



**ASSOCIATION OF ACCOUNTING TECHNICIANS  
OF SRI LANKA**

**CURRICULUM 2020**

**PILOT PAPER**

**Level I**

**102 - BUSINESS MATHEMATICS AND  
STATISTICS (BMS)**

A publication of the Education and Training Division

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**Association of Accounting Technicians of Sri Lanka**  
**102-Business Mathematics and Statistics (BMS)**  
**Pilot Paper**

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**Instructions to Candidates (Please Read Carefully)**

**Time Allowed:**

Writing : 03 hours

**Structure of Question Paper:**

- This paper consists of three Sections: Section A, Section B and Section C.
- All the questions of Section A, Section B and Section C should be answered.

**Marks:**

- Allocation of marks for each section:

<b>Section</b>	<b>Marks</b>
Section A	40
Section B	40
Section C	20
<b>Total</b>	<b>100</b>

- Marks for each question are shown with the question.
- The pass mark for this paper is 50%.

**Answers:**

- All answers should be written in the booklet provided, answers written on the question paper will not be considered for marking.
- Begin your answer of each question on a new page.
- All workings should be clearly shown.
- Do not write on the Margins.

**Answer Booklets:**

- Instructions are shown on the front cover of each answer booklet.

**Calculators:**

- Candidates may use any calculator except those with the facility for symbolic algebra and differentiation. No programmable calculators are allowed.

**Attached:**

- Action verb checklist – Each question will begin with an action verb (excluding OTQ's).
- Candidates should answer the questions based on the definition of the verb given in the checklist.
- Formula sheet and mathematical table

## Objective Test Questions (OTQs)

Answer ALL fifteen questions  
(Total = 40 marks)

## SECTION A

### Question 01

Select the most correct answer for question No 1.1 to 1.10. Write the number of the selected answer in your answer booklet with the number assigned to the question.

- 1.1 Telephone cost of a company in last month was Rs.20,000/-. It has been decided to allocate 60% of these telephone cost, to Central Administration division and to allocate 35 % of the remainder, to Finance division.

Telephone cost to be allocated to Finance division is:

- (1) Rs.2,000/-                      (2) Rs.8,000/-                      (3) Rs.5,200/-                      (4) Rs.2,800/-

(03 marks)

- 1.2 In 2017, the price of a certain commodity was Rs.120 while it was Rs.150/- in 2019. Price relative using the 2017 as the base year is:

- (1) 80%.                                  (2) 125%.                                  (3) 100%.                                  (4) 25%.

(03 marks)

- 1.3 The information on the cost incurred on advertising ( $x$ ) (Rs.000) and the number of items sold ( $y$ ) for the last 5 years are summarized below:

$$\sum x = 10, \sum y = 78, \sum x^2 = 30, \sum y^2 = 1,266 \text{ and } \sum xy = 134$$

Based on the above data, the correlation coefficient is:

- (1) 0.992                                  (2) -0.922                                  (3) -0.992                                  (4) 0.922

(03 marks)

- 1.4 The weights of eight items were as follows:-

$$60, 40, 50, 70, 36, 54, 65, x$$

If the mean of the eight items is 52, the value of  $x$  would be:

- (1) 41.                                      (2) 46.                                      (3) 54.                                      (4) 52.

(03 marks)

- 1.5 A person has deposited an amount Rs.20,000/- in a fixed deposit account of a bank at an annual interest rate of 12% compounded quarterly. The maturity value of the fixed deposit at the end of 3 years is (to the nearest integer):

- (1) Rs.28,515/-                      (2) Rs.27,700/-                      (3) Rs.22,400/-                      (4) Rs.27,200/-

(03 marks)

1.6 The seasonal variations of the sale of readymade garments of a particular company are given below:

$$Q1 = -5\% \quad Q2 = -20\% \quad Q3 = -10\% \quad Q4 = +35\%$$

The trend in sales is constant and the actual sales for the first quarter of the year would be Rs.7,600,000/-.

The forecast sales for the remaining three quarters of the year would be:

$$(1) \quad Q2 = \text{Rs.}7,200,000/\text{-} \quad Q3 = \text{Rs.}6,400,000/\text{-} \quad Q4 = \text{Rs.}10,800,000/\text{-}.$$

$$(2) \quad Q2 = \text{Rs.}6,000,000/\text{-} \quad Q3 = \text{Rs.}7,500,000/\text{-} \quad Q4 = \text{Rs.}12,800,000/\text{-}.$$

$$(3) \quad Q2 = \text{Rs.}5,400,000/\text{-} \quad Q3 = \text{Rs.}7,000,000/\text{-} \quad Q4 = \text{Rs.}10,000,000/\text{-}.$$

$$(4) \quad Q2 = \text{Rs.}6,400,000/\text{-} \quad Q3 = \text{Rs.}7,200,000/\text{-} \quad Q4 = \text{Rs.}10,800,000/\text{-}.$$

(03 marks)

1.7 An AAT qualified person applies for a job in two firms,  $x$  and  $y$ . The probability of him being selected at firm  $x$  is 80% and being rejected at  $y$  is 30%. Also the probability of at least one of his applications being rejected is 40%.

The probability that he will be selected from one of the firms is:

$$(1) \quad 0.1 \quad (2) \quad 0.7 \quad (3) \quad 0.9 \quad (4) \quad 0.5$$

(03 marks)

1.8 A manufacturer keeps a 30% of profit on production cost when goods are sold. If production cost of a product is Rs.700/-, selling price of a product is:

$$(1) \quad \text{Rs.}910/\text{-} \quad (2) \quad \text{Rs.}1,000/\text{-} \quad (3) \quad \text{Rs.}1,300/\text{-} \quad (4) \quad \text{Rs.}1,120/\text{-}.$$

(03 marks)

1.9 The following information was obtained from the records of a factory relating to monthly wages. Mean of monthly wages was Rs.32,600/-, and median and standard deviation of the same were Rs.27,800/- and Rs.16,000/- respectively.

The co-efficient of skewness of the wage distribution is:

$$(1) \quad 0.6 \quad (2) \quad 0.3 \quad (3) \quad 1.2 \quad (4) \quad 0.9$$

(03 marks)

1.10 An individual has taken a mortgage of Rs.500,000/-, at a fixed interest rate of 3% per quarter over 5 years. Repayments will be made at the end of each quarter after the mortgage is taken.

The quarterly repayment is (To the nearest integer):

$$(1) \quad \text{Rs.}25,000/\text{-} \quad (2) \quad \text{Rs.}34,906/\text{-} \quad (3) \quad \text{Rs.}33,609/\text{-} \quad (4) \quad \text{Rs.}35,350/\text{-}.$$

(03 marks)

1.11 Relate the component of time series given on the left side to the appropriate example on the right hand side:

Component of time series	Example
A. Trend	1. A fire in a factory delaying productions for one month.
B. Seasonal Variations	2. An economic cycle of ups and downs over 5 years.
C. Cyclical Variations	3. A 5% increase in demand for rice in the long-run due to increase in population.
D. Random Variations	4. Decrease in the employment in sugar factory during the off season.

State the corresponding number of the example against each component marked by **A, B, C** and **D**.

<b>A.</b>	
<b>B.</b>	
<b>C.</b>	
<b>D.</b>	

(01 mark each, 04 marks)

**Write the answers to question No. 1.12 – 1.13 in your answer booklet.**

1.12 100 students sat for a particular examination of which 60 were boys. Number of students who passed this examination was 40 of whom 20 were girls. Calculate the probability of a girl passing that examination. (02 marks)

1.13 A certain amount was deposited in a bank account which is given simple interest at the rate of 8% per annum. If the total value of this deposit at the end of 3 years would be Rs.153,760/- ,Calculate the value of the initial deposit. (02 marks)

**State whether each of the following statements is true or false. Write the answer (True / False) in your answer booklet with the number assigned to the question.**

1.14 An investment with a positive NPV is financially viable. (01 mark)

1.15 The value of correlation coefficient between a pair of variables is always a positive figure. (01 mark)

(Total = 40 marks)

**End of Section A**

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**Four Compulsory questions**

(Total = 40 marks)

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**SECTION B****Question 02**

- (a) **Demonstrate** the following inequalities and **identify** the area of the graph where all the inequalities hold:

$$5x + 3y \leq 30$$

$$x \geq y$$

$$x \geq 0$$

$$y \geq 0$$

(06 marks)

- (b) The following simultaneous equations are provided:

$$8x + 5y = 60$$

$$4x + 3y = 32$$

**Compute** the values of  $x$  and  $y$ .

(04 marks)

(Total = 10 marks)

**Question 03**

A manufacturing company has daily fixed costs of Rs.900/- and variable costs of  $10x + x^2$ , where  $x$  is the quantity (in units) produced per day. The demand function for this product is given by  $p = 120 - x$  where  $p$  is the unit price and  $x$  is the quantity (in units) sold per day.

- (a) **Identify** Total Cost function (TC) and Total Revenue function (TR) (03 marks)
- (b) **Calculate** the number of units at which profit is maximized. (04 marks)
- (c) **Calculate** the number of units at break – even point. (03 marks)

(Total = 10 marks)

### Question 04

A book publisher's book printing cost (Rs. million) and the number of books printed (in '000 units) of last seven months are shown in the following table.

No of books printed	1	3	4	6	8	9	15
book printing cost	4	6	5	7	8	9	11

- (a) **Identify** the regression line given by  $y = a + bx$  using the above information. (07 marks)
- (b) **Calculate** the book printing cost if the publisher is planning to print 10, 000 books. (03 marks)
- (Total = 10 marks)

### Question 05

A study has been carried out on the access times to the internet service and the number of users using that service of an Internet Service Provider called JETSTREAM.

Access time (in seconds)	No of users ( $f$ )
30 - 39	25
40 - 49	38
50 - 59	94
60 - 69	110
70 - 79	70
80 - 89	23

- (a) **Calculate** the mean access time. (03 marks)
- (b) **Calculate** the standard deviation of the access time. (04 marks)
- (c) **Calculate** the coefficient of variation of the access time. (03 marks)
- (Total = 10 marks)

**End of Section B**

**One Compulsory Question**

(Total = 20 marks)

**SECTION C****Question 06**

- (A) The **XYZ Ltd.** produces a variety of high-quality garden furniture and associated items, mostly in wood and iron. There is a potential to expand the business. The directors have identified two main options for a four year plan:

Option – 1 : Expand the retail outlet to include more products.

Option – 2 : Branches into on-line orders.

Option 1 & 2 would require an initial investment of Rs.7.5 million and Rs. 12 million respectively and net cash inflows of the two options are as follows:

*(Rs. million)*

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>
Option 1:	4	5	5	5
Option 2:	5	6	8	8

- (a) **Assess** the two investment opportunities using the Net Present Value (NPV) technique assuming the cost of capital is 10% per annum. (08 marks)
- (b) **Explain** which option is more profitable (02 marks)
- (B) (a) The following table shows the monthly demand and the probability of a company for a particular product.

<b>Monthly demand</b>	<b>Probability</b>
100	0.3
160	0.3
200	0.2
240	0.2

- Calculate** expected monthly demand and its standard deviation. (05 marks)
- (b) The annual sales of a popular item are in a normal distribution with the mean of 480 units and standard deviation of 40 units.
- Calculate** the probability of annual sales of this item:
- (i) Exceeding 550 units. (02 marks)
- (ii) Below 400 units. (03 marks)
- (Total = 20 marks)

**End of Section C**

# **FORMULA & MATHEMATICAL TABLES**

## **Mathematical Fundamentals:**

### Quadratic equation:

The solutions of a quadratic equation,  $ax^2 + bx + c = 0$  is given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### Arithmetic sequence:

The sum of first n terms of an AP:

$$S = \frac{n}{2} \{ 2a + (n - 1)d \}$$

### Geometric sequence:

The sum of first n terms of a GP:

$$S = a \frac{\{r^n - 1\}}{\{r - 1\}} \quad r \neq 1$$

## **Quantitative Finance:**

### Simple interest:

$$S = X (1 + nr)$$

### Compound Interest:

$$S = X \{1 + r\}^n$$

### Discounting:

$$\text{Present Value} = \text{Future Value} \times \frac{1}{(1+r)^n}$$

### Repayment of mortgage:

$$A = \frac{SR^n(R - 1)}{\{R^n - 1\}}$$

## **Numerical Descriptive Measures:**

### Mean $\bar{x}$ :

For ungrouped data:  $\frac{\sum x}{n}$

For grouped data:  $\frac{\sum fx}{\sum f}$

### Standard deviation $\sigma$ :

For ungrouped data:

$$\sqrt{\frac{\sum (x - \bar{x})^2}{n}} \text{ or } \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$$

For grouped data:

$$\sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} \text{ or } \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$$

Coefficient of variation (CV):

$$\frac{\text{Standard deviation}}{\text{Mean}} = \frac{\sigma}{\bar{x}}$$

Co efficient of skewness =  $\frac{3(\text{Mean} - \text{Medium})}{\text{Standard deviation}}$

## **Comparing Two Quantitative Variables:**

### Correlation coefficient (r):

$$\frac{[n \sum xy - \sum x \sum y]}{\sqrt{\{[n \sum x^2 - (\sum x)^2] \times [n \sum y^2 - (\sum y)^2]\}}}$$

Regression coefficients (a and b):

$$b = \frac{[n \sum xy - \sum x \sum y]}{[n \sum x^2 - (\sum x)^2]}$$

$$a = \bar{y} - b\bar{x}$$

## Index numbers and forecasting

### Index Numbers:

$$\text{Price Relative} = \frac{p_1}{p_0} \times 100$$

$$\text{Quantity Relative} = \frac{q_1}{q_0} \times 100$$

$$\text{Value Relative} = \frac{v_1}{v_0} \times 100$$

$$\text{Simple aggregate price index} = \frac{\sum p_1}{\sum p_0} \times 100$$

$$\text{Simple aggregate quantity index} = \frac{\sum q_1}{\sum q_0} \times 100$$

$$\text{Average price relative} = \frac{1}{n} \sum \frac{p_1}{p_0} \times 100$$

$$\text{Average quantity relative} = \frac{1}{n} \sum \frac{q_1}{q_0} \times 100$$

### Weighted aggregate indices

#### 1) Base-weighted / Laspeyre's:

$$\text{Price index} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$\text{Quantity index} = \frac{\sum q_1 p_0}{\sum q_0 p_0} \times 100$$

#### 2) Current-weighted / Paasche's:

$$\text{Price index} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

$$\text{Quantity index} = \frac{\sum q_1 p_1}{\sum q_0 p_1} \times 100$$

#### 3) Using standard weights

$$\text{Price index} = \frac{\sum p_1 w}{\sum p_0 w} \times 100$$

$$\text{Quantity index} = \frac{\sum q_1 w}{\sum q_0 w} \times 100$$

### Weighted average of relatives

$$\text{Price index} = \frac{\sum [w \times I_p]}{\sum w} \times 100$$

$$\text{Quantity index} = \frac{\sum [w \times I_q]}{\sum w} \times 100$$

### Time Series:

#### Multiplicative Model

$$Y = T \times S \times C \times R$$

### **Sets and Probability**

$\cup$  - Union;  $A \cup B$  defines all elements in A plus all elements in B, no element being counted twice.

$\cap$  - Intersection;  $A \cap B$  defines all elements included in both A and B.

$P(A)$  - Probability of event A

$P(A/B)$  - Probability of event A, given B

#### General rules:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

#### Expectation & standard deviation of a discrete random variable:

$$E(X) = \sum(\text{probability} \times \text{pay off}) = \sum p \times x$$

$$\sigma = \sqrt{\sum px^2 - (\sum px)^2}$$

#### Normal Distribution:

$$Z = \frac{x - \mu}{\sigma}$$

**PRESENT VALUE OF Re. 1**

<i>Period</i>	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149
21	0.811	0.660	0.538	0.439	0.359	0.294	0.242	0.199	0.164	0.135
22	0.803	0.647	0.522	0.422	0.342	0.278	0.226	0.184	0.150	0.123
23	0.795	0.634	0.507	0.406	0.326	0.262	0.211	0.170	0.138	0.112
24	0.788	0.622	0.492	0.390	0.310	0.247	0.197	0.158	0.126	0.102
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092
26	0.772	0.598	0.464	0.361	0.281	0.220	0.172	0.135	0.106	0.084
27	0.764	0.586	0.450	0.347	0.268	0.207	0.161	0.125	0.098	0.076
28	0.757	0.574	0.437	0.333	0.255	0.196	0.150	0.116	0.090	0.069
29	0.749	0.563	0.424	0.321	0.243	0.185	0.141	0.107	0.082	0.063
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057

**PRESENT VALUE OF Re. 1**

(Continued)

<b>Period</b>	<b>11%</b>	<b>12%</b>	<b>13%</b>	<b>14%</b>	<b>15%</b>	<b>16%</b>	<b>17%</b>	<b>18%</b>	<b>19%</b>	<b>20%</b>
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026
21	0.112	0.093	0.077	0.064	0.053	0.044	0.037	0.031	0.026	0.022
22	0.101	0.083	0.068	0.056	0.046	0.038	0.032	0.026	0.022	0.018
23	0.091	0.074	0.060	0.049	0.040	0.033	0.027	0.022	0.018	0.015
24	0.082	0.066	0.053	0.043	0.035	0.028	0.023	0.019	0.015	0.013
25	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016	0.013	0.010
26	0.066	0.053	0.042	0.033	0.026	0.021	0.017	0.014	0.011	0.009
27	0.060	0.047	0.037	0.029	0.023	0.018	0.014	0.011	0.009	0.007
28	0.054	0.042	0.033	0.026	0.020	0.016	0.012	0.010	0.008	0.006
29	0.048	0.037	0.029	0.022	0.017	0.014	0.011	0.008	0.006	0.005
30	0.044	0.033	0.026	0.020	0.015	0.012	0.009	0.007	0.005	0.004

## CUMULATIVE PRESENT VALUE OF Re. 1

This table shows the present value of Re. 1 per annum, receivable or payable at the end of each year for n years

<b>Period</b>	<b>1%</b>	<b>2%</b>	<b>3%</b>	<b>4%</b>	<b>5%</b>	<b>6%</b>	<b>7%</b>	<b>8%</b>	<b>9%</b>	<b>10%</b>
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514
21	18.857	17.011	15.415	14.029	12.821	11.764	10.836	10.017	9.292	8.649
22	19.660	17.658	15.937	14.451	13.163	12.042	11.061	10.201	9.442	8.772
23	20.456	18.292	16.444	14.857	13.489	12.303	11.272	10.371	9.580	8.883
24	21.243	18.914	16.936	15.247	13.799	12.550	11.469	10.529	9.707	8.985
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
26	22.795	20.121	17.877	15.983	14.375	13.003	11.826	10.810	9.929	9.161
27	23.560	20.707	18.327	16.330	14.643	13.211	11.987	10.935	10.027	9.237
28	24.316	21.281	18.764	16.663	14.898	13.406	12.137	11.051	10.116	9.307
29	25.066	21.844	19.188	16.984	15.141	13.591	12.278	11.158	10.198	9.370
30	25.808	22.396	19.600	17.292	15.372	13.765	12.409	11.258	10.274	9.427

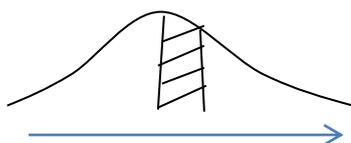
## CUMULATIVE PRESENT VALUE OF Re. 1

(Continued)

	<b>11%</b>	<b>12%</b>	<b>13%</b>	<b>14%</b>	<b>15%</b>	<b>16%</b>	<b>17%</b>	<b>18%</b>	<b>19%</b>	<b>20%</b>
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870
21	8.075	7.562	7.102	6.687	6.312	5.973	5.665	5.384	5.127	4.891
22	8.176	7.645	7.170	6.743	6.359	6.011	5.696	5.410	5.149	4.909
23	8.266	7.718	7.230	6.792	6.399	6.044	5.723	5.432	5.167	4.925
24	8.348	7.784	7.283	6.835	6.434	6.073	5.746	5.451	5.182	4.937
25	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
26	8.488	7.896	7.372	6.906	6.491	6.118	5.783	5.480	5.206	4.956
27	8.548	7.943	7.409	6.935	6.514	6.136	5.798	5.492	5.215	4.964
28	8.602	7.984	7.441	6.961	6.534	6.152	5.810	5.502	5.223	4.970
29	8.650	8.022	7.470	6.983	6.551	6.166	5.820	5.510	5.229	4.975
30	8.694	8.055	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979

## AREA UNDER THE STANDARD NORMAL CURVE

This table gives the area under the normal curve between the mean and a point of Z score above the mean. The corresponding area for deviations below the mean can be found by symmetry



*Z-Score*

<b>Z</b>	<i>0.00</i>	<i>0.01</i>	<i>0.02</i>	<i>0.03</i>	<i>0.04</i>	<i>0.05</i>	<i>0.06</i>	<i>0.07</i>	<i>0.08</i>	<i>0.09</i>
<i>0.0</i>	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
<i>0.1</i>	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
<i>0.2</i>	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
<i>0.3</i>	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
<i>0.4</i>	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
<i>0.5</i>	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
<i>0.6</i>	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
<i>0.7</i>	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
<i>0.8</i>	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
<i>0.9</i>	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
<i>1.0</i>	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
<i>1.1</i>	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
<i>1.2</i>	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
<i>1.3</i>	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
<i>1.4</i>	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
<i>1.5</i>	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
<i>1.6</i>	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
<i>1.7</i>	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
<i>1.8</i>	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
<i>1.9</i>	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
<i>2.0</i>	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
<i>2.1</i>	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
<i>2.2</i>	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
<i>2.3</i>	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
<i>2.4</i>	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
<i>2.5</i>	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
<i>2.6</i>	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
<i>2.7</i>	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
<i>2.8</i>	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
<i>2.9</i>	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
<i>3.0</i>	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
<i>3.1</i>	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
<i>3.2</i>	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
<i>3.3</i>	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
<i>3.4</i>	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
<i>3.5</i>	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983

# Action Verbs Check List

Analysis (4)	Draws Connections Among Ideas and Solve Problems	Analyze	Examine in details to find the solution or outcome
		Differentiate	Constitute a difference that distinguishes something
		Discuss	Examine in detail by arguments
		Compare	Examine to discover similarities
		Contrast	Examine to show differences
		Outline	Make a summary of significant features
		Communicate	Share or exchange information
Application (3)	Uses and Adapts Knowledge in New Situations	Apply	Put to practical use
		Calculate	Ascertain or reckon with mathematical computation
		Demonstrate	Prove or exhibit with examples
		Prepare	Make or get ready for particular purpose
		Solve	Find solutions through calculations and/or explanation
		Assess	Determine the value, nature, ability or quality
		Graph	Represent by graphs
Comprehension (2)	Explains Ideas and Information	Reconcile	Make consistent/compatible with another
		Define	Give the exact nature, scope or meaning
		Explain	Make a clear description in detail using relevant facts
		Describe	Write and communicate the key features
		Interpret	Translate in to understandable or familiar terms
		Recognize	Show validity or otherwise using knowledge or contextual experience
Knowledge (1)	Recalls Facts and Basic Concepts	List	Write the connected items
		Identify	Recognize, establish or select after consideration
		State	Express details definitely or clearly
		Relate	Establish logical or causal connections
		Draw	Produce a picture or diagram
Level of competency	Description	Action Verbs	Verb Definitions



**ASSOCIATION OF ACCOUNTING TECHNICIANS  
OF SRI LANKA**

**CURRICULUM 2020**

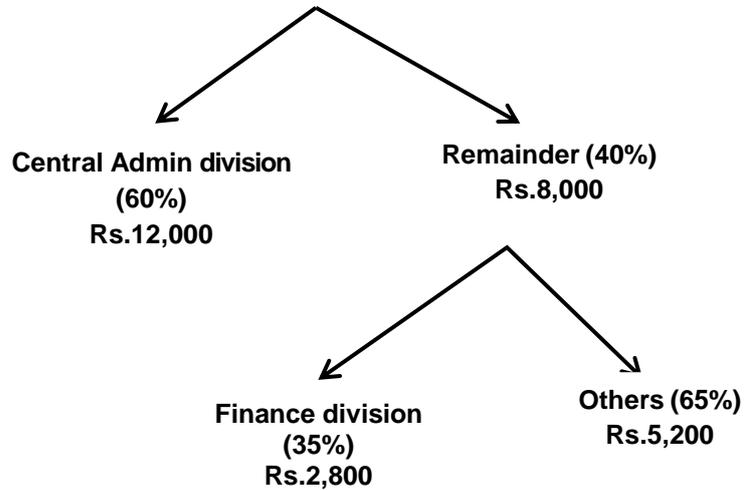
**SUGGESTED ANSWERS**

**Level I**

**102 - BUSINESS MATHEMATICS AND  
STATISTICS (BMS)**

A publication of the Education and Training Division

1.1 Telephone cost last month = Rs.20,000



Hence the amount allocated to finance = Rs.2,800/-.

**Correct answer = 4**

1.2 Price relative =  $\frac{150}{120} \times 100\% = 125\%$

**Correct answer = 2**

1.3 
$$r = \frac{\{(5 \times 134) - (10 \times 78)\}}{\sqrt{\{(5 \times 30) - 10^2\} \times \{(5 \times 1266) - 78^2\}}}$$
  
 = - 0.992

**Correct answer = 3**

1.4

$$\frac{60 + 40 + 50 + 70 + 36 + 54 + 65 + x}{8} = 52$$

$$375 + x = 416$$

$$x = 416 - 375$$

$$x = 41$$

**Correct answer = 1**

1.5

$$= 20,000 (1 + 0.03)^{12}$$

$$= 28,515$$

**Correct answer = 1**

1.6 Q1 trend =  $\frac{7,600,000}{.95} = \text{Rs.8,000,000}$

Quarter	Trend	Seasonal factor	Forecast
Q2	Rs.8,000,000	0.80	Rs.6,400,000
Q3	Rs.8,000,000	0.90	Rs.7,200,000
Q4	Rs.8,000,000	1.35	Rs.10,800,000

**Correct answer = 4**

---

1.7

$$\begin{aligned}
 P(X) &= 0.8 & P(\bar{X}) &= 0.2 \\
 P(\bar{Y}) &= 0.3 & P(Y) &= 0.7 \\
 P(\bar{X} \cup \bar{Y}) &= 0.4 \\
 P(X \cap Y) &= 1 - P(\bar{X} \cup \bar{Y}) \\
 &= 1 - 0.4 \\
 &= 0.6
 \end{aligned}$$

$$\begin{aligned}
 \text{Hence, } P(X \cup Y) &= P(X) + P(Y) - P(X \cap Y) \\
 &= 0.8 + 0.7 - 0.6 \\
 &= 0.9
 \end{aligned}$$

**Correct answer = 3**

---

1.8  $700/100 * 130\% = 910$

**Correct answer = 1**

---

1.9 Mean monthly wages = Rs. 32,600  
 Median monthly wages = Rs. 27,800  
 Std. deviation = Rs. 16,000

$$\begin{aligned}
 \text{Co-efficient of skewness} &= \frac{3(\text{Mean} - \text{Medium})}{SD} \\
 &= \frac{3 \times (32,600 - 27,800)}{16,000} = 0.9
 \end{aligned}$$

**Correct answer = 4**

---

1.10 Amount borrowed = Rs.500,000  
 Quarterly rate = 3%  
 Period taken to settle = 20 quarters

$$\begin{aligned}
 \text{Quarterly repayment} &= \frac{\text{Amount borrowed}}{\text{Cum. DCF}} \\
 &= \text{Rs.33,609/- (approx.)}
 \end{aligned}$$

**Correct answer = 3**

---

1.11

A.	3
B.	4
C.	2
D.	1

---

1.12  $\frac{20}{40} = \frac{1}{2}$

---

1.13  $153,760 = x + (x \times 0.08)3$   
 $153,760 = 1.24x$   
 $124,000 = x$

---

1.14 True

---

1.15 False

---

(Total 40 marks)

***End of Section A***

## Four Compulsory Questions

Total = 40 marks.

## SECTION B

### Answer to Question 02

#### Unit 1 – Basic Mathematics for Business.

Learning outcomes – Identify and solve the quantitative variables involved in business scenario.  
– Explain inequalities and identify inequalities using a graph.

- (a) Draw the lines  $5x + 3y = 30$ ,  $x = y$  and  $y = 0$  (the Y - axis)

Note: If  $X \geq Y$  and  $Y \geq 0$ , it is obvious that  $X \geq 0$  and the line  $X = 0$  is not necessary.

To draw the lines you put values in the equation and plot them.

$$5x + 3y = 30$$

When  $x = 0$ ,  $y = 10$  and similarly when  $y = 0$ ,  $x = 6$

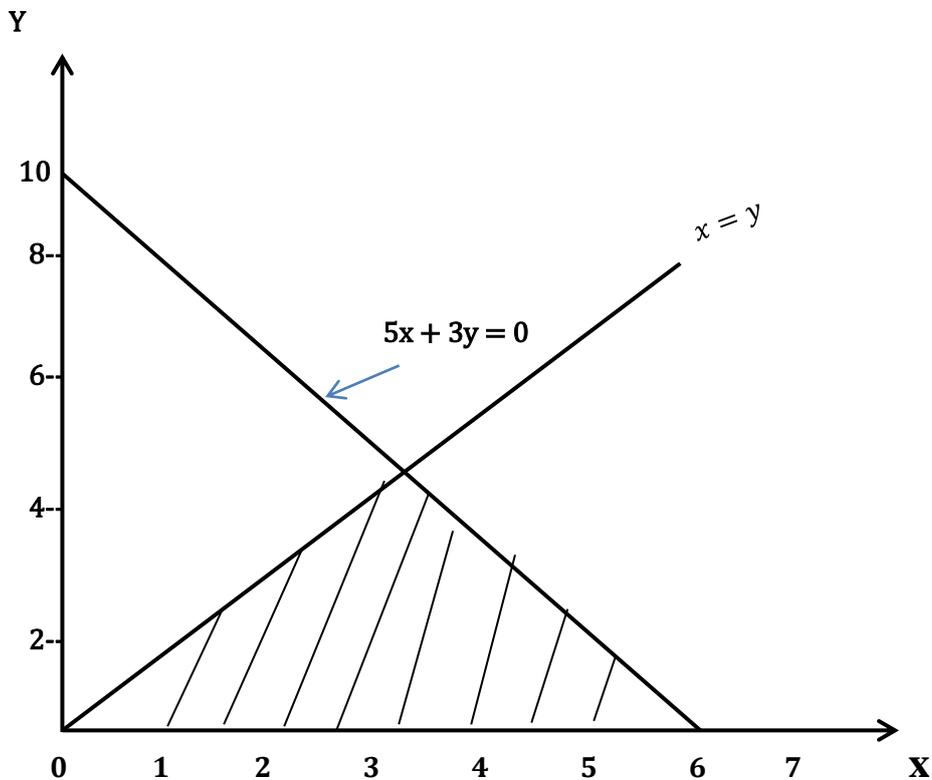
Plot  $x = 6$  and  $y = 10$  on the graph and connect them by a line

$$x = y$$

When  $x = 0$ ,  $y = 0$  and similarly when  $y = 6$   $x = 6$

Plot the two sets of points on the graph and connect them by a line

$y = 0$  (the Y - axis)  $x = 0$



(06 marks)

- (b)

$$8x + 5y = 60 \quad \text{—————}$$

$$4x + 3y = 32 \quad \text{—————} \quad \textcircled{2}$$

$$\textcircled{2} \times 2 \longrightarrow 8x + 6y = 64 \quad \text{—————} \quad \textcircled{3}$$

$$\textcircled{3} - \textcircled{1} \longrightarrow y = 64 - 60$$

$$\underline{y = 4}$$

$$8x + 5 \times 4 = 60$$

$$8x = 60 - 20$$

$$8x = 40$$

$$\underline{X = 5}$$

(04 marks)

(Total = 10 marks)

### Answer to Question 03

#### Unit 3 – Financial operative measures for business

Learning outcomes – Calculate the break-even point.

– Calculate the profit maximizing or cost minimizing output level.

(a)  $TC = 10x + x^2 + 900$   
 $TR = 120x - x^2$

(3 marks)

(b) Profit function =  $TR - TC$   
 $= 120x - x^2 - 10x - x^2 - 900$   
 $= 110x - 2x^2 - 900$

At maximum point  $dp / dx = 0$

$$110 - 4x = 0$$

$$4x = 110$$

$$\underline{X = 27.5}$$

(04 marks)

(b) The total daily cost  $C = 900 + 10x + x^2$

The daily revenue  $R = 120x - x^2$

Since the daily cost and daily revenue, both are quadratic functions and therefore the daily profit function is also a quadratic function. Hence there would be two break- even points.

At break - even  $C = R$

Hence,  $900 + 10x + x^2 = 120x - x^2$

$$2x^2 - 110x + 900 = 0$$

$X = 10$  units and  $x = 45$  units (2 break - even points)

(03 Marks)

(Total = 10 Marks)

## Answer to Question 04

### Unit 5 – Comparing two quantitative variables.

Learning outcomes – Identify the regression line using the free hand method or least square method.  
– Assess predictions obtained by regression equation.

(a) Independent variable (x) = Quantity printed (in '000)

Dependent variable (y) = printing costs (Rs. million)

Let the regression of printing costs on quantity printed be  $y = a + b x$

x	y	$x^2$	xy
1	4	1	4
3	6	9	18
4	5	16	20
6	7	36	42
8	8	64	64
9	9	81	81
15	11	225	165
$\sum x = 46$	$\sum y = 50$	$\sum x^2 = 432$	$\sum xy = 394$

$$\text{Then } b = \frac{[n \sum xy - \sum x \sum y]}{[n \sum x^2 - (\sum x)^2]}$$

$$= \frac{[(7 \times 394) - (46 \times 50)]}{[(7 \times 432) - 46^2]}$$

$$= \frac{2758 - 2300}{3024 - 2116}$$

$$= \frac{458}{908}$$

$$= 0.504$$

$$a = \bar{Y} - b\bar{x}$$

$$a = \left(\frac{50}{7}\right) - 0.504 \times \left(\frac{46}{7}\right)$$

a

$$= 7.14 - 0.504 \times 6.571$$

$$= 3.83$$

$$y = 3.83 + 0.504 x$$

(07 marks)

(b) To estimate the cost of producing 10,000 books

Put  $x = 10$  (as producing in 000 units) in the regression equation

$$Y = 3.83 + 0.504 \times 10 = Y = 8.87$$

= Rs.8.87 million (since the production cost is in Rs. Million)

(03 marks)

(Total = 10 marks)

## Answer to Question 05

**Unit 4** – **Data Presentation and Descriptive Measures.**  
Learning outcomes – Calculate Central tendency measures (Mean, Median and Mode)  
– Discuss the impact of skewness on central tendency.

$x$	$f$	$fx$	$fx^2$
34.5	25	862.5	29,756.25
44.5	38	1,691	75,249.5
54.5	94	5,123	279,203.5
64.5	110	7,095	457,627.5
74.5	70	5,215	388,517.5
84.5	23	1,943.5	164,225.75
	<b>360</b>	<b>21,930</b>	<b>1,394,580.00</b>

$$\begin{aligned} \text{(a) Mean access time } (\bar{x}) &= \frac{\Sigma fx}{\Sigma f} = \frac{21,930}{360} \\ &= 60.92 \end{aligned}$$

(03 marks)

$$\begin{aligned} \text{(b) Standard deviation access time} &= \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \bar{x}^2} \\ &= \sqrt{\frac{1,394,580}{360} - 60.92^2} \\ &= 12.75 \text{ seconds} \end{aligned}$$

(04 marks)

$$\begin{aligned} \text{(c) Co-efficient of variation (cv)} &= \frac{SD}{\bar{x}} \times 100 \% \\ &= \frac{12.75}{60.92} \times 100\% \\ &= 20.93 \% \end{aligned}$$

(03 marks)

(Total = 10 marks)

**End of Section B**

**One Compulsory Question**

(Total = 20 marks)

**SECTION C****Answer to Question 06**

**Unit 2** – **Financial Mathematics for business.**  
**Unit 6** – **Probability and its application.**  
 Learning outcomes – Calculate and interpret NPV.  
 – Explain normal distribution and calculate the probability of the standard normal distribution.

**(A)**

(a) Expansion possibilities:

*(Rs. million)*

Year	Option 1	Option 2	DCF at 10%	PV of option 1	PV of option 2
0	(7.5)	(12)	1.000	(7,5)	(12)
1	4	5	0.909	3.636	4.545
2	5	6	0.826	4.130	4.956
3	5	8	0.751	3.755	6.008
4	5	8	0.683	3.415	5.464
<b>Net Present Value (NPV)</b>				<b>7.436</b>	<b>8.973</b>

**(08 marks)**

(b) Both options are viable at 10% cost of capital based on the estimates provided, however the second option is more profitable as the NPV of it is higher. NPV would be Rs 7.436 million and Rs 8.973 million respectively. This shows the on line order operation would provide Rs 1.537 million more profit in present value terms.

**(02 marks)****(B)**

(a)

Monthly demand X	Probability (p)	$p \times x$	$P \times X^2$
100	0.3	30	3,000
160	0.3	48	7,680
200	0.2	40	8,000
240	0.2	48	11,520
<b>TOTAL</b>		<b>166</b>	<b>30,200</b>

*Expected monthly demand*

$$= E(X) = \sum (\text{Probability} \times \text{Pay off}) = \sum p \times x = 166 \text{ units}$$

