17.2.0   MATHEMATICS II

17.2.1   Introduction
This module unit is intended to equip the trainee with the relevant mathematical knowledge, skills, techniques and attitudes necessary to enhance better understanding of the construction trades.

17.2.2   General Objectives
By the end of the module unit, the trainee should be able to:
a)   Explain the role of mathematics in the construction industry
b)   Determine ratios and proportions
c)   Apply mathematical concepts in the building industry

17.2.3   Module Unit Summary and Time Allocation

Mathematics II

Code	Sub-Module Units	Content	Time (Hours)
17.2.01	Probability	• Definition of probability • Dependent, independent and mutually exclusive events	5
17.2.02	Statistics	• Definition of statistics • Measure of central tendency • Measure of dispersion	5
17.2.03	Commercial Arithmetic	• Currencies of different countries • Currency conversion • Profit and loss • Profit and loss as percentage • Simple and compound interest	5
17.2.04	Trigonometry II	• Properties of a right angled triangle • Pythagoras theorem • Application of pythagoras theorem • Definition of trigonometric ratios • Conversion of degrees to radians. • Determination of trigonometric ratios • Angle of elevation and depression	12

Code	Sub-Module Units	Content	Time (Hours)
		• Sine and cosine rules • Compound angle formula • Double angle formula • Trigonometric equations • Sine and cosine waveform	
17.2.05	Matrices	• Definition of a matrix • Operation on matrices • Determinant and inverse of a 2 x 2 matrix • Solution of simultaneous equations by matrix method	5
17.2.06	Vectors	• Definition of vector • Vector notation • Vectors on a grid • Vector addition • Vector multiplication • Operations on vector • Vector resolution • Relative velocity	14
17.2.07	Introduction to Calculus	• Definition of derivative of a function • Differentiation from first principles • Tables of common derivatives • Rules of differentiation • Application of differentiation • Higher order derivatives • Definition of partial functions • Partial differentiation • Application of partial differentiation • Stationary points for functions	8
17.2.08	Integral Calculus	• Integration • Indefinite and definite integrals • Solving problems of integration • Application of problems of integration	12
Total Time			**66**

17.2.01 PROBABILITY

17.2.01C Competence
The trainee should have the ability to determine the probability and events

17.2.01T0 *Specific objectives*
By the end of the sub-module unit, the trainee should be able to;
a) define the terms probability
b) deduce dependent, independent and mutually exclusive events

Content
17.2.01T1 Definition of probability
17.2.01T2 Dependent, independent and mutually exclusive events

17.2.02 STATISTICS

17.2.02C Competence
The trainee should have the ability to analyze data using statistics

17.2.02T0 *Specific objectives*
By the end of the sub-module unit, the trainee should be able to;
a) define statistics

b) determine measures of central tendency
c) determine measures of dispersion

Content
17.2.0T1 Definition of statistics
17.2.0T2 Measures of central tendency
17.2.0T3 Measures of dispersion

17.2.03 COMMERCIAL ARITHMETIC

17.2.03C Competence
The trainee should have the ability to prepare a simple profit and loss account report

17.2.03T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) state the currencies of different countries
b) convert currency from one form to another given the exchange rates
c) calculate profit and loss
d) express profit and loss as percentages
e) calculate simple and compound interest

Content

17.2.03T1 Currencies of different countries
17.2.03T2 Currency conversions
17.2.03T3 Profit and loss
17.2.03T4 Profit and loss as percentage
17.2.03T5 Simple and compound interest

17.2.04 TRIGONOMETRY II

17.2.04C Competence
The trainee should have the ability to solve trigonometric equations

17.2.04T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to;
a) state the properties of a right-angled triangle
b) solve simple problems using Pythagoras theorem
c) apply Pythagoras theorem to real life situations
d) define trigonometric ratios from a right angled triangle
e) read and use tables and calculators of trigonometric ratios to convert degrees to radians and vice versa
f) determine trigonometric ratios
g) determine angles of elevation and depression
h) solve triangles using sine and cosine rules
i) determine the compound angle formula
j) derive double angle formula
k) solve trigonometric equations
l) draw sine and cosine waveforms

Content
17.2.04T1 Properties of a right-angled triangle
17.2.04T2 Solution of problems using Pythagoras theorem
17.2.04T3 Application of Pythagoras theorem to real life situations
17.2.04T4 Definition of trigonometric ratios
   i) sine θ
   ii) cosine θ
   iii) tangent θ
17.2.04T5 Conversion of degrees to a radius
   i) sine tables
   ii) cosine tables
   iii) tangent tables
17.2.04T6 Trigonometric ratios
   i) use of calculators and mathematical tables
17.2.04T7 Angles of elevation and depression

17.2.04T8	Solution of triangles using sine and cosine rules	
17.2.04T9	Compound angle formula	
17.2.04T10	Derivation of double angle formula	
17.2.04T11	Trigonometric equations	
17.2.04T12	Sine and cosine waveforms	

17.2.05   MATRICES

17.2.05C   Competence
The trainee should have the ability to use matrices in solving simultaneous equations

17.2.05T0   *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to;
a) define a matrix
b) carry out operations on matrices
c) work out the determinant and inverse of a 2x2 matrix
d) apply matrices in solving simultaneous equations

Content
17.2.05T1 Definition of a matrix
17.2.05T2 Operation on matrices
17.2.05T3 Determinant and inverse of a 2x2 matrix

17.2.05T4 Solution of simultaneous equations by matrix method

17.2.06   VECTORS

17.2.06C   Competence
The trainee should have the ability to resolve vectors into horizontal and vertical components

17.2.06T0   *Specific Objectives*
By the end of the sub-module, the trainee should be able to;
a) define a vector
b) use vector notation
c) present vectors on a grid
d) add vectors
e) multiply vectors by scalar quantity and carry out operations on vectors
f) resolve vectors into horizontal and vertical components
g) determine relative velocity

Content
17.2.06T1 Definition of a vector and a scalar quantity
17.2.06T2 Vector notation
17.2.06T3 Presentation of vectors on a grid
17.2.06T4 Addition of vectors
17.2.06T5 Multiplication of vectors

17.2.06T6 Resolution of vectors into vertical and horizontal components

17.2.06T7 Relative velocity

17.2.07 INTRODUCTION TO CALCULUS

17.2.07C Competence
The trainee should have the ability to resolve problems using differentiation

17.2.07T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to;
a) define the derivative of a function
b) differentiate from first principles
c) refer to tables of derivatives of some common functions
d) state and use the rules of differentiation
e) determine the derivative of higher order
f) apply differentiation to stationary points, curve sketching, rates of change, small changes
g) define partial derivatives for two variable
h) differentiate partial functions of two variable
i) solve problems involving small changes using partial fractions
j) find stationary points for functions of two variables

Content
17.2.07T1 Definition of derivative of a function
17.2.07T2 Differentiation from first principles
17.2.07T3 Tables of some common derivatives
17.2.07T4 Rules of differentiation
    i) sum
    ii) product rule
    iii) quotient rule
17.2.07T5 Application of differentiation to stationery points, curve
17.2.07T6 Higher order derivatives
17.2.07T7 Definition of partial functions for two variables
17.2.07T8 Partial differentiation for function of two variables
17.2.07T9 Application of partial differentiation to small changes
17.2.07T10 Stationary points for functions of two variables

17.2.08   INTEGRAL CALCULUS

17.2.08C   Competence
The trainee should have the ability to solve problems using integration

17.2.08T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) define integration
b) differentiate between indefinite and definite integrals
c) solve problems involving various methods of integration
d) apply integration to real life situations

Content
17.2.08T1 Integration
17.2.08T2 Indefinite and definite integrals
17.2.08T3 Solving problems of integration including
i) integration by substitution
ii) integration by partial fractions
iii) integration by tan½ɵ substitution
iv) integration by sin ɵ and cos ɵ substitution
v) integration by parts
17.2.08T4 Application of integration to real life
i) velocity, acceleration
ii) area under a curve

Suggested Teaching / Learning Resources
- Plait and audio/visual material
- Charts
- Mathematical tables
- Scientific calculators
- Square grid-boards
- Normal tables
- T-distribution tables
- Tables of integrals
- Computers
- Tables of LT
- Regular solids

Suggested Assessment Methods
- Written tests
- Puzzles and games
- Quizzes
- Oral tests
- Assignment