



Course Name

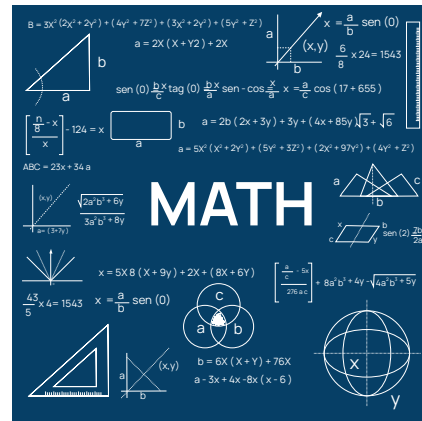
ELEMENTARY MATHEMATICS (ALGEBRA & TRIGONOMETRY)

FULL COURSE SUMMARY

IN SUMMARY

In the first week, you explored sets in mathematics, learning about their definition as collections of distinct objects. You discovered three ways to describe sets: roster notation, set-builder notation, and semantic definition, as well as the various types of sets.

Furthermore, you delved into numbers, where you explored different number sets such as natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers. The ordering of real numbers was covered, along with the representation of numbers on the real number line using interval notation.



Additionally, you learned exponents, covering their definitions and rules. You learned how exponents are used to express large and small numbers, as well as the product, quotient, and power rules for simplifying expressions. Scientific notation, a shorthand method for representing numbers, was also introduced, along with the conversion between scientific and standard notation.

Finally, you explored quadratic equations, including their general form and connection to second-degree polynomials. Three methods for solving quadratic equations were discussed: factoring, using the square root property, and the quadratic formula.

In summary, these weeks provided a comprehensive overview of sets, numbers, exponents, and quadratic equations, laying the foundation for further mathematical exploration.

BULLET POINT SUMMARY



- A set is a collection of distinct objects.
- There are three ways to describe sets: roster notation, set-builder notation, and semantic definition.
- Number sets include natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers.
- Numbers can be represented on the real number line using interval notation.
- Exponents are used to express large and small numbers.
- Scientific notation is a shorthand method for representing numbers.
- Quadratic equations are second-degree polynomials.

BULLET POINT SUMMARY

- Three methods for solving quadratic equations include factoring, using the square root property, and the quadratic formula.

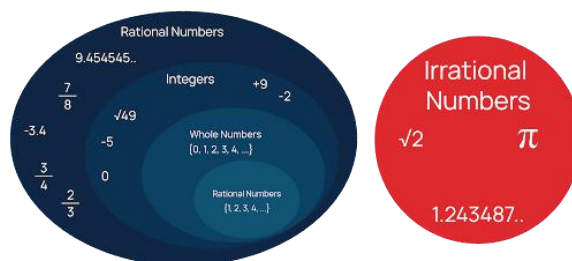
CASE STUDY

CASE STUDY 1

TITLE: ANALYSING CUSTOMER PREFERENCES FOR A
RETAIL STORE

This case study focuses on the application of set theory to analyse customer preferences for a retail store. The objective is to use customer purchasing behaviour to identify preferences, analyse overlapping tastes, and inform product assortment and marketing strategies. The method involves collecting customer transaction data, demographics, and

product categories to define preferences. Set operations are used to analyse preferences, and Venn diagrams visualise preference sets. Popular categories are identified for targeted marketing and optimised assortment. Continuous data collection refines preferences and strategies. The effectiveness of the approach is evaluated through sales data and feedback, measuring satisfaction, revenue, and performance improvements.



CASE STUDY 2

TITLE: MODELLING POPULATION GROWTH USING
QUADRATIC EQUATIONS

This case study explores the use of quadratic equations to analyse and predict population growth in a specific region. The objective is to collect population data, derive a quadratic equation to model population growth, and assess the accuracy of the equation through comparisons with actual population values. The established equation is then used to forecast population growth in future years, with continual monitoring to evaluate the model's reliability.

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

QUESTIONS TO PONDER

- How do improvements in customer satisfaction, sales revenue, and overall business performance serve as indicators of the success of strategies informed by set theory analysis?
- How can interval notation and the properties of ordering be applied to solve real-life problems and make informed decisions in various fields such as finance, statistics, or scientific research?
- How does the use of scientific notation simplify calculations and the representation of large or small numbers in various scientific fields?
- What are the advantages and disadvantages of each method (factoring, square root property,

quadratic formula) for solving quadratic equations?

$$a^0 = 1, a \neq 0$$



SKILLS AND COMPETENCIES YOU HAVE ACQUIRED AFTER THIS LESSON

Understanding of set theory, Mathematical representation, Set operations, Visualisation with Venn diagrams, Analytical thinking, Problem solving skill, Critical thinking, Data interpretation, Continuous learning and adaptation, Classification of number sets, Understanding of perfect squares and square roots, Ordering of real numbers, Representation on the real number line, Familiarity with interval notation, Application of properties of ordering, Understanding quadratic equations and their importance, Knowledge of different methods to solve quadratic equations, Understanding the concept of exponents and their rules, Proficiency in performing operations with numbers in scientific notation

PERSONAL REFLECTION

Set theory offers a framework to analyse and categorise information with precision. Exponents and scientific notation enhance numeracy skills. Quadratic equations are relevant in real-life scenarios like garden dimensions and projectile motion.



IN SUMMARY

Firstly, you delved into exponential functions and logarithmic functions. You learned that exponential functions involve raising a positive base to a variable exponent and can represent exponential growth or decay, while logarithmic functions are the inverse of exponential functions and involve finding the exponent needed to obtain a given value.

Next, you explored sequences and series. You learned that sequences are ordered lists of numbers, and you applied explicit formulas to find specific terms in a sequence. Moving

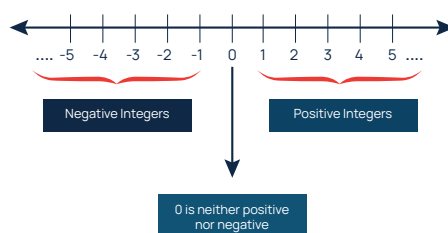
on to series, which represents the sum of terms in a sequence, you studied summation notation, formulas, and properties for calculating series sums.

Additionally, you learned about factorials, binomial expansion, and counting principles such as permutations and combinations. The principles of addition and multiplication were used to solve counting problems involving the arrangement and selection of distinct objects.

Lastly, you explored angles and their measurement. You studied the formation, naming, and measurement of angles, with degrees as the common unit of measurement. You learned about arcs, radians as an alternative unit of measurement, the conversion between degrees and radians, and the concept of arc length.

In summary, these weeks encompassed exponential and logarithmic functions, sequences and series, combinations and expansion, and angles and their measurement. These concepts provide you with valuable mathematical tools and applications for solving various problem

BULLET POINT SUMMARY



- Exponential functions involve raising a positive base to a variable exponent and can represent exponential growth or decay.
- Logarithmic functions are the inverse of exponential functions and involve finding the exponent needed to obtain a given value.
- Sequences are ordered lists of numbers.
- A series represents the sum of terms in a sequence.
- Permutations and combinations are counting principles
- The principles of addition and multiplication were used to solve counting problems involving the arrangement and selection of distinct objects.
- The degree is the common unit of angle measurement.



CASE STUDY

CASE STUDY 1

TITLE: MODELLING POPULATION GROWTH WITH EXPONENTIAL FUNCTIONS

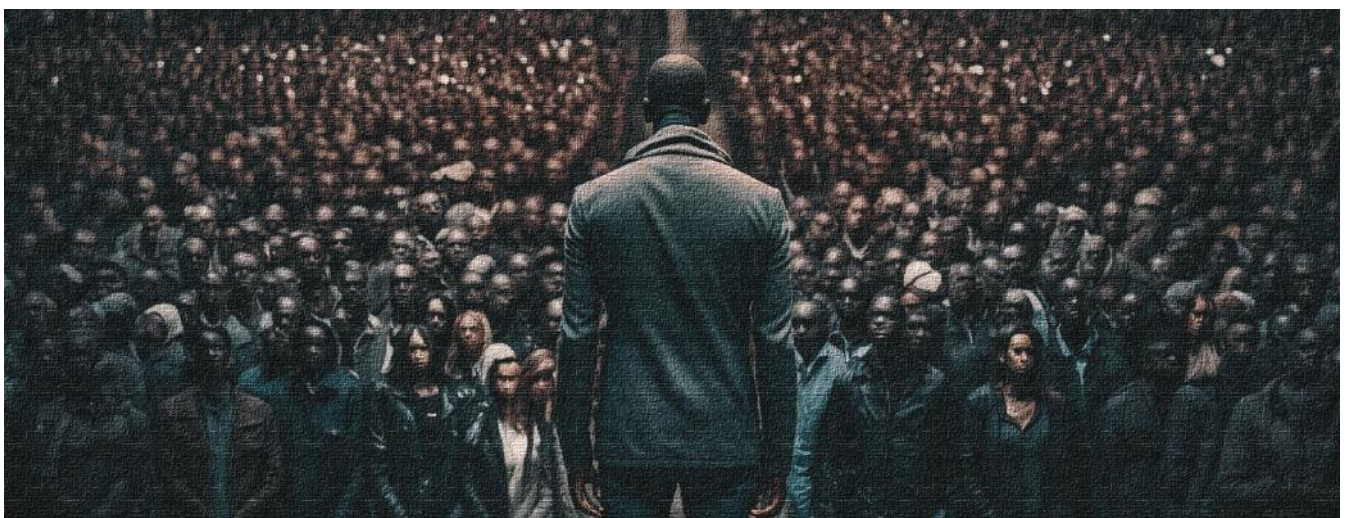
This case study explores the use of exponential functions to model and predict population growth. By analysing population data and employing exponential functions, accurate models are developed and validated against real-world data. The objective is to gain insights into population dynamics for informed decision-making in demographics, urban planning, and environmental studies.



CASE STUDY 2

TITLE: EXPLORING ANGLES AND CIRCULAR MEASURES: A CASE STUDY

This case study delves into angles and circular measures, aiming to enhance students' understanding and problem-solving skills in real-life contexts. Through a literature review, practical examples, measurement exploration, and problem-solving exercises, students gain a comprehensive grasp of angles and their applications. Data analysis and recommendations further contribute to effective teaching strategies and materials.



QUESTIONS TO PONDER

- How can exponential functions be applied to real-world scenarios beyond population growth, such as financial investments or the spread of diseases?
- What are the limitations or challenges associated with working with sequences and series in practical situations?
- Can you think of any situations where combinations and permutations are used outside of mathematics, such as in computer science or probability theory?
- How can the concept of arc length be applied in fields like physics or geography to calculate distances or trajectories?

$$a^{-n} = \frac{1}{a^n}$$

SKILLS AND COMPETENCIES YOU HAVE ACQUIRED AFTER THIS LESSON

Understanding the concept of exponential functions and their applications in various real-life scenarios, Proficiency in evaluating logarithms and using them to solve equations, Enhanced critical thinking and analytical abilities, Recognising and analysing patterns in mathematical sequences, Applying explicit and recursive formulas to find specific terms in a sequence, Understanding and using summation notation to represent and evaluate series, Understanding factorials, Combinations, and permutations, Problem solving, Mathematical reasoning, Application of formulas, Understanding of angle measurement, Drawing angles, Conversion between degrees and radians, Knowledge of quadrantal angles, Application of arc length.



PERSONAL REFLECTION

Studying exponential and logarithmic functions is a rewarding experience. The lesson on sequences and series provides valuable insights into mathematical concepts and their applications. Understanding factorials helps to grasp the principles of combinations and permutations, which are essential in counting problems. Trigonometry provides a comprehensive overview of angles, arc measurements, and their applications.



IN SUMMARY

This week, you explored the concept of trigonometry, covering angles, circular measures, and trigonometric functions. Reference angles were explored to evaluate trigonometric functions in different quadrants. You learned the even and odd nature of trigonometric functions and their relationships with their opposites.

Furthermore, you delved into the concept of complex numbers. You learned that a complex number is the combination of real and imaginary parts. The imaginary number i , is the square root of -1 . Arithmetic operations such as addition, subtraction, and multiplication can be carried out on complex numbers.

Additionally, you learned about linear equations, and systems of linear equations, which consist of two or more linear equations made up of two or more variables. You learned about the solution to a system of linear equations, which is any ordered pair that satisfies each equation. Also, you delved into matrices, which are rectangular arrays of numbers.

Finally, you explored matrix operations. You reviewed the process of matrix multiplication, where the product matrix is obtained by multiplying the entries of corresponding rows and columns. You learned the importance of determinants in matrix invertibility.

Overall, these weeks provided a comprehensive understanding of trigonometry, complex numbers, linear equations, and matrices, equipping you with valuable mathematical tools and problem solving skills.

BULLET POINT SUMMARY

$$\ln x = \log_e x$$

- Reference angles are used to evaluate trigonometric functions in different quadrants.
- Trigonometric functions are either even or odd in nature.
- A complex number is a combination of real and imaginary parts.
- The imaginary number i , is the square root of -1 .
- Systems of linear equations consist of two or more linear equations made up of two or more variables.
- Matrices are rectangular arrays of numbers.
- The product matrix is obtained by multiplying the entries of corresponding rows and columns.
- The determinant is very important for matrix invertibility.

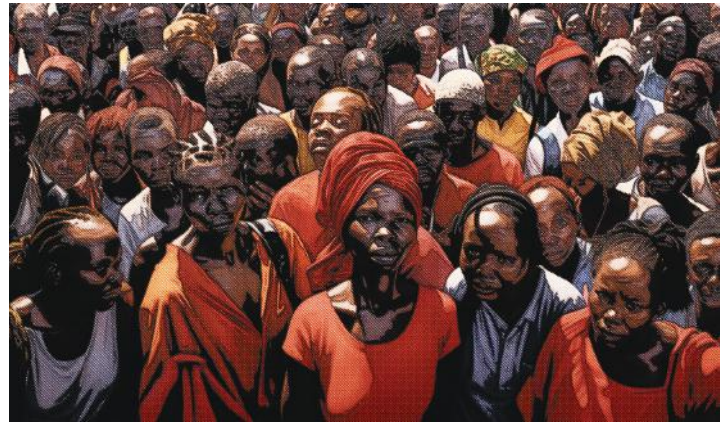


CASE STUDY

CASE STUDY 1

TITLE: ESTIMATING HEIGHTS USING TRIGONOMETRY: A CASE STUDY

This case study demonstrates the application of trigonometry to estimate the heights of tall structures. By measuring distances and angles, trigonometric functions are used to calculate the heights accurately and validate the estimates.



CASE STUDY 2

TITLE: OPTIMISING PRODUCTION PROCESSES IN A MANUFACTURING COMPANY

This case study focuses on optimising production processes in a manufacturing company to enhance efficiency and reduce costs. By analysing costs, quantities, and relationships, matrix operations are used to solve equations and determine the optimal mix of production units. The study aims to provide recommendations for ongoing cost optimisation in manufacturing.



QUESTIONS TO PONDER

- How are trigonometric functions applicable in real-world scenarios outside of mathematics and physics?
- Can you provide examples of how complex numbers are used in problem-solving or practical situations?
- How can the knowledge of solving systems of linear equations help us analyse real-world situations that involve multiple variables and equations?
- How are matrix operations and the concept of determinants used in real-world applications beyond solving systems of linear equations?

SKILLS AND COMPETENCIES YOU
HAVE ACQUIRED AFTER THIS LESSON

Understanding the concepts of angles and circular measure, Proficiency in evaluating trigonometric functions, Application of trigonometry in real-life problems, Improved spatial reasoning and visualisation abilities, Critical thinking, Understanding and representation of complex numbers, Proficiency in arithmetic operations of complex numbers, Familiarity with the cyclic pattern of raising the imaginary unit, i , to increasing powers, Recognising and formulating systems of linear equations, Solving systems of linear equations in two or three variables, Understanding matrices and their properties, Performing matrix operations.



PERSONAL REFLECTION

Trigonometry allows for shape and proportion analysis without precise dimensions. Understanding their representation, distinguishing between real and imaginary parts, and performing arithmetic operations enhance mathematical skills. The concept of linear equations and matrices offers a valuable exploration of fundamental mathematical concepts and their practical applications.

