MATH 1070Q: Mathematics for Business and Economics

Lecture Slides

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CAPS/SSS
Summer 2026

Introduction

Welcome to the Course

Course Information

- Instructor: Dion Mann.
- Contact: dion.mann@uconn.edu
- Office Hours: Monday & Tuesday 3:00 PM - 4:30 PM in MONT 213, or by appointment.
- Course Webpage: dionmann.github.io/math1070.
- Course Book: "Contemporary Mathematics" on openstax.org. This is a free text. Access via the course webpage or openstax.org.

About MATH 1070Q

This course prepares students for MATH 1071Q: Calculus for Business and Economics and emphasizes applications for business majors.

Grading Scheme

The style of instruction is based on Second Chance Grading due to Oscar E. Fernandez (see syllabus for Fernandez's paper).

Topics

You will be graded based on topics (e.g., "Topic 1: Algebraic Expressions and Linear Equations"). Each topic is worth 20 points; there are 16 topics throughout the program for a total of 320 points. However, you will be graded only out of 300 points or 15 topics.

Grading Distribution

15 Topics	60%
15 Worksheets	20%
1 Final Exam	20%

Second Chance Grading: Topics

You will always have two opportunites to get graded on a given topic:

1. A quiz on that topic.
2. A second chance assessment on that topic consisting of alternative quiz questions.

Your topic score is the maximum between (1) and (2) above.

Note: Each day covers exactly one topic.

Quizzes

Quizzes are given Wednesday, Thursday, and Friday (except week 1 due to the holiday) at the beginning of class and are 20 minutes long. They will test the previous day's topic with 4 questions, each worth 5 points.

Second Chance Assessments

Second Chance Exam

Second Chance Exams (SC Exams) are given each Monday and are 80 minutes long. These "exams" are really just 4 quizzes packed together:

- Starts with the usual quiz on the previous Friday's topic.
- The rest is 3 alternative quizzes on the previous Tuesday, Wednesday, and Thursday topics. This is the "second chance" for those topics.

Second Chance Quiz

Since Friday topics are tested for the first time in an SC Exam, you will be given a Second Chance Quiz (SC Quiz) on Tuesdays. This is again an alternative quiz on the previous Friday's topic and is your "second chance" for that topic.

Course Schedule

It is easier to just follow the course schedule:

Week of...	Monday	Tuesday	Wednesday	Thursday	Friday
29 June	Introduction: Syllabus & Course Structure - Topic 1: Algebraic Expressions and Linear Equations (5.1 - 5.2) - **Worksheet 1**	**Quiz: Topic 1** - Topic 2: Ratios, Proportions, and Percents (5.4, 6.1) - **Worksheet 2**	**Quiz: Topic 2** - Topic 3: Percents and Discounts, Markups, Taxes, and Simple Interest (6.2, 6.3) - **Worksheet 3**	**Quiz: Topic 3** - Topic 4: Compound Interest, Methods of Saving, and Investing (6.4, 6.6 - 6.7) - **Worksheet 4**	Holiday - No Class
6 July	Review of Week 1 - **SC Exam: Topic 4 Quiz and Second Chance Topics 1 - 3**	**SC Quiz: Topic 4** - Topic 5: TBD - **Worksheet 5**	**Quiz: Topic 5** - Topic 6: TBD - **Worksheet 6**	**Quiz: Topic 6** - Topic 7: TBD - **Worksheet 7**	**Quiz: Topic 7** - Topic 8: TBD - **Worksheet 8**
13 July	Review of Week 2 - **SC Exam: Topic 8 Quiz and Second Chance Topics 5 - 7**	**SC Quiz: Topic 8** - Topic 9: TBD - **Worksheet 9**	**Quiz: Topic 9** - Topic 10: TBD - **Worksheet 10**	**Quiz: Topic 10** - Topic 11: TBD - **Worksheet 11**	**Quiz: Topic 11** - Topic 12: TBD - **Worksheet 12**
20 July	Review of Week 3 - **SC Exam: Topic 12 Quiz and Second Chance Topics 9 - 11**	**SC Quiz: Topic 12** - Topic 13: TBD - **Worksheet 13**	**Quiz: Topic 13** - Topic 14: TBD - **Worksheet 14**	**Quiz: Topic 14** - Topic 15: TBD - **Worksheet 15**	**Quiz: Topic 15** - Topic 16: TBD - **Worksheet 16**
27 July	Review of Week 4 - **SC Exam: Topic 16 Quiz and Second Chance Topics 13 - 15**	**SC Quiz: Topic 16** - Review	Review	**Final Exam**	

Worksheets

At the end of class (except Monday with the SC Exams), you will be given a worksheet on the topic covered that day.

Worksheet Information

- Worksheets will mimic a real quiz in that they have 4 questions, worth 5 points each, and will be 20 minutes long. However, worksheets are graded on completion, not correctness.
- The completion grade will scale: a half-way answer to a problem will be awarded 2-3 points, and a full but possibly incorrect answer to a problem will be awarded all 5 points.
- There are 16 worksheets for a total of 320 points, but your grade will only be based on 15 worksheets or 300 points.

I am happy to check all your worksheet answers. You may work with other people, but my advice is to pretend it is a quiz for the practice.

Homework

There is weekly homework, but it is not graded and entirely optional.

Homework Information

- Homework is posted Sundays and covers the following week's topics.
- Advice: Each day, do the corresponding topic in the homework set during your math breakouts that night. This will help enforce the concepts and prepare you for the topic's quiz the next morning.
- All graded assessments (quizzes, SC exams, SC quiz, and the final) will sometimes draw problems from the homework sets.

Final Exam

We will have our final exam on Thursday, 30 July 2026.

Final Exam Information

- The final will be cumulative.
- You are allowed a calculator.
- **ALL** problems on the final will be drawn from homeworks, quizzes, SC exams, SC quizzes, and worksheets. In theory, if you do all of these, then you will have seen all the problems on the final.

The idea is that you will be—as a simple side-effect of going through this course—studying for the final the entire time. This is meant to introduce university studying habits and is a vital skill.

Make-Up and Extra Credit Policy

Due to the fast-paced nature of the course and the mandatory attendance policy set by the CAPS program, there will be no make-up assignments. However...

Extra Credit

Recall that you will be graded on 300 points out of 320 points in the "topics" category, and 300 points out of 320 points in the "worksheet" category. Any extra points earned will be considered extra credit.

Other Information

- I will always begin lectures with a "reminders" slide, reminding you of the day's assignments and if there is a quiz the next day.
- The best way to keep track is to keep the course schedule handy. Each week I will fill in the titles for the topics.
- I have created an anonymous feedback form on the course webpage. Sometimes, you may have questions or comments in which you prefer to remain anonymous. Feel free to use that form for anything you'd like (e.g., homework questions or comments on how the course or the CAPS program is going). I will address them in the following class.
- **AI policy.** All MATH courses in CAPS have taken a unified policy on generative AI (see syllabus for details). In short:

  no generative AI may be used for any assignment.

Topic 1: Algebraic Expressions and Linear Equations

Reminders and To-Do

- Topic 1 will cover sections 5.1 and 5.2 of the text.
- Worksheet 1 will be done at the end of the class.
- Quiz (Topic 1) will be Tuesday morning.
- Remember to check out the homework set on the course webpage.

Variables and Notation

Definition:

A variable is a symbol, typically a letter like x or y, that represents a mathematical object (like a number).

If a variable x stands for the number 2, then we write $x = 2$. We can also apply operations here; for example $x + 3 = 5$. Multiplication is written either with a dot or with no symbol; for example, $3x = 6$ or $3 \cdot x = 6$.

We will see later that variables can stand for other mathematical objects (e.g., "sets").

Expressions vs. Equations

Definition:

1. A mathematical expression is an arrangement of mathematical symbols such that true or false does not apply.
2. A mathematical equation is a statement that equates two mathematical expressions.

Examples

To tell the difference, ask whether each of the following is true or false:

1. $7x - 1$.
2. $3x^2 = y$.
3. 2.

Example: Describing Situations with Expressions

Bob and Alice have the same birthday, but were born on different years. Currently, Bob is 25 and Alice is 28.

1. When Bob was 17, how old was Alice?
2. When Alice was 21, how old was Bob?
3. Let x denote Bob's age at any point in time. How old is Alice at the same point in time, in terms of x?
4. Let y denote Alice's age at any point in time. How old is Bob at the same point in time, in terms of y?
5. Write an equation that relates x and y.

Parenthesis

Let x be a variable standing for some number. Consider the following two procedures:

1. Add 3, then multiply by 2.
2. Multiply by 2, then add 3.

Are the results of the two procedures above the same?

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Are the results of the two procedures above the same?

We use parenthesis to prevent ambiguity. Everything inside a parenthesis is always done *first*. The two operations above are then written like:

1. $2 \cdot (x + 3)$: *first* add 3, then multiply by 2.
2. $(2x) + 3$: *first* multiply by 2, then add 3.

More on Order of Operations

The expression $2 \cdot (x + 3)$ can be written without the multiplication symbol, like $2(x + 3)$. You can also write $(2)(x + 3)$.

The order of multiplication does not matter: $2 \cdot x = x \cdot 2$. We say multiplication is commutative.

Similarly, the order of addition does not matter: $x + 3 = 3 + x$. We say addition is also commutative.

However, as we've seen, the order between addition and multiplication does matter: $2(x + 3)$ is different from $(2x) + 3$.

PEMDAS

To avoid using so many parenthesis, for example in $2((3x)+6)$, mathematicians use a convention on what order to do operations in when parenthesis are not present.

PEMDAS: Order of Operations

1. Parenthesis.
2. Exponents.
3. Multiplication/Division.
4. Addition/Subtraction.

Note that multiplication and division can be interchanged; similarly for addition/subtraction.

Example: The expression $2((3x)+6)$ is just written $2(3x+6)$.

Examples

Simplify the following:

1. $5(7 - 3 \cdot 2)$.
2. $(8 + 12/6 - 3) \cdot 2$.

The following expression is ambiguous:

$$24 - 17 - 6.$$

Use parenthesis so that the above evaluates to 13.

Exponents

Exponents are shorthand for repeated multiplication. For example:

- $3^2 = 3 \cdot 3$.
- $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$.
- $x^2 = x \cdot x$.

Examples

Using PEMDAS, simplify the following:

1. $(9 - 2 \cdot 3)^2$
2. $9^2 - 2 \cdot 3$.
3. $9 - 2^2 \cdot 3$.

Distributive Law

Distributive Law

Let x, y, and z be variables for numbers. Then:

$$x \cdot (y + z) = xy + xz.$$

Example

Compute the expression $2 \cdot (3 + 5)$ in two ways:

1. Using PEMDAS.
2. Using the distributive law.

FOIL

We can use the distributive law to prove the following FOIL technique works:

FOIL: First, Outside, Inside, Last

$$(a+b)(x+y) = ax + ay + bx + by.$$

Examples:

Using FOIL, simplify the following expressions:

1. $(x+2)(x+5)$.
2. $(x+y)(x-y)$.

Linear Equations

Definition

A linear equation (in one variable) is an equation that can be written in the form

$$ax + b = 0,$$

where a and b are prescribed numbers (not variables), x is a variable, and $a \neq 0$.

Note that if $a = 0$, then $ax = 0$, so that would mean $ax + b = 0$ is just $b = 0$. Nothing to study here!

It does not matter what symbol the variable is. We could use x, t, or any other symbol we'd like.

Examples and Non-Examples of Linear Equations

Determine which equations are linear and which are not.

1. $7x + 3 = 0$.
2. $2x = 14$.
3. $x^2 + 3 = 0$.
4. $5x - 2x + 1 = 0$.
5. $x = 1$.

What to do with Linear Equations

We will be interested in two things regarding linear equations:

1. Given a linear equation, how to solve for the variable.
2. Given a situation, how to model it using a linear equation.

Solving for Variables

Definition: Solution of an Equation

A solution to the equation $ax + b = 0$ is a number x that satisfies the given equality.

Example:

The solution to the equation $x + 5 = 7$ is the number $x = 2$, since $2 + 5 = 7$.

In practice, we need a technique to find solutions.

How to Solve Linear Equations

Strategy

1. Try to simplify as much as possible. Solving for one variable term is easier than solving for multiple.
2. Force the variable term on one side, and move everything else to the other side.

Example

Consider the example equation $x + 5 = 7$ from before. To apply our technique, subtract 5 from both sides:

$$\begin{aligned} x + 5 &= 7 \\ x + 5 - 5 &= 7 - 5 \\ x &= 2 \end{aligned}$$

Example

Consider the following equation:

$$4x + 10 = 2x + 5x - 1.$$

What is its solution?

Strategy (Reminder)

1. Try to simplify as much as possible. Solving for one variable term is easier than solving for multiple.
2. Force the variable term on one side, and move everything else to the other side.

Example

Solve the following equation. Remember PEMDAS:

$$(3+7)x - 5^2(2+1) = (3 \cdot 2 - 3)^2 x.$$

Examples

Solve the following:

1. $\frac{1}{2}x + x = 2\left(x + \frac{1}{2}\right)$.
2. $x^2 - (x-1)^2 = 5$.
3. $\frac{2n-3}{3} + \frac{1}{2} = \frac{5}{6}$.

Note the second equation is really a linear equation. Why?

Applications of Linear Equations

Some physical systems can be modeled by linear equations, often requiring at least 2 variables that depend on one another.

Example:

The price of a candy bar is \$7. We can model this with a first-degree equation in two variables:

$$P = 7A,$$

where A is the amount of candy bars and P is the total price to be paid.

Definition: Independent and Dependent Variables

A variable in an equation is said to be independent if it does not depend on other variables. Otherwise, it is said to be dependent.

Example:

In the previous equation $P = 7A$, we have that A is the independent variable and P is the dependent variable.

Linear Equations in More Variables

Linear equations have a natural extension to include multiple variables, like the previous slide. For example,

$$ax + by + c = 0, \qquad a, b, c \text{ numbers}$$

is a linear equation in two variables (x and y).

The equation $P = 7A$ from before is linear (in two variables).

Question

The pressure on a diver can be calculated using the formula $P = 15 + \frac{1}{2}D$, where P is the pressure (in pounds per square inch) and D is the depth (in feet).

Answer the following questions:

1. Which is the independent variable, and which is the dependent variable?
2. What is the pressure on the diver when the diver is at 60 ft?
3. What is the depth of a diver when the pressure on the diver is 55 lb/in^2?

Example

A family has two cats, Lily and Trixie. Together they weigh 25 pounds. If Lily weighs 17 pounds, how much does Trixie weigh? Solve the problem with a linear equation.

Example

Gas in California costs, on average, \$5.46 per gallon. Write an equation that relates the total cost of buying gas with the amount of gas. How many gallons of gas can I get if I don't want to spend more than \$70?

Example

On the day Bob was born, he was given 7 teddy bears. Each birthday he is given 2 teddy bears.

1. Write a linear equation that gives how many teddy bears Bob owns at any given year.
2. How many years until Bob has 57 teddy bears?

Solving in terms of other Variables

Often, it is convenient to symbolically solve an equation before plugging in numbers.

Example

The pressure on a diver can be calculated using the formula

$$P = 15 + \frac{1}{2}D,$$

where P is the pressure and D is the depth. What is the depth of a diver when the pressure on the diver is 55? First solve symbolically.