

Montgomery County Community College
 MAT 108
 Mathematics Cultures and Concepts
 3-3-0

COURSE DESCRIPTION:

A course, designed primarily for liberal arts students, which shows how mathematics has developed concomitantly with civilization. The applications demonstrate that mathematics is related not only to the physical sciences but also to the social sciences, to philosophy, logic, religion, literature and the arts. This course does not satisfy the MAT 100 prerequisite requirement for MAT 125, MAT 131, MAT 140 or MAT 161.

REQUISITE(S):

Previous Course Requirement

* MAT 080 - Fundamentals of Mathematics, or MAT 011 - Beginning Algebra, or MAT 011B - Beginning Algebra with Review of Arithmetic with a minimum grade of C.

Concurrent Course Requirements

None

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Know the historical development of mathematics from early times to the time of Isaac Newton.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
2. Explain how real world problems created a need for the development of mathematics.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
3. Show how mathematics solved these real world problems.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
4. Write two or three sentences on the accomplishments of the following personages. Al Khowarizmi Galileo Appollonius Gauss Archimedes Goldbach Aristotle Hipparchus Brahe Kepler Cardan Leibniz Copernicus Newton Descartes Plato Einstein Ptolemy Eratosthenes Pythagoras Euclid Thales Fermat	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
5. Be familiar with the following terms. In particular, the student should be able to explain the terms and/or their connection with the individuals listed above. Abscissa Abstraction Alexandria Algebra Algorithm Analytic (Coordinate Geometry) Approximation Area of Plane Figures Average Axiom Babylonian Mathematics Calculus Circle Compass Conic Sections	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

Cosine Critical Angle for Refraction of Light Cuneiform Writing Deductive Reasoning Egyptian Mathematics Ellipse Euclidean Geometry Experimentation		
LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
Exponents Formula Fraction Geocentric Theory Geometric Constructions Greek Mathematics Heliocentric Theory Hypotenuse Idealization Inductive Reasoning Integer Irrational Numbers Laws of Motion: Kepler's and Newton's Natural Numbers Negative Numbers One-To-One Correspondence Papyrus Parabola Parallel Lines Perpendicular Lines Perspective Pi Polygon Postulate Premises Prime Numbers Primitive Counting Systems Projective Geometry Proof Ptolemaic Theory Quadrilateral Reflection of Light Refraction of Light Similar Triangles Sine Tangent Vertex		

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
<p>6. Work problems associated with the persons and terms previously listed. Examples of such type problems are in the following non-exhaustive list.</p> <p>A. Simple word problems with negative numbers</p> <p>B. Problems involving algebraic transformations</p> <p>C. Translate word problems into mathematical form and then solve</p> <p>D. Know and be able to use the Pythagorean theorem</p> <p>E. Be able to write numbers in the Egyptian, Roman, and Mayan numeration systems</p> <p>F. Be able to multiply using the method of duplation and mediation</p> <p>G. Solve problems involving geometric shapes and relationships, especially angle measure, perimeter, area, and volume</p>	<p>Lectures</p> <p>Small Group Discussions and/or Projects</p> <p>The Use of TI 84 Graphics Calculator</p> <p>Homework</p> <p>Quizzes</p> <p>Projects</p>	<p>Exams</p> <p>Quizzes</p> <p>Homework</p> <p>Projects</p>

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
<p>H. Be able to do these straight edge and compass constructions:</p> <p>Draw the perpendicular bisector of a line segment</p> <p>Bisect an angle</p> <p>Copy an angle - given one side for the new angle</p> <p>Trisect a line segment</p> <p>Trisect a 90° angle</p> <p>Draw a line segment $\sqrt{2}$ units in length</p> <p>Given a line L and a point P not on L, draw a line through P perpendicular to L and a line through P parallel to L</p> <p>I. Solve similar triangle problems using proportions</p> <p>J. Solve right triangle problems using trigonometric functions</p>		

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
K. Solve problems concerning the motion of objects near the surface of the earth i.e. $a = 32 \text{ ft/sec}^2$ $v = 32t$ $d = 16t^2$ $v = v_0 + 32t$ $d = h_0 + v_0t - 16t^2$ L. Discuss and solve light reflection and refraction situations		

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria*.

SEQUENCE OF TOPICS:

1. Ancient Mathematics (Egyptian, Babylonian, Mayan), Greek Mathematics, Hindu and Arabic
2. Idealization, Abstraction, Reasoning, Axioms, Proofs
3. Historical Development of Numbers Including Negative and Irrational Numbers. Pythagorean Theorem, Atomic Weights
4. Review of Algebra Exponents, Solving First Degree Equations, History of Higher Degree Equations
5. Euclidean Geometry, Axioms and Proofs, Mundane Uses of Geometry, Study of Light, Conic Sections, Geometric Constructions with Compass and Straight Edge
6. Alexandrian Mathematics, Trigonometry, Charting the Heavens, Refraction of Light
7. Greek Concept of Nature; Ptolemaic Theory; Arab Sacking of Alexandria; Rebirth of Math in Medieval and Renaissance Europe; Religion, Painting, and Perspective
8. Coordinate Geometry; Descartes and Fermat; Straight Lines, Parabolas, Ellipses
9. Galileo and the Scientific Method, Formulas, Motion of Objects Near the Surface of the Earth
10. New Astronomical Theories, Relating Earthly and Heavenly Motions, Newton

LEARNING MATERIALS:

Berlinghoff, William and Gouvea, Fernando. (2004). *Math through the Ages*. Oxton House Publishers.

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL:

Prepared by: Joseph Freiwald	Date: 9/1996
Revised by: Thomas Moyer, Professor of Mathematics	Date: 6/1998
Revised by: Thomas Moyer, Professor of Mathematics	Date: 1/2004
Revised by: Mark McFadden	Date: 2/1/2013
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 2/15/2013
Revised by: Marion Graziano/Debbie Dalrymple	Date: 8/1/2017
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 8/24/2017
Revised by: Math Pathways Team	Date: 2/29/2024
VPAA or designee Compliance Verification:	Date: 2/29/2024



This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.