MATH M12: MATHEMATICAL REASONING FOR LIBERAL ARTS

Originator
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Co-Contributor(s)

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College
Moorpark College

Discipline (CB01A)
MATH - Mathematics

Course Number (CB01B)
M12

Course Title (CB02)
Mathematical Reasoning for Liberal Arts

Banner/Short Title
Math Reasoning - Liberal Arts

Credit Type
Credit

Start Term
Fall 2023

Catalog Course Description
Introduces liberal arts students to mathematical ideas necessary for their careers and daily lives. Includes topics in logic, quantitative information in the real world, managing finances, statistical reasoning, and mathematics in politics. Enhances mathematical ideas with topics in fields such as the arts, quantitative reasoning, and more.

Taxonomy of Programs (TOP) Code (CB03)
1701.00 - Mathematics, General

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
B - Satisfies Math/Quantitative Reasoning req (CSUGE-B B4, IGETC 2, or 4-yr)

Support Course Status (CB26)
N - Course is not a support course

Field trips
Will not be required

Grading method
(L) Letter Graded

Alternate grading methods
(O) Student Option- Letter/Pass
(P) Pass/No Pass Grading

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
52.5
Maximum Contact/In-Class Lecture Hours
52.5

Activity

Laboratory

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
52.5

Total Maximum Contact/In-Class Hours
52.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
105
Maximum Outside-of-Class Hours
105

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
157.5
Total Maximum Student Learning Hours
157.5

Minimum Units (CB07)
3
Maximum Units (CB06)
3

Prerequisites
Intermediate Algebra or placement as determined by the college's multiple measures assessment process.

Entrance Skills
Entrance Skills

- analyze and solve various equations, inequalities, and systems of equations.
- graph and interpret linear and quadratic functions.

Requisite Justification
Requisite Type
Prerequisite

Requisite
Intermediate Algebra or placement as determined by the college's multiple measures assessment process.

Requisite Description
Other (specify)

Specify Other Requisite Description
Requisite content knowledge is required for student success in this course.

Level of Scrutiny/Justification
Required by 4 year institution

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	identify logical arguments and common fallacies as well as various forms of propositions with the aid of sets and Venn Diagrams.
2	determine how to budget and save by computing interest formulas and calculating projected investment values for loans, retirement plans, and stocks and bonds.
3	recognize the conditions for which a statistical study is considered unbiased and credible.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	construct logical arguments and avoid fallacies; understand various forms of propositions, including "and", "or", and "if...then" statements, and the converse, inverse, and contrapositive of those statements, with the aid of sets and Venn diagrams.
2	observe, question, and analyze statements; evaluate inductive and deductive arguments.
3	take control of finances by budgeting and saving; compute interest using simple and compound interest formulas; calculate projected investment values for savings plans, retirement plans, stocks, and bonds; compute loan, credit card, and mortgage payments; understand the Federal Budget and National Debt.
4	apply the fundamentals of statistics, including sampling methods, types of studies, the placebo effect and blinding; determine when to believe a statistical study; observe the fundamentals of probability with dice, cards, and coins
5	analyze the voting process, including majority rule, and observe the outcome of employing different voting methods to produce a different winner; determine which method of voting is fairest; understand the constitutional context of voting and observe various apportionment methods and redistricting.
6	appreciate and understand mathematical topics as determined by the instructor, such as further exploration of quantitative reasoning, averages, statistical graphs and tables, modeling of linear and exponential functions, math of music and art, fractals, infinity, graph theory, and more.

Course Content

Lecture/Course Content

25% A. Logic and Problem Solving

1. Logical Arguments and Common Fallacies
2. Propositions, Converse, Inverse and Contrapositives of Statements
3. Venn Diagrams
4. Critical Analysis of Statements
5. Inductive and Deductive Reasoning

25% B. Managing Money

1. Percentages
2. Budgeting and Saving
3. Simple and Compound Interest
4. Savings and Retirement Plans
5. Stocks and Bonds
6. Loans, Credit Cards, and Mortgage Payments
7. Federal Budget and National Debt

10% C. Probability and Statistics

1. Statistics Fundamentals
2. Types of Statistical Studies
3. Fundamentals of Probability

15% Mathematics in Politics

1. Voting Methods
2. Apportionment Methods and Redistricting

25% E. Selected Topics

The following additional topics may be selected by the instructor.

1. Applications of All of the Above Topics
2. Historical Systems of Numeration
3. Quantitative Information (Numbers in the Real World)

4. Further Explorations in Finance (Buying a House, Income Taxes, Stocks/Bonds)
5. Graphics in the Media
6. Cause and Effect Relationships
7. Gerrymandering
8. Further Explorations in Statistical Reasoning and Probability
9. Modeling Linear and Exponential Functions
10. Mathematics of Music and Art
11. Non-Euclidean and Projective Geometry
12. Historically Notable Math Concepts (Four-Color Theorem, Seven Bridges of Königsberg, Scheduling, Graph Theory)
13. Infinity
14. Applications of Mathematics in Other Disciplines

Laboratory or Activity Content

n/a

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Written expression
Problem solving exercises
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
Essay exams
Group projects
Individual projects
Objective exams
Problem-solving exams
Problem-solving homework
Quizzes
Reports/papers
Research papers
Skills demonstrations
Skills tests or practical examinations
Written analyses
Written creation (poem, screenplay, song)
Written homework
Other (specify)
Classroom Discussion
Projects

Other

Quizzes and graded work will be used to evaluate students for the critical thinking skills needed to solve problems of mathematical nature.

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
Class activities
Class discussions
Collaborative group work
Computer-aided presentations
Demonstrations
Distance Education
Field trips
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Large group activities
Lecture

Problem-solving examples
Other (specify)

Specify other method of instruction

All instructors will use best practices to provide an inclusive learning
environment that respects all forms of racial, ethnic, age, and gender
diversity, and provides for the individual needs of students of all learning
styles.

Describe specific examples of the methods the instructor will use:

1. Use of whiteboard or overhead projector to demonstrate solutions to calculations, such as finding interest rates to solve problems involving buying a home.
2. Classroom discussion, with student response, such as discussing the misleading data and information in different forms of media.
3. In-class group activities, such as guided practice on solving various types of logic problems.

Representative Course Assignments

Writing Assignments

1. Create and conduct your own survey. Discuss the bias of the sample group you surveyed.

2. Describe how drawing of district boundaries in a geographic region can give one political party an advantage in an election, even if support for both parties is equal in the region.

Critical Thinking Assignments

1. Use various websites for a major professional polling organization to study results from a recent poll and evaluate the poll according to the guidelines in this section.

2. Find one piece of pre-20th-century art and one piece of 20th- or 21st-century art that you like. Use as many ideas as possible from the textbook involving symmetry and perspective to write a two page analysis and comparison of these two pieces of art.

Reading Assignments

1. Find a recent news article that causes you to question accuracy or precision. For example, the article might report a figure with more precision than you think is justified, or it may cite a figure that you know is inaccurate. Write a short summary of the report and explain why you question its accuracy or precision.

2. Read resource materials from the library or online concerning real-life applications of percentages.

Skills Demonstrations

1. Demonstration of computational skills such as finding account balances with interest compounded annually.

2. Analyze a Venn Diagram of 2 or more sets, determining the representation of various regions of the diagram.

Problem-Solving and Other Assignments (if applicable)

1. Describe and analyze the steps in solving a problem, such as identifying and labeling the several steps in calculating the interest paid over 30 years of a mortgage loan.

2. Demonstrate of the proper use of a calculator in finding the total return and annual return on an investment.

Outside Assignments

Representative Outside Assignments

1. Research recent news about changes in voting procedures locally or nationally and decide whether or not the changes will make vote counting more reliable.

2. Visit a website devoted to connections between music and mathematics and write an essay that describes these connections.

2. Find salary data for a career you are considering. Assume you were able to save 10% of that salary each month and invest it in an account paying 4% interest. How much money would you have after 5 years? 10 years?

Articulation

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU Fullerton	MATH 110	Mathematics for Liberal Arts Students	3
CSU Fresno	MATH 45	What is Mathematics	3
Cal Poly San Luis Obispo	MATH 112	Nature of Modern Math	4

| San Diego State Univ. | MATH 118 | Topics in Mathematics | 3 |
| CSU Long Beach | MATH 103 | Mathematical Ideas | 3 |

Comparable Courses within the VCCCD

MATH V40 - Exploration of Mathematical Ideas

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
Citrus College	MATH 160	Mathematics for Everyday Living - A Liberal Arts Course	5
LA Mission College	MATH 230	Mathematics for Liberal Arts Students	3

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

D2. Communication/Analytical Thinking

Approved

Effective term:

Fall 2020

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable

Yes

CSU Baccalaureate List effective term:

F2019

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

B4 Mathematical/Quantitative Reasoning

Approved

Effective term:

Fall 2020

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

Area F: Ethnic Studies

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Approved

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 2A: Mathematical Concepts & Quantitative Reasoning
Approved

Effective term:
Fall 2020

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Classic Textbook
No

Description
Miller, Charles, et al. *Mathematical Ideas.* 14th ed., Pearson, 2020.

Resource Type
Textbook

Classic Textbook
No

Description
Bennett, Jeffrey and William L. Briggs. *Using and Understanding Mathematics: A Quantitative Reasoning Approach.* 8th ed., Pearson, 2023.

Resource Type
Textbook

Classic Textbook

No

Description

Lippman, David. *Math in Society*. E-book, Open Textbook Store, 2022, https://www.opentextbookstore.com/mathinsociety/. Accessed 21 Oct 2022.

Resource Type

Textbook

Classic Textbook

No

Description

Matsumoto, Saburo. *Liberal Arts Mathematics. E-book*, LibreTexts, 2021, https://math.libretexts.org/Courses/College_of_the_Canyons/ Math_100%3A_Liberal_Arts_Mathematics_(Saburo_Matsumoto). Accessed 21 Oct 2022.

Library Resources

Assignments requiring library resources

Research, using the Library's print and online resources, to access current information on such topics as interest rates to solve an application problem involving loan payments, mortgages, or investment accounts.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Using library resources to investigate cultural identity and ancestry, relating one's family history to a relevant culture, researching a cultural identity or history of one's interest and determining how mathematics is used or invented in these cultures.

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (1%–50% online)
Hybrid (51%–99% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.

Examinations

Hybrid (1%–50% online) Modality
On campus

Hybrid (51%–99% online) Modality
On campus

Primary Minimum Qualification
MATHEMATICS

Review and Approval Dates

Department Chair
10/25/2022

Dean
10/25/2022

Technical Review
11/17/2022

Curriculum Committee
12/6/2022

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000602413

DOE/accreditation approval date
MM/DD/YYYY