



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

Higher Secondary School Certificate  
Examination Syllabus

# Business Maths & Business Statistics

Grades XI - XII

(based on National Curriculum 2000)

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**Higher Secondary School Certificate  
Examination Syllabus**

**BUSINESS MATHEMATICS AND  
BUSINESS STATISTICS  
GRADES XI-XII**

**This syllabus will be examined in both  
May and September Examination sessions from  
May 2021 for Grade XI (Business Mathematics) and May  
2022 Grade XII (Business Statistics)**

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## Preface

Established in 2002 through Ordinance CXIV, the Aga Khan University Examination Board (AKU-EB) is Pakistan's first private autonomous examination body for secondary (SSC) and higher secondary (HSSC) school certifications. Its vision is to be a model of excellence and innovation in education in Pakistan and the developing world.

One of the ways in which AKU-EB achieves its vision is by developing syllabi which inculcates conceptual thinking and higher order learning skills based on the National Curriculum. The AKU-EB revises its syllabi every 4 years so that they continue to meet the needs of students, teachers and examiners.

The aims of the current syllabus review of SSC and HSSC in 2016 were to:

- Ensure continued compatibility with the goals of the National Curriculum of Pakistan.
- Review the content for inclusion of new knowledge and deletion of obsolete knowledge.
- Review the content for clarity and relevance as per the changing needs of students, teachers and examiners.
- Enhance and strengthen continuation and progression of content both within and across grades IX - XII (SSC and HSSC).
- Ensure the readiness of students for higher education.

During this syllabus review, the needs of all the stakeholders were identified through a needs-assessment survey. Students and teachers of AKU-EB affiliated schools from across Pakistan participated in the survey. Thereafter, a revision panel, which consisted of examiners, teachers of affiliated and non-affiliated schools, teacher trainers and university academics, reviewed and revised the syllabus following a planned, meticulous and standardised syllabi review process.

The syllabus is organised into topics and subtopics. Each subtopic is further divided into achievable student learning outcomes (SLOs). The SLOs of the cognitive domain are each assigned a cognitive level on which they have to be achieved. These cognitive levels are 'knowledge', 'understanding' and 'application', the latter also including other higher order cognitive skills. This is followed by the Exam Specifications which gives clear guidance about the weightage of each topic and how the syllabus will be assessed.

The development of the revised syllabus has been made possible by the creativity and relentless hard work of Curriculum and Examination Development unit and the constant support provided by all the other units of AKU-EB. We are particularly thankful to Dr Sohail Qureshi for his very useful feedback on revising the syllabus review process, to Dr Naveed Yousuf for his continued guidance and support throughout the syllabus revision process and to Raabia Hirani for leading the syllabi revision. We are also thankful to all the students and teachers who took part in the needs-assessment survey and to the principals of AKU-EB affiliated schools who made this endeavour possible by facilitating and encouraging their teachers to be a part of the survey and the syllabus revision panel.

With your support and collective hard work, the AKU-EB has been able to take the necessary steps to ensure effective implementation of the National Curriculum of Pakistan through this syllabus. We are confident that this syllabus will continue to provide the support that is needed by students to progress to the next level of education and we wish all the best to students and their teachers in implementing this syllabus.



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## Introduction to AKU-EB Syllabi

1. The Aga Khan University Examination Board (AKU-EB) has a mandate by Ordinance CXIV of 2002 ‘to test the attainment of the objectives of the national curriculum, for the purpose of enhancing student learning, and to do all such things that may be considered appropriate for the improvement of education in respect to teaching and learning, institutional effectiveness and all things ancillary and incidental thereto’.
2. The AKU-EB syllabi are an important tool in the achievement of this mandate. These syllabi are based on the latest National Curriculum of Pakistan and the National Scheme of Studies. The syllabi bring together all those cognitive outcomes of the National Curriculum statement which can be reliably and validly assessed. Moreover, the syllabi aim to achieve the pedagogically desirable objectives of the National Curriculum which encourage ‘observation, creativity and other higher order thinking skills’, better meeting the needs of the students of the twenty-first century.
3. The syllabi guide the students, teachers, parents and other stakeholders regarding the topics that will be taught and examined in each grade (IX, X, XI and XII). In each syllabus document, the content progresses from simple to complex, thereby, facilitating a gradual, conceptual learning of the content.
4. The topics of the syllabi are divided into subtopics and **student learning outcomes (SLOs)**. The subtopics and the SLOs define the depth and the breadth at which each topic will be taught, learnt and examined. The syllabi complement the national curriculum by providing enabling SLOs where needed to scaffold student learning.
5. Each SLO starts with an achievable and assessable **command word** such as describe, relate, evaluate, etc. The purpose of the command words is to direct the attention of teachers and students to specific tasks that the students are expected to undertake in the course of their studies. The examination questions are framed using the same command words or their connotations to elicit evidence of these competencies in students’ responses.
6. The SLOs are classified under three **cognitive levels**: knowledge (K), understanding (U) and application and other higher order skills (A) for effective planning during teaching and learning and deriving multiple choice questions (MCQs) and constructed response questions (CRQs) and extended response questions (ERQs) on a rational basis from the subject syllabi, ensuring that the intentions of the national curriculum are also met during examinations.
7. By focusing on the achievement of the SLOs, these syllabi aim to counter the culture of rote memorisation as the preferred method of examination preparation. While suggesting relevant, locally available textbooks for achieving these outcomes, AKU-EB recommends that teachers and students use multiple teaching and learning resources for achieving these outcomes.



8. The syllabi follow a uniform layout for all subjects to make them easier for students and teachers to follow. They act as a bridge between students, teachers and assessment specialists by providing a common framework of student learning outcomes and **exam specifications**.
9. On the whole, the AKU-EB syllabi for Higher Secondary School Certificate (HSSC) progressively help the students to achieve the benchmarks of the national curriculum and hone in them conceptual understanding, critical thinking and problem solving skills, thereby preparing them for professional and higher education.



## Aims/ Objectives of the National Curriculum (2007)<sup>1</sup>

### Aims

The Curriculum of General Mathematics for grades IX-X has been designed keeping in view the socio-economic, technical, professional and labour market needs of the country. It continuously focuses on the contents of five Mathematics Standards framed in the National Curriculum of Mathematics 2006. The following themes permeate the curriculum for General Mathematics.

- The curriculum builds the solid conceptual foundation in Mathematics that enables the students to apply their knowledge skillfully and further their learning successfully.
- The curriculum accentuates arithmetic skills that apply to both personal and vocational business opportunities.
- The flourishing fields of financial and business Mathematics have been introduced to provide step-by-step guidance. They serve as a good foundation for further study in management, accounting and finance.
- The curriculum stresses graphics that enable the students to visualize and interpret mathematical expressions correctly rather than to manipulate them ‘blindly’.

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<sup>1</sup> Government of Pakistan (2007), Page 1, *National Curriculum for General Mathematics IX-X*, Islamabad, Ministry of Education (Curriculum Wing)

# Subject Rationale of AKU-EB Business Mathematics & Business Statistics

## What will you learn in AKU-EB Business Mathematics and Business Statistics?

The syllabus of Business Mathematics and Business Statistics is specifically designed for the benefit of commerce students so that they can be prepared for higher studies. It is a combination of financial mathematics, algebra, calculus and substantial topics of basic statistics. The topics encompassed in the syllabus of business mathematics are pertinent to consumer mathematics which is applicable in everyday life and commerce, in particular. The statistics develops the skills of collecting, representing and analysing data to make informed decisions. It is an art to learn from data and to make key judgements in research, quality assurance, forecasting, policy making and personal management.

## Where will it take you?<sup>2</sup>

The overall syllabus of business mathematics and business statistics along with economics, accounting and business communication provide a pedestal to the students to peruse their career as a/ an

- Entrepreneur
- Actuary
- Finance Manager
- Budget Expert
- Market Research Analyst, etc.

## How to approach the syllabus?

The topics and the student learning outcomes (SLOs) guide regarding the details about what has to be achieved. The exam specifications guide regarding what will be expected in the examination.

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<sup>2</sup> Students may be required to study others subject alongside in order to qualify for graduate studies in these fields.

# Student Learning Outcomes of AKU-EB HSSC Business Mathematics & Business Statistics

## Part I (Grade XI)

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level <sup>3</sup>		
			K	U	A
<b>1. Business Arithmetic</b>	Students should be able to:				
1.1 Ratio	1.1.1	find the ratio in which a quantity is increased or decreased;			*
	1.1.2	solve word problems related to the concepts of ratios;			*
1.2 Variations and its Types	1.2.1	describe direct, inverse and compound (joint and combined) variations;		*	
	1.2.2	solve word problems related to SLO 1.2.1;			*
1.3 Percentage	1.3.1	describe percentage;		*	
	1.3.2	solve word problems related to the concept of percentages; i.e, marked/ tag/ list price, selling price, cost price, profit, loss, and discount.			*

<sup>3</sup> K = Knowledge, U = Understanding, A = Application and other higher-order cognitive skills

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>2. Interest and Annuities</b>	Students should be able to:				
2.1 Simple Interest	2.1.1	describe simple interest, principal amount, rate of interest and accumulated amount;		*	
	2.1.2	solve word problems related to the concept of -simple interest;			*
2.2 Compound Interest	2.2.1	describe compound interest, principal amount, rate of interest (monthly, bi-monthly/ twice in a month, quarterly, half yearly/ semi-annually/ bi-annually, yearly/ per annum) and future value/ compounded value/ accumulated amount;		*	
	2.2.2	distinguish between simple and compound interest;		*	
	2.2.3	describe effective annual rate of interest;		*	
	2.2.4	calculate effective annual rate of interest;			*
	2.2.5	solve word problems related to the concept of compound interest;			*
2.3 Annuities	2.3.1	describe annuities and its accumulation factor;		*	
	2.3.2	distinguish between compound interest and annuities;		*	
	2.3.3	distinguish between ordinary annuity and annuity due;		*	
	2.3.4	describe present and future value of annuity;		*	
	2.3.5	solve word problems related to the concept of ordinary annuity i.e. investment, deposit and loans.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>3. Linear Equations, Functions and their Graphs</b>	Students should be able to:				
3.1 Linear Equations	3.1.1	illustrate the Cartesian plane, i.e. horizontal axis, vertical axis, origin and quadrants, abscissa, ordinate and ordered pair;			*
	3.1.2	define the slope or gradient of a line;	*		
	3.1.3	find the slope of a line passing through two points;			*
	3.1.4	interpret graphically the slope of a line, i.e. zero, negative, positive and undefined;			*
	3.1.5	convert the given equation into: a. slope - intercept form ( $y = mx + c$ ) b. intercepts form;			*
	3.1.6	find the equation of a straight line using: a. slope - intercept form ( $y = mx + c$ ) b. point - slope form c. intercepts form;			*
	3.1.7	find the equation of straight line when they are: a. parallel to $x$ - axis b. parallel to $y$ - axis c. parallel to a given line d. perpendicular to a given line;			*
3.2 Linear Functions	3.2.1	sketch the graphs of linear functions;			*
	3.2.2	interpret the meaning of gradient and $y$ - intercept in a linear graph;			*
	3.2.3	interpret the graph of linear functions in a given situation.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>4. Quadratic Equations, Quadratic Functions and their Graphs</b>	Students should be able to:				
4.1 Quadratic Equations	4.1.1	solve quadratic equations in one variable by using a. factorisation method b. the quadratic formula c. completing the square method;			*
	4.1.2	solve word problems related to quadratic equations;			*
4.2 Quadratic Functions and Their Graphs	4.2.1	distinguish between a. independent and dependent variables b. domain and range of quadratic functions;		*	
	4.2.2	convert a quadratic function into the form $y = a(x - h)^2 + k$ where, $h$ and $k$ are the coordinates of vertex / turning point;			*
	4.2.3	find the vertex, intercepts, axis of symmetry and direction (concavity) of a quadratic function;			*
	4.2.4	find the minimum or maximum value of quadratic functions;			*
	4.2.5	find domain and range of a quadratic functions;			*
	4.2.6	sketch the graph of a quadratic functions, i.e. parabola;			*
	4.2.7	solve problems based on the graph of a quadratic functions.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>5. Simultaneous Solution of Equations and Linear Inequalities</b>	Students should be able to:				
5.1 Simultaneous Solution of Linear and Quadratic Equations in two variables	5.1.1	solve simultaneous equations: a. both are linear b. both are quadratic, i.e., $ax^2 + by^2 = m$ ; $cx^2 + dy^2 = n$ c. one is linear and other is quadratic, i.e., $ax + by = m$ ; $cx^2 + dy^2 = n$ ;			*
5.2 Linear Inequalities in two variables	5.2.1	explain the concept of algebraic solutions of linear inequality in one variable and its representation on the number line;		*	
	5.2.2	find the region for linear inequalities in two variables:			*
	5.2.3	determine graphically, the region bounded by linear inequalities in two variables; ( <b>Note:</b> up to four linear inequalities.)			*
	5.2.4	solve problems based on linear inequalities in two variables.			*



Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>6. Matrices and Determinants</b>	Students should be able to:				
6.1 Addition and Subtraction of Matrices (up to order $3 \times 3$ )	6.1.1	find the addition and subtraction of matrices (where applicable);			*
	6.1.2	write the additive identity and additive inverse of a matrix;	*		
6.2 Multiplication of Matrices (up to order $3 \times 3$ )	6.2.1	describe the multiplication of a matrix by a real number;		*	
	6.2.2	find the multiplication of two (or three) matrices (where applicable);			*
	6.2.3	verify with the help of examples that commutative law under multiplication does not hold in general i.e. $AB \neq BA$ ;			*
6.3 Multiplicative Inverse of Matrix (up to order $3 \times 3$ )	6.3.1	calculate the determinant of a matrix;			*
	6.3.2	solve problems related to singular and non-singular matrix;			*
	6.3.3	find the multiplicative inverse of a matrix;			*
	6.3.4	solve the matrix equation e.g. Find X, if $3X + \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 1 & 5 \\ 0 & -1 \end{bmatrix} = 6 \begin{bmatrix} 2 & 7 \\ 3 & 4 \end{bmatrix};$			*
	6.3.5	solve word problems based on matrices;			*
6.4 Solution of Simultaneous Linear Equations (up to three variables)	6.4.1	solve a matrix equation using the following methods: a. Inverse Matrix Method b. Cramer's Rule.			*

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
<b>7. Derivative of Algebraic Functions</b>	Students should be able to:			
7.1 Derivative of Algebraic Functions	7.1.1 describe derivative as a. an instantaneous rate of change b. gradient or slope of tangent to the curve;		*	
	7.1.2 find the derivative of an algebraic function using the following rules of differentiation: a. $\frac{d}{dx}[c] = 0$ b. $\frac{d}{dx}(f(x))^n = nf(x)^{n-1} \times f'(x)$ c. $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$ d. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$ e. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2};$			*
	7.1.3 find the gradient or slope of tangent to the curve.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>8. Sequence and Series</b>	Students should be able to:				
8.1 Arithmetic Sequence	8.1.1	describe arithmetic sequence;		*	
	8.1.2	solve problems involving arithmetic sequence;			*
8.2 Arithmetic Series	8.2.1	describe arithmetic series;		*	
	8.2.2	solve problems involving arithmetic series;			*
8.3 Geometric Sequence	8.3.1	describe geometric sequence;		*	
	8.3.2	solve problems involving geometric sequence;			*
8.4 Geometric Series	8.4.1	describe geometric series;		*	
	8.4.2	find the sum to $n$ terms of a finite geometric series.			*

## Part II (Grade XII)

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>9. Introduction to Statistics</b>	Students should be able to:				
9.1 Introduction	9.1.1	describe the importance of statistics;		*	
	9.1.2	distinguish between: a. descriptive and inferential statistics b. statistic and parameter c. population and sample;		*	
9.2 Data Collection	9.2.1	distinguish between primary and secondary data;		*	
	9.2.2	explain the methods of collection of primary and secondary data;		*	
	9.2.3	describe an effective questionnaire and its characteristics;		*	
	9.2.4	construct a simple and effective questionnaire using pen and paper or via Survey Monkey or Google Forms;			CA <sup>4</sup>
9.3 Types of Variable	9.3.1	describe constant, variable, qualitative variable, quantitative variable, discrete variable and continuous variable.		*	
	9.3.2	differentiate among constant, variable, qualitative variable, quantitative variable, discrete variable and continuous variable.		*	

<sup>4</sup> CA = Classroom Activity, not to be assessed under examination conditions

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>10. Presentation of Statistical Data</b>	Students should be able to:				
10.1 Frequency Distribution	10.1.1	construct a frequency distribution table of discrete and continuous data including equal and unequal class intervals, tally marks/ frequency, upper class limit/ boundary, lower class limit/ boundary, class mark/ midpoint, class width and cumulative frequency;			*
	10.1.2	draw a frequency polygon and extract information from the graph;			*
	10.1.3	draw a histogram for equal and unequal class interval and extract information from the graph (estimation of mode);			*
	10.1.4	find relative frequency;			*
	10.1.5	draw a relative frequency histogram and polygon to extract information from graph;			*
	10.1.6	draw a pie chart and extract information from it;			*
	10.1.7	solve problems related to the above-mentioned graphs and charts;			*
	10.1.8	use MS Excel to make histograms, frequency polygons and pie charts.			CA

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>11. Measures of Central Tendency and Quartiles</b>	Students should be able to:				
11.1 Arithmetic Mean	11.1.1	calculate arithmetic mean (A.M) for grouped and ungrouped data;			*
	11.1.2	calculate the weighted A.M;			*
	11.1.3	apply the following properties of arithmetic mean to solve related problems: a. if $X = a$ ( $a$ is constant), then $\bar{X} = a$ b. if $Y = X \pm a$ , then $\bar{Y} = \bar{X} \pm a$ c. if $Y = bX$ , then $\bar{Y} = b \bar{X}$ d. if $Y = \frac{X}{a}$ , then $\bar{Y} = \frac{\bar{X}}{a}$ or $\bar{Y} = \frac{1}{a}(\bar{X})$ ;			*
11.2 Median	11.2.1	describe median;		*	
	11.2.2	calculate median for ungrouped and grouped data;			*
11.3 Quartiles	11.3.1	describe quartiles;		*	
	11.3.2	calculate quartiles for ungrouped and grouped data;			*
	11.3.3	construct less than and more than cumulative frequency table;			*
	11.3.4	draw a less than and more than cumulative frequency curve for grouped data;			*
	11.3.5	construct a. stem and leaf display/ plot to summarise data; b. box and whisker (5 number summary) diagram;			*
	11.3.6	solve problems related to SLOs 11.3.2 to 11.3.5;			*
	11.3.7	use MS Excel to calculate mean, median and quartiles etc. (descriptive statistics for ungrouped data);			CA
	11.3.8	use MS Excel to draw cumulative frequency curve.			CA

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
<b>12. Measures of Dispersion</b>	Students should be able to:			
12.1 Standard Deviation, Variance and Coefficient of Variation	12.1.1		*	
	12.1.2		*	
	12.1.3			*
	12.1.4			*
	12.1.5		*	

Students should be able to:

12.1.1 describe variance and standard deviation (S.D) for ungrouped and grouped data;

12.1.2 distinguish between variance and standard deviations;

12.1.3 calculate variance and standard deviation for ungrouped data by using the formulae:

$$\text{a. variance : } \sigma^2 = \frac{\sum x^2}{n} - \left( \frac{\sum x}{n} \right)^2 \text{ or } \sigma^2 = \frac{\sum (x - \bar{x})^2}{n}$$

$$\text{b. standard deviation : } \sigma = \sqrt{\frac{\sum x^2}{n} - \left( \frac{\sum x}{n} \right)^2} \text{ or}$$

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

12.1.4 calculate variance and standard deviation for grouped data by using the formulae:

$$\text{a. variance : } \sigma^2 = \frac{\sum fx^2}{\sum f} - \left( \frac{\sum fx}{\sum f} \right)^2 \text{ or } \sigma^2 = \frac{\sum f(x - \bar{x})^2}{\sum f}$$

$$\text{b. standard deviation : } \sigma = \sqrt{\frac{\sum fx^2}{\sum f} - \left( \frac{\sum fx}{\sum f} \right)^2} \text{ or } \sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$$

12.1.5 explain the following properties of variance and standard deviation:

a. S.D (a) = 0 and Var (a) = 0

b. S.D (X + a) = S.D (X) and Var (X + a) = Var (X)

c. S.D (X - a) = S.D (X) and Var (X - a) = Var (X)

d. S.D (aX) = a S.D (X) and Var (aX) = a<sup>2</sup> Var (X)

e. S.D  $\left( \frac{X}{a} \right) = \frac{1}{a}$  S.D (X) and Var  $\left( \frac{X}{a} \right) = \frac{1}{a^2}$  Var (X);



Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
	Students should be able to:			
	12.1.6 apply the above-mentioned properties to solve related problems;			*
	12.1.7 describe coefficient of variation;		*	
	12.1.8 calculate coefficient of variation for ungrouped data;			*
	12.1.9 solve problems related to variance, standard deviation and coefficient of variation for ungrouped data;			*
	12.1.10 use scientific calculator to find mean, median, quartiles, variance and standard deviation of grouped and ungrouped data;			CA
	12.1.11 use MS Excel commands to calculate variance, standard deviation and coefficient of variation.			CA

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>13. Index Number</b>	Students should be able to:				
13.1 Index Number	13.1.1	describe price index, quantity index and volume index;		*	
	13.1.2	distinguish between simple and composite index number;		*	
	13.1.3	explain the uses of index numbers;		*	
13.2 Construction of Index Number	13.2.1	calculate index number by fixed base method and chain base method;			*
	13.2.2	calculate simple price index and interpret its meaning;			*
13.3 Construction of Composite Index Number	13.3.1	calculate weighted price index by Laspeyeres, Paasche's and Fisher's indices.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>14. Counting Techniques and Probability</b>	Students should be able to:				
14.1 Counting Techniques	14.1.1	identify $n!$ as the notation to express the product of the first $n$ natural numbers;		*	
	14.1.2	describe the fundamental principle of counting;		*	
	14.1.3	illustrate the fundamental principle of counting by using a tree diagram;			*
	14.1.4	solve problems (tree diagram or otherwise) related to fundamental principle of counting;			*
14.2 Permutation	14.2.1	describe permutation;		*	
	14.2.2	apply the formula of permutation for: a. $n$ different objects taken $r$ at a time when repetition is not allowed b. $n$ different objects taken $r$ at a time when repetition is allowed c. $n$ objects when $n_1$ are alike, $n_2$ are alike, $n_3$ are alike,..... $n_k$ are alike where $n = n_1 + n_2 + n_3 + \dots + n_k$ ;			*
	14.2.3	solve problems related to permutation with and without restrictions;			*
14.3 Combination	14.3.1	describe combination;		*	
	14.3.2	apply the formula of combination to solve related problems;			*
14.4 Basic Concepts of Probability	14.4.1	describe probability with related terminologies, i.e. experiment, outcome, sample space and event;		*	
	14.4.2	state the axioms of probability;	*		
	14.4.3	calculate probability of an event in simple cases;			*
	14.4.4	distinguish between mutually exclusive and mutually non-exclusive events;		*	

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		K	U	A
	Students should be able to:			
	14.4.5 describe the general addition rule of probability where $A$ and $B$ are: a. mutually exclusive, i.e. $P(A \cup B) = P(A) + P(B)$ b. mutually non-exclusive i.e. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ ;		*	
	14.4.6 distinguish between independent and dependent events;		*	
	14.4.7 describe the law of multiplication of probability where $A$ and $B$ are independent events i.e. $P(A \cap B) = P(A) \times P(B)$ ;		*	
	14.4.8 describe conditional probability;		*	
	14.4.9 calculate conditional probability $P(B A)$ or $P(A B)$ where $A$ and $B$ are dependent events;			*
	14.4.10 describe the law of multiplication of probability where $A$ and $B$ are dependent events i.e. $P(A \cap B) = P(A) \times P(B A)$ OR $P(A \cap B) = P(B) \times P(A B)$ ;		*	
	14.4.11 find the probability of independent and dependent events using a tree diagram;			*
	14.4.12 apply the laws mentioned in SLOs 14.4.5, 14.4.7 and 14.4.10 to solve related problems.			*

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			K	U	A
<b>15. Scatter Diagram and Correlation</b>	Students should be able to:				
15.1 Scatter Diagram	15.1.1	draw scatter diagram;			*
	15.1.2	discuss the nature of relationship between two variables;		*	
15.2 Simple Linear Correlation	15.2.1	describe correlation and its nature, i.e. positive correlation, negative correlation and no correlation;		*	
	15.2.2	describe the correlation coefficient, i.e. $r$ ;		*	
	15.2.3	calculate the coefficient of correlation by using the formula: $r = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{[n \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}}$			*

# Summary of Student Learning Outcomes (SLOs)

## Grade XI

**Table 1: Number of Student Learning Outcomes by Cognitive level**

Topic No.	Topic	No. of Sub-Topics	SLOs			Total SLOs
			K	U	A	
1.	Business Arithmetic	3	0	2	4	6
2.	Interest and Annuities	3	0	8	4	12
3.	Linear Equations, Functions and their Graphs	2	1	0	9	10
4.	Quadratic Equations, Quadratic Functions and their Graphs	2	0	1	8	9
5.	Simultaneous Solution of Equations and Linear Inequalities	2	0	1	4	5
6.	Matrices and Determinants	4	1	1	9	11
7.	Derivative of Algebraic Functions	1	0	1	2	3
8.	Sequence and Series	4	0	4	4	8
<b>Total</b>		<b>21</b>	<b>2</b>	<b>18</b>	<b>44</b>	<b>64</b>
<b>Percentage</b>			<b>3</b>	<b>28</b>	<b>69</b>	<b>100</b>

Table 2: Number of Student Learning Outcomes by Cognitive level

Topic No.	Topic	No. of Sub-Topics	SLOs			Total SLOs
			K	U	A	
9.	Introduction to Statistics	3	0	7	0	7
10.	Presentation of Statistical Data	1	0	0	7	7
11.	Measures of Central Tendency and Quartiles	3	0	2	9	11
12.	Measures of Dispersion	1	0	4	5	9
13.	Index Number	3	0	3	3	6
14.	Counting Techniques and Probability	4	1	11	9	21
15.	Scatter Diagram and Correlation	2	0	3	2	5
<b>Total</b>		<b>17</b>	<b>1</b>	<b>30</b>	<b>35</b>	<b>66</b>
<b>Percentage</b>			<b>2</b>	<b>45</b>	<b>53</b>	<b>100</b>



# Scheme of Assessment

## Grade XI

**Table 3: Exam Specification**

Topic No.	Topic	Marks Distribution	Total Marks
1.	Business Arithmetic	MCQs 2 @ 1 Mark CRQ 1 @ 4 Marks	6
2.	Interest and Annuities	MCQs 2 @ 1 Mark CRQ 1 @ 4 Marks	6
3.	Linear Equations, Functions and their Graphs	MCQs 2 @ 1 Mark CRQ 1 @ 3 Marks	5
4.	Quadratic Equations, Quadratic Functions and their Graphs	MCQs 3 @ 1 Mark *CRQs 2 @ 4 Marks each Choose any ONE from TWO	7
5.	Simultaneous Solution of Equations and Linear Inequalities	MCQs 2 @ 1 Mark CRQ 1 @ 5 Marks	7
6.	Matrices and Determinants	MCQs 3 @ 1 Mark CRQ 1 @ 4 Marks	7
7.	Derivative of Algebraic Functions	MCQs 4 @ 1 Mark CRQ 1 @ 3 Marks	7
8.	Sequence and Series	MCQs 2 @ 1 Mark CRQ 1 @ 3 Marks	5
<b>Total Marks</b>		<b>MCQs 20</b> <b>CRQs 30</b>	<b>50</b>

\* There will be TWO questions and the candidates will be required to attempt any ONE by making a choice out of the TWO.

Table 4: Exam Specification

Topic No.	Topic	Marks Distribution	Total Marks
9.	Introduction to Statistics	MCQ 1 @ 1 Mark CRQ 1 @ 3 Marks	4
10.	Presentation of Statistical Data	MCQs 3 @ 1 Mark CRQ 1 @ 4 Marks	7
11.	Measures of Central Tendency and Quartiles	MCQs 5 @ 1 Mark *CRQs 2 @ 5 Marks Choose any ONE from TWO	10
12.	Measures of Dispersion	MCQs 4 @ 1 Mark CRQ 1 @ 4 Marks	8
13.	Index Number	MCQs 2 @ 1 Mark CRQ 1 @ 5 Marks	7
14.	Counting Techniques and Probability	MCQs 4 @ 1 Mark *CRQs 2 @ 5 Marks Choose any ONE from TWO	9
15.	Scatter Diagram and Correlation	MCQ 1 @ 1 Mark CRQ 1 @ 4 Marks	5
<b>Total</b>		<b>MCQs 20</b> <b>CRQs 30</b>	<b>50</b>

\* There will be TWO questions and the candidates will be required to attempt any ONE by making a choice out of the TWO.

- Tables 1 and 2 indicate the number and nature of SLOs in each topic in classes XI (Business Mathematics) and XII (Business Statistics) respectively. This will serve as a guide in the construction of the examination paper. It also indicates that more emphasis has been given to the Understanding (28% in XI and 45% in XII), Application and higher order skills (69% in XI and 53% in XII) to discourage rote memorisation. Tables 1 and 4, however, do not translate directly into marks.
- There will be two examinations, one at the end of Class XI (Business Mathematics) and one at the end of Class XII (Business Statistics).
- In each class, the theory paper will be in two parts: paper I and paper II. Both papers will be of duration of 2 hours.
- Paper I theory will consist of 20 compulsory, multiple choice items. These questions will involve four response options.
- Paper II theory will carry 30 marks and consist of a number of compulsory constructed response questions. There will be no choice among the topics in the constructed response but it may be within the topic.
- All constructed response questions will be in a booklet which will also serve as an answer script.

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