	1.5465	1.5278	02
03	2.4437	2.4018	2.3612	2.3216	2.2832	2.2459	2.2096	2.1743	2.1399	2.1065	03
04	3.1024	3.0373	2.9745	2.9137	2.8550	2.7982	2.7432	2.6901	2.6386	2.5887	04
05	3.6959	3.6048	3.5172	3.4331	3.3522	3.2743	3.1993	3.1272	3.0576	2.9906	05
06	4.2305	4.1114	3.9976	3.8887	3.7845	3.6847	3.5892	3.4976	3.4098	3.3255	06
07	4.7122	4.5638	4.4226	4.2883	4.1604	4.0386	3.9224	3.8115	3.7057	3.6046	07
08	5.1461	4.9676	4.7988	4.6389	4.4873	4.3436	4.2072	4.0776	3.9544	3.8372	08
09	5.5370	5.3282	5.1317	4.9464	4.7716	4.6065	4.4506	4.3030	4.1633	4.0310	09
10	5.8892	5.6502	5.4262	5.2161	5.0188	4.8332	4.6586	4.4941	4.3389	4.1925	10
11	6.2065	5.9377	5.6869	5.4527	5.2337	5.0286	4.8364	4.6560	4.4865	4.3271	11
12	6.4924	6.1944	5.9176	5.6603	5.4206	5.1971	4.9884	4.7932	4.6105	4.4392	12
13	6.7499	6.4235	6.1218	5.8424	5.5831	5.3423	5.1183	4.9095	4.7147	4.5327	13
14	6.9819	6.6282	6.3025	6.0021	5.7245	5.4675	5.2293	5.0081	4.8023	4.6106	14
15	7.1909	6.8109	6.4624	6.1422	5.8474	5.5755	5.3242	5.0916	4.8759	4.6755	15
16	7.3792	6.9740	6.6039	6.2651	5.9542	5.6685	5.4053	5.1624	4.9377	4.7296	16
17	7.5488	7.1196	6.7291	6.3729	6.0472	5.7487	5.4746	5.2223	4.9897	4.7746	17
18	7.7016	7.2497	6.8399	6.4674	6.1280	5.8178	5.5339	5.2732	5.0333	4.8122	18
19	7.8393	7.3658	6.9380	6.5504	6.1982	5.8775	5.5845	5.3162	5.0700	4.8435	19
20	7.9633	7.4694	7.0248	6.6231	6.2593	5.9288	5.6278	5.3527	5.1009	4.8696	20
21	8.0751	7.5620	7.1016	6.6870	6.3125	5.9731	5.6648	5.3837	5.1268	4.8913	21
22	8.1757	7.6446	7.1695	6.7429	6.3587	6.0113	5.6964	5.4099	5.1486	4.9094	22
23	8.2664	7.7184	7.2297	6.7921	6.3988	6.0442	5.7234	5.4321	5.1668	4.9245	23
24	8.3481	7.7843	7.2829	6.8351	6.4338	6.0726	5.7465	5.4509	5.1822	4.9371	24
25	8.4217	7.8431	7.3300	6.8729	6.4641	6.0971	5.7662	5.4669	5.1951	4.9476	25

TABLE B (CONT.) : PRESENT VALUE OF ONE RUPEE DUE AT THE END OF N YEARS

N	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%	N
01	.8264	.8197	.8130	.8065	.8000	.7937	.7874	.7813	.7752	.7692	01
02	1.5095	1.4915	1.4740	1.4568	1.4400	1.4235	1.4074	1.3916	1.3761	1.3609	02
03	2.0739	2.0422	2.0114	1.9813	1.9520	1.9234	1.8956	1.8684	1.8420	1.8161	03
04	2.5404	2.4936	2.4483	2.4043	2.3616	2.3202	2.2800	2.2410	2.2031	2.1662	04
05	2.9260	2.8636	2.8035	2.7454	2.6893	2.6351	2.5827	2.5320	2.4830	2.4356	05
06	3.2446	3.1669	3.0923	3.0205	2.9514	2.8850	2.8210	2.7594	2.7000	2.6427	06
07	3.5079	3.4155	3.3270	3.2423	3.1611	3.0833	3.0087	2.9370	2.8682	2.8021	07
08	3.7256	3.6193	3.5179	3.4212	3.3289	3.2407	3.1564	3.0758	2.9986	2.9247	08
09	3.9054	3.7863	3.6731	3.5655	3.4631	3.3657	3.2728	3.1842	3.0997	3.0190	09
10	4.0541	3.9232	3.7993	3.6819	3.5705	3.4648	3.3644	3.2689	3.1781	3.0915	10
11	4.1769	4.0354	3.9018	3.7757	3.6564	3.5435	3.4365	3.3351	3.2388	3.1473	11
12	4.2785	4.1274	3.9852	3.8514	3.7251	3.6060	3.4933	3.3868	3.2859	3.1903	12
13	4.3624	4.2028	4.0530	3.9124	3.7801	3.6555	3.6381	3.4272	3.3224	3.2233	13
14	4.4317	4.2646	4.1082	3.9616	3.8241	3.6949	3.5733	3.4587	3.3507	3.2487	14
15	4.4890	4.3152	4.1530	4.0013	3.8593	3.7261	3.6010	3.4834	3.3726	3.2682	15
16	4.5364	4.3567	4.1894	4.0333	3.8874	3.7509	3.6228	3.5026	3.3896	3.2832	16
17	4.5755	4.3908	4.2190	4.0591	3.9099	3.7705	3.6400	3.5177	3.4028	3.2948	17
18	4.6079	4.4187	4.2431	4.0799	3.9279	3.7861	3.6536	3.5294	3.4130	3.3037	18
19	4.6346	4.4415	4.2627	4.0967	3.9424	3.7985	3.6642	3.5386	3.4210	3.3105	19
20	4.6567	4.4603	4.2786	4.1103	3.9539	3.8083	3.6726	3.5458	3.4271	3.3158	20
21	4.6750	4.4756	4.2916	4.1212	3.9631	3.8161	3.6792	3.5514	3.4319	3.3198	21
22	4.6900	4.4882	4.3021	4.1300	3.9705	3.8223	3.6344	3.5558	3.4356	3.3230	22
23	4.7025	4.4985	4.3106	4.1371	3.9764	3.8273	3.6885	3.5592	3.4384	3.3254	23
24	4.7128	4.5070	4.3176	4.1428	3.9811	3.8312	3.6918	3.5619	3.4406	3.3272	24
25	4.7213	4.5139	4.3232	4.1474	3.9849	3.8342	3.6943	3.5640	3.4423	3.3286	25

TABLE B (CONT.) : PRESENT VALUE OF ONE RUPEE DUE AT THE END OF N YEARS

N	31%	32%	33%	34%	35%	36%	37%	38%	29%	40%	N
01	.7634	.7576	.7519	.7463	.7407	.7353	.7299	.7245	.7194	.7143	01
02	1.3461	1.3315	1.3172	1.3032	1.2894	1.2760	1.2627	1.2497	1.2370	1.2245	02
03	1.7909	1.7663	1.7423	1.7188	1.6959	1.6735	1.6516	1.6302	1.6093	1.5889	03
04	2.1305	2.0957	2.0618	2.0290	1.9969	1.9658	1.9355	1.9060	1.8772	1.8492	04
05	2.3897	2.3452	2.3021	2.2604	2.2200	2.1807	2.1427	2.1058	2.0699	2.0352	05
06	2.5875	2.5342	2.4828	2.4331	2.3852	2.3388	2.2939	2.2506	2.2086	2.1680	06
07	2.7386	2.6775	2.6187	2.5620	2.5075	2.4550	2.4043	2.3555	2.3083	2.2628	07
08	2.8539	2.7860	2.7208	2.6582	2.5982	2.5404	2.4849	2.4315	2.3801	2.3306	08
09	2.9419	2.8681	2.7976	2.7300	2.6653	2.6033	2.5437	2.4866	2.4317	2.3790	09
10	3.0091	2.9304	2.8553	2.7836	2.7150	2.6495	2.5867	2.5265	2.4689	2.4136	10
11	3.0604	2.9776	2.8987	2.8236	2.7519	2.6834	2.6180	2.555	2.4956	2.4383	11
12	3.0995	3.01333	2.9314	2.8534	2.7792	2.7084	2.6409	2.5764	2.5148	2.4559	12
13	3.1294	3.0404	2.9559	2.8757	2.7994	2.7268	2.6576	2.5916	2.5286	2.4685	13
14	3.1522	3.0609	2.9744	2.8923	2.8144	2.7403	2.6698	2.6026	2.5386	2.4775	14
15	3.1696	3.0764	2.9883	2.9047	2.8255	2.7502	2.6787	2.6106	2.5457	2.4839	15
16	3.1829	3.0882	2.9987	2.9104	2.8337	2.7575	2.6852	2.6164	2.5509	2.4885	16
17	3.1931	3.9071	3.0065	2.9209	2.8398	2.7629	2.6899	2.6206	2.5546	2.4918	17
18	3.2008	3.1039	3.0124	2.9260	2.8443	2.7668	2.6934	2.6236	2.5573	2.4941	18
19	3.2067	3.1090	3.0169	2.9299	2.8476	2.7697	2.6959	2.6258	2.5592	2.4958	19
20	3.2112	3.1129	3.0202	2.9327	2.8501	2.7718	2.0977	2.6274	2.5606	2.4970	20
21	3.2147	3.1158	3.0227	2.9349	2.8519	2.7734	2.6991	2.6285	2.5616	2.4979	21
22	3.2173	3.1180	3.0246	2.9365	2.8533	2.7746	2.7000	2.6294	2.5623	2.4985	22
23	3.2193	3.1197	3.0260	2.9377	2.8543	2.7754	2.7008	2.6300	2.8528	2.4989	23
24	3.2209	3.1210	3.0271	2.9386	2.8550	2.7760	2.7013	2.6304	2.5832	2.4992	24
25	3.2220	3.1220	3.0279	2.9392	2.8556	2.7765	2.7017	2.6307	2.5634	204994	25

THE NORMAL DISTRIBUTION TABLE

Area under the Normal Curve from 0 to X

X	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.00000	0.00399	0.00798	0.01197	0.01595	0.01994	0.02392	0.02790	0.03188	0.03586
0.1	0.03983	0.04380	0.04776	0.05172	0.05567	0.05962	0.06356	0.06749	0.07142	0.07535
0.2	0.07926	0.08317	0.08706	0.09095	0.09483	0.09871	0.10257	0.10642	0.11026	0.11409
0.3	0.11791	0.12172	0.12552	0.12930	0.13307	0.13683	0.14058	0.14431	0.14803	0.15173
0.4	0.15542	0.15910	0.16276	0.16640	0.17003	0.17364	0.17724	0.18082	0.18439	0.18793
0.5	0.19146	0.19497	0.19847	0.20194	0.20540	0.20884	0.21226	0.21566	0.21904	0.22240
0.6	0.22575	0.22907	0.23237	0.23565	0.23891	0.24215	0.24537	0.24857	0.25175	0.25490
0.7	0.25804	0.26115	0.26424	0.26730	0.27035	0.27337	0.27637	0.27935	0.28230	0.28524
0.8	0.28814	0.29103	0.29389	0.29673	0.29955	0.30234	0.30511	0.30785	0.31057	0.31327
0.9	0.31594	0.31859	0.32121	0.32381	0.32639	0.32894	0.33147	0.33398	0.33646	0.33891
1.0	0.34134	0.34375	0.34614	0.34849	0.35083	0.35314	0.35543	0.35769	0.35993	0.36214
1.1	0.36433	0.36650	0.36864	0.37076	0.37286	0.37493	0.37698	0.37900	0.38100	0.38298
1.2	0.38493	0.38686	0.38877	0.39065	0.39251	0.39435	0.39617	0.39796	0.39973	0.40147
1.3	0.40320	0.40490	0.40658	0.40824	0.40988	0.41149	0.41308	0.41466	0.41621	0.41774
1.4	0.41924	0.42073	0.42220	0.42364	0.42507	0.42647	0.42785	0.42922	0.43056	0.43189
1.5	0.43319	0.43448	0.43574	0.43699	0.43822	0.43943	0.44062	0.44179	0.44295	0.44408
1.6	0.44520	0.44630	0.44738	0.44845	0.44950	0.45053	0.45154	0.45254	0.45352	0.45449
1.7	0.45543	0.45637	0.45728	0.45818	0.45907	0.45994	0.46080	0.46164	0.46246	0.46327
1.8	0.46407	0.46485	0.46562	0.46638	0.46712	0.46784	0.46856	0.46926	0.46995	0.47062
1.9	0.47128	0.47193	0.47257	0.47320	0.47381	0.47441	0.47500	0.47558	0.47615	0.47670
2.0	0.47725	0.47778	0.47831	0.47882	0.47932	0.47982	0.48030	0.48077	0.48124	0.48169
2.1	0.48214	0.48257	0.48300	0.48341	0.48382	0.48422	0.48461	0.48500	0.48537	0.48574
2.2	0.48610	0.48645	0.48679	0.48713	0.48745	0.48778	0.48809	0.48840	0.48870	0.48899
2.3	0.48928	0.48956	0.48983	0.49010	0.49036	0.49061	0.49086	0.49111	0.49134	0.49158
2.4	0.49180	0.49202	0.49224	0.49245	0.49266	0.49286	0.49305	0.49324	0.49343	0.49361
2.5	0.49379	0.49396	0.49413	0.49430	0.49446	0.49461	0.49477	0.49492	0.49506	0.49520
2.6	0.49534	0.49547	0.49560	0.49573	0.49585	0.49598	0.49609	0.49621	0.49632	0.49643
2.7	0.49653	0.49664	0.49674	0.49683	0.49693	0.49702	0.49711	0.49720	0.49728	0.49736
2.8	0.49744	0.49752	0.49760	0.49767	0.49774	0.49781	0.49788	0.49795	0.49801	0.49807
2.9	0.49813	0.49819	0.49825	0.49831	0.49836	0.49841	0.49846	0.49851	0.49856	0.49861
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49896	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.49938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983
3.6	0.49984	0.49985	0.49985	0.49986	0.49986	0.49987	0.49987	0.49988	0.49988	0.49989
3.7	0.49989	0.49990	0.49990	0.49990	0.49991	0.49991	0.49992	0.49992	0.49992	0.49992
3.8	0.49993	0.49993	0.49993	0.49994	0.49994	0.49994	0.49994	0.49995	0.49995	0.49995
3.9	0.49995	0.49995	0.49996	0.49996	0.49996	0.49996	0.49996	0.49996	0.49997	0.49997
4.0	0.49997	0.49997	0.49997	0.49997	0.49997	0.49997	0.49998	0.49998	0.49998	0.49998

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	Mean Differences								
											1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	8	12	17	21	25	29	33	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	26	30	34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	10	14	17	21	24	28	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	26	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	17	20	22	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	18	21	24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	10	12	15	17	20	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
29	4624	2639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	Mean Differences								
											1	2	3	4	5	6	7	8	9
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	5	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	5	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	4	4

ANTILOGARITHMS

	0	1	2	3	4	5	6	7	8	9	Mean Differences								
											1	2	3	4	5	6	7	8	9
.00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021	0	0	1	1	1	1	2	2	2
.01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	0	0	1	1	1	1	2	2	2
.02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	0	0	1	1	1	1	2	2	2
.03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	0	1	1	1	1	2	2	2
.04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	1	1	2	2	2	2
.05	1122	1125	1127	1130	1132	1135	1138	1140	1143	1146	0	1	1	1	1	2	2	2	2
.06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	0	1	1	1	1	2	2	2	2
.07	1175	1178	1180	1183	1186	1189	1191	1194	1197	1199	0	1	1	1	1	2	2	2	2
.08	1202	1205	1208	1211	1213	1216	1219	1222	1225	1227	0	1	1	1	1	2	2	2	3
.09	1230	1233	1236	1239	1242	1245	1247	1250	1253	1256	0	1	1	1	1	2	2	2	3
.10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	0	1	1	1	1	2	2	2	3
.11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	0	1	1	1	2	2	2	2	3
.12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	0	1	1	1	2	2	2	2	3
.13	1349	1352	1355	1358	1361	1365	1368	1371	1374	1377	0	1	1	1	2	2	2	3	3
.14	1380	1384	1387	1390	1393	1396	1400	1403	1406	1409	0	1	1	1	2	2	2	3	3
.15	1413	1416	1419	1422	1426	1429	1432	1435	1439	1442	0	1	1	1	2	2	2	3	3
.16	1445	1449	1452	1455	1459	1462	1466	1469	1472	1476	0	1	1	1	2	2	2	3	3
.17	1479	1483	1486	1489	1493	1496	1500	1503	1507	1510	0	1	1	1	2	2	2	3	3
.18	1514	1517	1521	1524	1528	1531	1535	1538	1542	1545	0	1	1	1	2	2	2	3	3
.19	1549	1552	1556	1560	1563	1567	1570	1574	1578	1581	0	1	1	1	2	2	3	3	3
.20	1585	1589	1592	1596	1600	1603	1607	1611	1614	1618	0	1	1	1	2	2	3	3	3
.21	1622	1626	1629	1633	1637	1641	1644	1648	1652	1656	0	1	1	2	2	2	3	3	3
.22	1660	1663	1667	1671	1675	1679	1683	1687	1690	1694	0	1	1	2	2	2	3	3	3
.23	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	0	1	1	2	2	2	3	3	4
.24	1738	1742	1746	1750	1754	1758	1762	1766	1770	1774	0	1	1	2	2	2	3	3	4
.25	1778	1782	1786	1791	1795	1799	1803	1807	1811	1816	0	1	1	2	2	2	3	3	4
.26	1820	1824	1828	1832	1837	1841	1845	1849	1854	1858	0	1	1	2	2	3	3	3	4
.27	1862	1866	1871	1875	1879	1884	1888	1892	1897	1901	0	1	1	2	2	3	3	3	4
.28	1905	1910	1914	1919	1923	1928	1932	1936	1941	1945	0	1	1	2	2	3	3	4	4
.29	1950	1954	1959	1963	1968	1972	1977	1982	1986	1991	0	1	1	2	2	3	3	4	4
.30	1995	2000	2004	2009	2014	2018	2023	2028	2032	2037	0	1	1	2	2	3	3	4	4
.31	2042	2046	2051	2056	2061	2065	2070	2075	2080	2084	0	1	1	2	2	3	3	4	4
.32	2089	2094	2099	2104	2109	2113	2118	2123	2128	2133	0	1	1	2	2	3	3	4	4
.33	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	0	1	1	2	2	3	3	4	4
.34	2188	2193	2198	2203	2208	2213	2218	2223	2228	2234	1	1	2	2	3	3	4	4	5
.35	2239	2244	2249	2254	2259	2265	2270	2275	2280	2286	1	1	2	2	3	3	4	4	5
.36	2291	2296	2301	2307	2312	2317	2323	2328	2333	2339	1	1	2	2	3	3	4	4	5
.37	2344	2350	2355	2360	2366	2371	2377	2382	2388	2393	1	1	2	2	3	3	4	4	5
.38	2399	2404	2410	2415	2421	2427	2432	2438	2443	2449	1	1	2	2	3	3	4	4	5
.39	2455	2460	2466	2472	2477	2483	2489	2495	2500	2506	1	1	2	2	3	3	4	5	5
.40	2512	2518	2523	2529	2535	2541	2547	2553	2559	2564	1	1	2	2	3	4	4	5	5
.41	2570	2576	2582	2588	2594	2600	2606	2612	2618	2624	1	1	2	2	3	4	4	5	5
.42	2630	2636	2642	2649	2655	2661	2667	2673	2679	2685	1	1	2	2	3	4	4	5	6
.43	2692	2698	2704	2710	2716	2723	2729	2735	2742	2748	1	1	2	3	3	4	4	5	6
.44	2754	2761	2767	2773	2780	2786	2793	2799	2805	2812	1	1	2	3	3	4	4	5	6
.45	2818	2825	2831	2838	2844	2851	2858	2864	2871	2877	1	1	2	3	3	4	5	5	6
.46	2884	2891	2897	2904	2911	2917	2924	2931	2938	2944	1	1	2	3	3	4	5	5	6
.47	2951	2958	2965	2972	2979	2985	2992	2999	3006	3013	1	1	2	3	3	4	5	5	6
.48	3020	3027	3034	3041	3048	3055	3062	3069	3076	3083	1	1	2	3	4	4	5	6	6
.49	3090	3097	3105	3112	3119	3126	3133	3141	3148	3155	1	1	2	3	4	4	5	6	6

ANTILOGARITHMS

	0	1	2	3	4	5	6	7	8	9	Mean Differences								
											1	2	3	4	5	6	7	8	9
.50	3162	3170	3177	3184	3192	3199	3206	3214	3221	3228	1	1	2	3	4	4	5	6	7
.51	3236	3243	3251	3258	3266	3273	3281	3289	3296	3304	1	2	2	3	4	5	5	6	7
.52	3311	3319	3327	3334	3342	3350	3357	3365	3373	3381	1	2	2	3	4	5	5	6	7
.53	3388	3396	3404	3412	3420	3428	3436	3443	3451	3459	1	2	2	3	4	5	6	6	7
.54	3467	3475	3483	3491	3499	3508	3516	3524	3532	3540	1	2	2	3	4	5	6	6	7
.55	3548	3556	3565	3573	3581	3589	3597	3606	3614	3622	1	2	2	3	4	5	6	7	7
.56	3631	3639	3648	3656	3664	3673	3681	3690	3698	3707	1	2	3	3	4	5	6	7	8
.57	3715	3724	3733	3741	3750	3758	3767	3776	3784	3793	1	2	3	3	4	5	6	7	8
.58	3802	3811	3819	3828	3837	3846	3855	3864	3873	3882	1	2	3	4	4	5	6	7	8
.59	3890	3899	3908	3917	3926	3936	3945	3954	3963	3972	1	2	3	4	5	5	6	7	8
.60	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064	1	2	3	4	5	6	6	7	8
.61	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159	1	2	3	4	5	6	7	8	9
.62	4169	4178	4188	4198	4207	4217	4227	4236	4246	4256	1	2	3	4	5	6	7	8	9
.63	4266	4276	4285	4295	4305	4315	4325	4335	4345	4355	1	2	3	4	5	6	7	8	9
.64	4365	4375	4385	4395	4406	4416	4426	4436	4446	4457	1	2	3	4	5	6	7	8	9
.65	4467	4477	4487	4498	4508	4519	4529	4539	4550	4560	1	2	3	4	5	6	7	8	9
.66	4571	4581	4592	4603	4613	4624	4634	4645	4656	4667	1	2	3	4	5	6	7	9	10
.67	4677	4688	4699	4710	1721	4732	4742	4753	4764	4775	1	2	3	4	5	7	8	9	10
.68	4786	4797	4808	4819	4831	4842	4853	4864	4875	4887	1	2	3	4	6	7	8	9	10
.69	4898	4909	4920	4932	4943	4955	4966	4977	4989	5000	1	2	3	5	6	7	8	9	10
.70	5012	5023	5035	5047	5058	5070	5082	5093	5105	5117	1	2	4	5	6	7	8	9	11
.71	5129	5140	5152	5164	5176	5188	5200	5212	5224	5236	1	2	4	5	6	7	8	10	11
.72	5248	5260	5272	5284	5297	5309	5321	5333	5346	5358	1	2	4	5	6	7	9	10	11
.73	5370	5383	5395	5408	5420	5433	5445	5458	5470	5483	1	3	4	5	6	8	9	10	11
.74	5495	5508	5521	5534	5546	5559	5572	5585	5598	5610	1	3	4	5	6	8	9	10	12
.75	5623	5636	5649	5662	5675	5689	5702	5715	5728	5741	1	3	4	5	7	8	9	10	12
.76	5754	5768	5781	5794	5808	5821	5834	5848	5861	5875	1	3	4	5	7	8	9	11	12
.77	5888	5902	5916	5929	5943	5957	5970	5984	5998	6012	1	3	4	5	7	8	10	11	12
.78	6026	6039	6053	6067	6081	6095	6109	6124	6138	6152	1	3	4	6	7	8	10	11	13
.79	6166	6180	6194	6209	6223	6237	6252	6266	6281	6295	1	3	4	6	7	9	10	11	13
.80	6310	6324	6339	6353	6368	6383	6397	6412	6427	6442	1	3	4	6	7	9	10	12	13
.81	6457	6471	6486	6501	6516	6531	6546	6561	6577	6592	2	3	5	6	8	9	11	12	14
.82	6607	6622	6637	6653	6668	6683	6699	6714	6730	6745	2	3	5	6	8	9	11	12	14
.83	6761	6776	6792	6808	6823	6839	6855	6871	6887	6902	2	3	5	6	8	9	11	13	14
.84	6918	6934	6950	6966	6982	6998	7015	7031	7047	7063	2	3	5	6	8	10	11	13	15
.85	7079	7096	7112	7129	7145	7161	7178	7194	7211	7228	2	3	5	7	8	10	12	13	15
.86	7244	7261	7278	7295	7311	7328	7345	7362	7379	7396	2	3	5	7	8	10	12	13	15
.87	7413	7430	7447	7464	7482	7499	7516	7534	7551	7568	2	3	5	7	9	10	12	14	16
.88	7586	7603	7621	7638	7656	7674	7691	7709	7727	7745	2	4	5	7	9	11	12	14	16
.89	7762	7780	7798	7816	7834	7852	7870	7889	7907	7925	2	4	5	7	9	11	13	14	16
.90	7943	7962	7980	7998	8017	8035	8054	8072	8091	8110	2	4	6	7	9	11	13	15	17
.91	8128	8147	8166	8185	8204	8222	8241	8260	8279	8299	2	4	6	8	9	11	13	15	17
.92	8318	8337	8356	8375	8395	8414	8433	8453	8472	8492	2	4	6	8	10	12	14	15	17
.93	8511	8531	8551	8570	8590	8610	8630	8650	8670	8690	2	4	6	8	10	12	14	16	18
.94	8710	8730	8750	8770	8790	8810	8831	8851	8872	8892	2	4	6	8	10	12	14	16	18
.95	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099	2	4	6	8	10	12	15	17	19
.96	9120	9141	9162	9183	9204	9226	9247	9268	9290	9311	2	4	6	8	11	13	15	17	19
.97	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528	2	4	7	9	11	13	15	17	20
.98	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750	2	4	7	9	11	13	16	18	20
.99	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977	2	5	7	9	11	14	16	18	20