Geometry: A Complete Course (with Trigonometry)

STRUCTURE OF GEOMETRY (Unit I)

A. What is Geometry?

1 – Origin and Structure
2 – More on Things
3 – More on Operations
4 – More on Relations
5 – More on Groupings

B. Scope of our Geometry

1 – Undefined Terms
2 – Simple Closed Plane Curves
3 – Polygons
4 – Solids

C. Measurement

1 – Rectangles
2 – Parallelograms
3 – Triangles
4 – Trapezoids
5 – Regular Polygons
6 – Circles
7 – Prisms
8 – Pyramids
9 – Spheres

D. Inductive Reasoning

1 – General Nature
2 – Applications in Math

E. Deductive Reasoning

1 – General Nature
2 – Applications in Math

F. Logic

1 – Simple Statements
2 – Conditionals
3 – Negating Conditionals
4 – Fallacies

UNIT TEST I

Module A

ESSENTIAL ELEMENTS

Fundamental Terms (Unit II)

A. Undefined Terms

1 – In Algebra
2 – In Geometry

B. Defined Terms

1 – Good Definitions
2 – About Points
3 – About Lines
4 – About Rays
5 – About Line Segments
6 – About Angles as Sets of Points
7 – About Measurement of Angles
8 – About Pairs of Angles
9 – About Circles

C. Postulates (or Axioms)

1 – Need
2 – Post.1 – Existence of Points
3 – Post.2 – Uniqueness of Lines, Planes, and Space
4 – Post.3 – One, Two, and Three Dimensions
5 – Post.4 – Separation
6 – Post.5 – Line-Plane Intersection
7 – Post.6 – Ruler
8 – Post.7 – Protractor
9 – Post.8 – Circle
10 – Post.9 – Uniqueness of Parallel Lines
11 – Post.10 – Uniqueness of Perpendicular Lines

UNIT TEST II

Module B

Fundamental Theorems (Unit III)

A. Deductive Proof

1 – Direct Proof
2 – Indirect Proof

B. About Points and Lines

1 – Th. 1 – One Plane-Line & Point
2 – Th. 2 – Relationship between Three Points on a Line

C. About Segments and Rays

1 – Th. 3 – Distance from the Endpoint of a Ray
2 – Th. 4 – Midpoint of a Segment

D. About Two Lines

1 – Th. 5 – One Plane containing Two Intersecting Lines
2 – Th. 6 – Perpendicular through a Point on a Line

E. About Angles (Part 1)

1 – Th. 7 – Unique Angle formed by Two given Rays
2 – Th. 8 – Bisector of an Angle

F. About Angles (Part 2)

1 – Th. 9 – Adj. Ang. with Exterior Sides Perpendicular
2 – Th.10 – Supp. Angles formed by Opposite Rays
3 – Th.11 – Rt. Angles Congruent
4 – Th.12 – St. Angles Congruent

G. About Angles (Part 3)

1 – Th.13 – Angles Comp. to Congruent Angles
2 – Th.14 – Angles Supp. to Congruent Angles
3 – Th.15 – Vert. Angles Cong.

H. About Parallel Lines

1 – Post.11 – Corr. Angles Cong.
2 – Th.16 – Alt. Int. Angles Cong.
3 – Th.17 – Int. Angles Supp.
4 – Th.18 – Trans. Perp. to Parallel
5 – Th.19 – Corr. Angles – Parallel
6 – Th.20 – Alt. Int. Ang. – Parallel
7 – Th.21 – Int. Ang. Supp.-Parallel
8 – Th.22 – Perp. Trans. – Parallel
9 – Th.23 – Lines Parallel to Third
10 – Th.24 – Parallel Planes

UNIT TEST III

Module C

SIMPLE CLOSED PLANE CURVES

Triangles (Unit IV)

A. Basic Definitions

1 – Triangle Parts
2 – Triangle Types

B. Basic Theorems

1 – Th.25 – Sum of the Angles
2 – Th.26 – Exterior Angle

C. Similarity (Part 1)

1 – Ratio and Proportion
2 – Special Properties
3 – Th.27 – Perimeters of Similar Polygons

D. Similarity (Part 2)

1 – Post.12 – Triangle Similarity
2 – Th.28 – Side Splitter
3 – Th.29 – Alt. (Sim. Triangles)
4 – Th.30 – Alt. (to Hypotenuse)
5 – Th.31 – Pythagoras
6 – Application (3-Dimensions)

E. Congruence (Part 1)

1 – Definition
2 – Post.13 – Triangle Congruence
3 – Cong. Post. Corollaries

F. Congruence (Part 2)

1 – Overlapping Triangles
2 – Using CPCTC
3 – Th.32 – Two Cong. to Third
4 – Th.33 – Cong. Sides give Cong. Opp. Angles
5 – Th.34 – Cong. Angles give Cong. Opp. Sides
6 – Th.35 – Ray Bisecting Angle
7 – Th.36 – Pythagoras Converse

G. Congruence (Part 3)

1 – Th.37 – Ext. Ang. Greater than Remote Int.
2 – Th.38 – Sides not Congruent Opp. Ang. not Cong.
3 – Th.39 – Ang. not Congruent Opp. Sides not Con.
4 – Th.40 – Sum of Two Sides Greater than Third

UNIT TEST IV

Module D

Other Polygons (Unit V)

A. Properties of Polygons

1 – Basic Terms
2 – Parallelograms
3 – Special Parallelograms
4 – Trapezoids
5 – Kites
6 – Midsegments
7 – General Polygons

B. Areas of Polygons

1 – Post. 14 - Area
2 – Parallelograms
3 – Triangles
4 – Trapezoids
5 – Regular Polygons

C. Applications

1 – Using Areas in Proofs
2 – Schedules

UNIT TEST V

Module E

Circles (Unit VI)

A. Fundamental Terms

1 – Lines and Segments
2 – Arcs and Angles
3 – Circle Relationships

B. Angle and Arc Relationships

1 – Th.65-66 – Central Angles and Intercepted Arcs
2 – Th.67 – Measure of an Inscribed Angle
3 – Th.68 – Angle Formed Inside by a Secant and a Tangent
4 – Th.69-70 – Angle Formed by two Secants
5 – Th.71-72 – Angle Formed Outside by Secant and Tangent or 2 Tangents

C. Line and Segment Relationships

1 – Th.73–Diameter Perpendicular to a Chord
2 – Th.74-75 – Chord as a Perpendicular Bisector of Another Chord
3 – Th.76 – Measures of Two Intersecting Chords
4 – Th.77-78 – Measures of Two Secant Segments or 1 Secant Segment and 1 Tangent Segment
5 – Th.79 –Tangent Perpendicular to Diameter
6 – Th.80 – Congruent Tangent Segments
7 – Th.81-82 – Congruent Chords and Congruent Arcs

D. Concurrency

1 – Th.83 – A Triangle is Cyclic
2 – Th.84 – If Opposite Angles of a Quadrilateral are Supplementary, then Quadrilateral is cyclic

UNIT TEST VI

LOCI AND CONSTRUCTIONS (Unit VII)

A. Locus

1 – Definitions
2 – Constructions

B. Basic Rules

1 – Definitions
2 – Construction Postulates 1-5

C. Basic Constructions

1 – Angles
2 – Perpendicular Lines
3 – Parallel Lines
4 – Arc Bisectors
5 – Tangents
6 – Circumscribed Circle
7 – Inscribed Circle
8 – Dividing Segments

D. Combinations of Constructions

1 – Triangles
2 – Other Polygons

UNIT TEST VII

Module F

TRIGONOMETRIC RELATIONS (Unit VIII)

A. Basic Concepts

1 – Measuring Angles
2 – Applications of Similarity
3 – Trigonometric Functions

B. Functions of General Angles

1 – The Unit Circle
2 – Values of Trig. Functions

C. Applications

1 – Solving Right Triangles
2 – Laws of Sines and Cosines
3 – Solving General Triangles
4 – Areas of Triangles

D. Circular Functions

1 – Radian Measure
2 – Definition of Circular Functions
3 – Periodicity and Symmetry
4 – Graphs of Trig. Functions

E. Trigonometric Identities

1 – Fundamental Identities
2 – Addition Formulas
3 – Double-Ang. and Half-Ang.
4 – Tangent Formulas

F. Vectors

1 – Operations
2 – In the Plane
3 – Polar Coordinates
4 – Complex Numbers
5 – DeMoivre's Theorem
6 – Inverse Functions
7 – Trigonometric Equations

UNIT TEST VIII

Module G

Revised – October 8, 2009