At the end of the lesson, you should be able to:

# Chapter 2: Systems of Linear Equations and Matrices:

## 2.1: Solutions of Linear Systems by the Echelon Method

- Define linear systems, unique solution, inconsistent, and dependent.
- Define the transformations of an equivalent system, the echelon method, and back substitution.
- Solve linear systems using the echelon method.
- Define parameter and parametric form.
- Solve dependent linear systems in parametric form using the echelon method.

## 2.2: Solutions of Linear Systems by the Gauss-Jordan Method

- Define matrix, element, and augmented matrix.
- Define row operations and relate them to system transformations.
- Formulate the Gauss-Jordan method as an extension of the echelon method.
- Solve linear systems using the Gauss-Jordan method.
- Solve dependent linear systems in parametric form using the Gauss-Jordan method.

## 2.3: Addition and Subtraction of Matrices

- Define matrix size, square matrix, row matrix, column matrix, and matrix equality.
- Define when two matrices can be added or subtracted and the corresponding matrix operations.
- Add and subtract matrices of the same size.

## 2.4: Multiplication of Matrices

- Define the scalar product of a matrix.
- Multiply a scalar and a matrix.
- Define when two matrices can be multiplied and the corresponding matrix operation.
- Multiply compatible matrices.

## 2.5: Matrix Inverses

- Define identity matrix and multiplicative inverse matrix.
- Find the inverse of a square matrix using the matrix, the identity, and the Gauss-Jordan method.
- Define coefficient matrix, variable matrix, and matrix equations.
- Solve a linear system using matrix equations and matrix inverses.

## 2.6: Input-Output Models

- Define input-output matrix, production matrix, and demand matrix.
- Define closed model, open model, and a zero matrix.
- Apply matrix methods to find the demand and production matrix for a given open model.
- Apply matrix methods to find the production matrix for a given closed model.

# Chapter 3: Linear Programming: The Graphical Method

## 3.1: Graphing Linear Inequalities

- Graph linear inequalities.
- Find the feasible region satisfying all inequalities of the given system.
- Determine whether a feasible region is bounded or unbounded.

## 3.2: Solving Linear Programming Problems Graphically

- Find corner points on given a feasible region.
- Find the optimum value(s) of the objective function given a bounded region.
- Determine the existence of optimum value(s) of the objective function given a unbounded region and find the optimal value.
- Determine the existence of optimum value(s) of the linear programming problems and find the optimal value(s).

## 3.3: Applications of Linear Programming

- Solve application of the linear programming problem.

# Chapter 5: Mathematics of Finance

## 5.1: Simple and Compound Interest

- Calculate simple interest and future value for simple interest.
- Calculate compound interest and future value for compound interest.
- Calculate the effective corresponding a compound interest rate.
- Calculate the present value for compound interest.
- Calculate the compounding time given principal, future value, and the compound interest rate.
- Calculate the compounding rate given principal, future value, and the compound time.
- Calculate the above with continuous compound interest.

## 5.2: Future Value of an Annuity

- Calculate the sum of a geometric sequence.
- Calculate the future value of an ordinary annuity
- Calculate the periodic payment for a sinking fund.
- Calculate the annuities due for a future value of an annuity.
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## 5.3: Present Value of an Annuity; Amortization

- Calculate the present value of an ordinary annuity.
- Calculate the periodic payment for an amortization.
- Solve amortization schedule problems.

# Chapter 7: Sets and Basic Probability

## 7.1: Sets

- Define set, subset of a set, the compliment set of a set, the universal set, and the empty set.
- List the elements of a subset of a set, the compliment of a set, and the universal set.
- Represent a collection of objects using set and set-builder notation.
- Define the set operations: complement, intersection, disjoint, and union.
- Create a collection of elements based on set operations.
- Construct a tree diagram to list all of the subsets of a given set.

## 7.2: Applications of Venn Diagrams

- Define and apply union rule.
- Interpret or construct a Venn diagram to illustrate relationships amongst sets.
- Compute the number of elements in a region of a Venn diagram.

## 7.3: Introduction to Probability

- Define experiment, trial, outcomes, and sample space.
- Define simple event, certain event, impossible event, and mutually exclusive events.
- Count the number of outcomes for an event and its sample space.
- Define probability, properties of probability, and empirical probability.
- Calculate basic probability given the number of outcomes for an event and sample space.

## 7.4: Basic Concepts of Probability

- Calculate the probability of event(s) using set theory and set operations.
- Define the complement rule, odds in favor, and odds against an event.
- Calculate odds in favor and odds against, given the outcomes for an event and sample space.
- Calculate odds in favor and odds against, given the probability of an event.
- Calculate the probability of an event using the compliment rule.

## 7.5: Conditional Probability; Independent Events

- Define independence, conditional probability, and their product rules.
- Test two events for independence.
- Calculate the conditional probability given a probability table.
- Evaluate conditional probability on a probability tree by using the product rule.

# Chapter 8: Counting Principles and Advanced Probability

## 8.1: The Multiplication Principle; Permutations

- Define the multiplication principle, factorial, and permutations.
- Evaluate basic factorials and permutations.

## 8.2: Combinations

- Define and evaluate combinations.
- Solve basic probability problems using combinations and permutations.

## 8.3: Probability Applications of Counting Principles

- Apply permutations with multiplication principle to solve advanced probability applications.
- Apply combinations with multiplication principle to solve advanced probability applications.

## 8.4: Binomial Probability

- Define Bernoulli trials, binomial experiment, binomial probability, and Pascal's triangle.
- Calculate the probability of a binomial experiment using the binomial formula.

## 8.5: Probability Distributions; Expected Value

- Define random variable and probability distribution.
- Construct a probability distribution function and its corresponding histogram.
- Define expected value, fair game, and the expected value for a binomial experiment.
- Calculate the expected value of a probability distribution.
- Determine the fairness of a game given the expected value.

# Chapter 9: Statistics

## 9.1: Frequency Distributions; Measures of Central Tendency

- Define random sample, grouped data, grouped frequency distribution, mean, and median
- Evaluate mean and median for ungrouped data.
- Evaluate mean for a grouped data.

## 9.2: Measures of Variation

- Define range, deviations from the mean, variance, standard deviation, sample, and population.
- Determine whether a scenario or data represents a sample or a population.
- Calculate range, standard deviation, and variance for ungrouped data.
- Calculate standard deviation and variance for grouped data.

## 9.3: The Normal Distribution

- Define continuous distribution, skewed, normal distribution, and normal probability
- Define the standard normal curve and z-score.
- Draw a normal curve and identify the desired shaded region underneath the curve.
- Calculate the z-score given a value in a normal distribution.
- Calculate the probability of the desired shaded region in a normal distribution.

## 9.4: Normal Approximations to the Binomial Distribution

- Define binomial distribution and its mean and standard deviation.
- Calculate the mean and standard deviation of a binomial distribution.
- Define the rule of thumb for approximating a binomial distribution with a normal distribution.
- Apply normal curve mechanics to calculate z-scores and probabilities for a binomial distribution.

# Chapter 11: Game Theory

## 11.1: Strictly Determined Games

- Create a payoff matrix to represent a game scenario.
- Determine if any dominated strategies exist in a payoff matrix.
- Identify any saddle points in a payoff matrix.
- Determine the value of a game with a saddle point.

## 11.2: Mixed Strategies

- Calculate the expected value of a game with no saddle point.
- Find the optimum strategies of a non-strictly determined game.
- Calculate the value of a non-strictly determined game.