Mathematics 247, Introduction to Geometry, Bowdoin College, Winter/Spring 2009

Actual Syllabus.

Chapter I. Foundations of Geometry in the Plane (*Overview*)..... **January 20**

§1 The Real Numbers.
§2 The Incidence Axioms.
§3 Distance and the Ruler Axiom.
§4 Betweenness.
§5 The Plane Separation Axiom.
§6 The Angular Measure Axioms.
§7 Triangles and the SAS Axiom.
§8 Geometric Inequalities.
§9 Parallelism.
§10 The Parallel Postulate.
§11 Directed Angle Measure and Ray Translation.
§12 Similarity.
§13 Circles. (*Brief coverage*)
§14 Bolzano's Theorem. (*Omitted*)
§15 Axioms for the Euclidean Plane. (*Merely a summary for reference*)

Chapter II. Isometries in the Plane: Products of Reflections..... **February 3**

§1 Transformations in the Plane.
§2 Isometries in the Plane.
§3 Composition and Inversion. (*Left for student reading*)
§4 Fixed Points and the First Structure Theorem.
§5 Triangle Congruence and Isometries.

Chapter III. Isometries in the Plane: Classification & Structure..... **February 12**

§1 Two Reflections: Translations and Rotations.
§2 Glide Reflections.
§3 The Classification Theorem.
§4 Orientation.
§5 Groups of Transformations.
§6 The Second Structure Theorem.
§7 Rotation Angles.

Chapter IV. Similarities in the Plane..... **February 26**

§1 Elementary Properties of Similarities.
§2 Dilations as Similarities.
§3 The Structure of Similarities.
§4 Orientation and Rotation Angles.
§5 Fixed Points for Similarities

Chapter V. Conjugacy and Geometric Equivalence ..... March 5
- §1 Congruence and Geometric Equivalence.
- §2 Geometric Equivalence of Transformations: Conjugacy.
- §3 Geometric Equivalence under Similarities.
- §4 Euclidean Geometry Derived from Transformations. (*Brief coverage*)

Chapter VI. Applications to Plane Geometry ..... March 26
- §1 Symmetry in Early Geometry.
- §2 The Classical Coincidences.
- §3 Dilation by Minus Two Around the Centroid.
- §4 Reflections, Light, and Distance.
- §5 Fagnano's Problem and the Orthic Triangle.
- §6 The Fermat Problem.
- §7 The Circle of Apollonius. (*Omitted*)

Chapter VII. Symmetric Figures in the Plane ..... April 9
- §1 Symmetry Groups.
- §2 Invariant Sets and Orbits.
- §3 Bounded Figures in the Plane.

Chapter VIII. Frieze and Wallpaper Groups ..... April 23
- §1 Point Groups and Translation Subgroups.
- §2 Frieze Groups.
- §3 Two-Dimensional Translation Lattices. (*Summarized results*)
- §4 Wallpaper Groups. (*Summarized results*)

Chapter IX. Area, Volume, and Scaling ..... (*Omitted*)
- §1 Length of Curves. (*Omitted*)
- §2 Area of Polygonal Regions: Basic Properties. (*Omitted*)
- §3 Area and Equidecomposability. (*Omitted*)
- §4 Area by Approximation. (*Omitted*)
- §5 Area and Similarity. (*Omitted*)
- §6 Scaling and Dimension. (*Omitted*)

	Tuesday	Thursday	
	Jan 20 **Chapter I** Preface, §§ I.1 – I.2	Jan 22 §§ I.3 – I.6	
	Jan 27 §§ I.6 – I.9	Jan 29 §§ I.10 – I.11	
	Feb 3 §§ I.12 – I.13 **Chapter II** § II.1	Feb 5 §§ II.2 – II.3	
	Feb 10 §§ II.4 – II.5	Feb 12 § II.5 **Chapter III** § III.1	
	Feb 17 §§ III.1 – III.3	Feb 19 §§ III.4 – III.5	Feb 19 **Exam I** 7:00 pm
	Feb 24 §§ III.5 – III.7	Feb 26 **Chapter IV** §§ IV.1 – IV.2	
	March 3 §§ IV.2 – IV.4	March 5 §§ IV.4 – IV.5 **Chapter V** § V.1	
	Spring	**Break**	
	March 24 §§ V.2 – V.3	March 26 § V.4 **Chapter VI** §§ VI.1 – VI.3	
	March 31 § VI.3	April 2 §§ VI.4 – VI.5	
	April 7 §§ VI.5 – VI.6	April 9 **Chapter VII** § VII.1	
	April 14 §§ VII.1 – VII.2	April 16 § VII.3	April 16 **Exam II** 7:00 pm
	April 21 § VII.3	April 23 **Chapter VIII** § VIII.1	
	April 28 § VIII.1	April 30 §§ VIII.1 – VIII.2	
	May 5 §§ VIII.2 – VIII.4		

Final Exam: Tuesday, May 12, 2:00p.m.