Valparaiso University Course Syllabus

MATH 110: Intermediate Algebra

Description: *A first course to assist students in developing fundamental mathematical concepts and processes. Self-paced course focused on mastering topics in the realm of Intermediate Algebra.*

Credit Hours: 1

Frequency: Offered every term

Audience: Completion of this course, or placement higher, is a prerequisite or corequisite for many quantitative courses across the University. This course may not be used to fulfill the General Education Requirement in the College of Arts and Sciences nor be counted toward a major or minor in mathematics. This course may not be taken by a student with credit for any other mathematics course.

Prerequisites: None

Format: 1 class session (50 minutes) per week for 15 weeks, plus online work outside of class

Textbook: All required coursework will be completed in the ALEKS 360 platform, which includes access to tutorials, an e-textbook, and videos. The instructor will provide you with a course code to input into the ALEKS 360 platform, but you must also purchase an ALEKS access code. An ALEKS access code can be purchased through the University Bookstore, or through the ALEKS website after inputting the course code. (You can use a financial aid access code that will be provided from the instructor for the first two weeks if you are not able to purchase an ALEKS access code at the beginning of the term. However, you must purchase your own ALEKS access code within the first two weeks.)

AARC: The Access and Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.

Notice of Cancellation:	Notifications of class cancellations will be made through Blackboard with as much advance notice as possible. It will be both posted on Blackboard and sent to your Valpo e-mail address. If you don't check your Valpo e-mail account regularly or have it set-up to be forwarded to your preferred e-mail account, you may not get the message. Please check Blackboard and your Valpo e-mail (or the e-mail address it forwards to) before coming to class.
Emergency Protocol:	VU's Emergency Notification System (ENS) uses multiple forms of communication, including e-mail, building alarms, outdoor sirens, message boards, computer alerts, Twitter, and public address messaging. Please review the specific procedures for this class found in Blackboard. Remember: "Siren inside, GO outside; Siren outside, GO inside." To evacuate, gather your personal belongings quickly and proceed to the nearest exit. Do not use the elevator. To shelter in place, move away from the windows and stay low to the ground; lock or barricade the door if there is a threat of violence.

Student Learning Objectives:

A. Students will demonstrate mastery of a range of algebraic topics in the realm of Intermediate Algebra. (See attached example detailed syllabus from ALEKS 360.)

ALEKS®

Class Syllabus

Class: MATH 110 Fall 2021 - A   **Class Code:** GGTEC-RJQ6L

Subject: Beginning and Intermediate Algebra Combined   **Instructor:** Kolba

Class Dates: 08/25/2021 - 12/10/2021   **Class Content:** 203 topics / 191 accessible topics

Textbook: Miller/O'Neill/Hyde: Beginning and Intermediate Algebra, 5th Ed. (McGraw-Hill)

⤒ Accessible Topic - Topics accessible to visually impaired students using a screen reader.

Course Readiness (1 Topic)

Course Readiness (1 Topic)
- Interpreting a bar graph

Chapter 1: The Set of Real Numbers (37 Topics)

Section 1.1 (14 Topics)
- Factors ⤒
- Least common multiple of 2 numbers ⤒
- Equivalent fractions ⤒
- Simplifying a fraction ⤒
- Finding the LCD of two fractions ⤒
- Addition or subtraction of fractions with different denominators ⤒
- Product of a unit fraction and a whole number ⤒
- Fraction multiplication ⤒
- Product of a fraction and a whole number: Problem type 2 ⤒
- Word problem involving fractions and multiplication ⤒
- The reciprocal of a number ⤒
- Fraction division ⤒
- Writing an improper fraction as a mixed number ⤒
- Writing a mixed number as an improper fraction ⤒

Section 1.2 (3 Topics)
- Evaluating an algebraic expression: Whole numbers with two operations ⤒
- Using a common denominator to order fractions ⤒
- Absolute value of a number ⤒

Section 1.3 (7 Topics)
- Order of operations with whole numbers ⤒
- Order of operations with whole numbers and grouping symbols ⤒
- Order of operations with whole numbers and exponents: Basic ⤒
- Exponents and fractions ⤒
- Order of operations with fractions: Problem type 2 ⤒
- Translating a phrase into a one-step expression ⤒
- Translating a phrase into a two-step expression ⤒

Section 1.4 (1 Topic)
- Writing a signed number for a real-world situation ⤒

Section 1.5 (2 Topics)
- Signed fraction addition or subtraction: Basic ⤒
- Operations with absolute value: Problem type 2 ⤒

Section 1.6 (6 Topics)
- Division involving zero ⤒
- Signed fraction multiplication: Basic ⤒
- Signed fraction division ⤒
- Exponents and integers: Problem type 2 ⤒
- Exponents and signed fractions ⤒

- Evaluating a quadratic expression: Integers ⬈

Section 1.7 (4 Topics)
- Combining like terms: Integer coefficients ⬈
- Distributive property: Integer coefficients ⬈
- Using distribution and combining like terms to simplify: Univariate ⬈
- Combining like terms in a quadratic expression ⬈

Additional Topics Appendix (3 Topics)

Section A.2 (3 Topics)
- Mode of a data set ⬈
- Mean and median of a data set ⬈
- Weighted mean ⬈

Chapter 2: Linear Equations and Inequalities (25 Topics)

Section 2.1 (3 Topics)
- Additive property of equality with signed fractions ⬈
- Multiplicative property of equality with signed fractions ⬈
- Additive property of equality with a negative coefficient ⬈

Section 2.2 (4 Topics)
- Using two steps to solve an equation with whole numbers ⬈
- Solving a linear equation with several occurrences of the variable: Variables on both sides and distribution ⬈
- Solving a linear equation with several occurrences of the variable: Fractional forms with monomial numerators ⬈
- Solving equations with zero, one, or infinitely many solutions ⬈

Section 2.3 (3 Topics*)
- Solving a multi-step equation given in fractional form ⬈
- Solving a linear equation with several occurrences of the variable: Fractional forms with monomial numerators ⬈
- Solving a linear equation with several occurrences of the variable: Variables on both sides and fractional coefficients ⬈

Section 2.4 (4 Topics)
- Translating a phrase into a one-step expression ⬈
- Translating a phrase into a two-step expression ⬈
- Solving a word problem with two unknowns using a linear equation ⬈
- Solving a word problem involving consecutive integers ⬈

Section 2.5 (4 Topics)
- Converting a fraction to a percentage: Denominator of 4, 5, or 10 ⬈
- Finding a percentage of a total amount: Real-world situations ⬈
- Finding the sale price given the original price and percent discount ⬈
- Finding the total cost including tax or markup ⬈

Section 2.6 (3 Topics)
- Solving for a variable in terms of other variables using multiplication or division: Advanced ⬈
- Solving for a variable in terms of other variables using addition or subtraction with division ⬈
- Solving for a variable inside parentheses in terms of other variables ⬈

Section 2.8 (5 Topics)
- Graphing a linear inequality on the number line ⬈
- Graphing a compound inequality on the number line ⬈
- Multiplicative property of inequality with signed fractions ⬈
- Solving a two-step linear inequality: Problem type 1 ⬈
- Solving a linear inequality with multiple occurrences of the variable: Problem type 1 ⬈

(*) Some topics in this section are also covered in a previous section of this Objective. Topics are only counted once towards the total number of topics for this Objective.

Chapter 3: Graphing Linear Equations in Two Variables (19 Topics)

Section 3.1 (1 Topic)
- Plotting a point in the coordinate plane

Section 3.2 (6 Topics)
- Table for a linear equation
- Finding a solution to a linear equation in two variables
- Graphing a line given its equation in slope-intercept form: Fractional slope
- Graphing a vertical or horizontal line
- Finding x- and y-intercepts of a line given the equation: Basic
- Graphing a line by first finding its x- and y-intercepts

Section 3.3 (3 Topics)
- Finding slope given the graph of a line on a grid
- Finding the slope of horizontal and vertical lines
- Graphing a line through a given point with a given slope

Section 3.4 (4 Topics)
- Finding the slope and y-intercept of a line given its equation in the form y = mx + b
- Writing an equation of a line given its slope and y-intercept
- Finding slopes of lines parallel and perpendicular to a line given in slope-intercept form
- Identifying parallel and perpendicular lines from equations

Section 3.5 (2 Topics)
- Writing the equation of the line through two given points
- Writing equations of lines parallel and perpendicular to a given line through a point

Section 3.6 (3 Topics)
- Interpreting a line graph
- Scatter plots and correlation
- Predictions from the line of best fit

Chapter 4: Systems of Linear Equations in Two Variables (6 Topics)

Section 4.1 (2 Topics)
- Graphically solving a system of linear equations
- Interpreting the graphs of two functions

Section 4.2 (1 Topic)
- Solving a system of linear equations using substitution

Section 4.3 (2 Topics)
- Solving a system of linear equations using elimination with addition
- Solving a system of linear equations using elimination with multiplication and addition

Section 4.4 (1 Topic)
- Solving a word problem involving a sum and another basic relationship using a system of linear equations

Chapter 5: Polynomials and Properties of Exponents (20 Topics)

Section 5.1 (5 Topics)
- Exponents and integers: Problem type 2
- Exponents and signed fractions
- Product rule with positive exponents: Multivariate
- Introduction to the quotient rule of exponents
- Quotient of expressions involving exponents

Section 5.2 (2 Topics)
- Power rules with positive exponents: Multivariate products
- Power rules with positive exponents: Multivariate quotients

Section 5.3 (5 Topics)

- Evaluating expressions with exponents of zero 🔗
- Evaluating an expression with a negative exponent: Positive fraction base 🔗
- Quotient rule with negative exponents: Problem type 2 🔗
- Power of a power rule with negative exponents 🔗
- Power and quotient rules with negative exponents: Problem type 1 🔗

Section 5.4 (2 Topics)
- Scientific notation with positive exponent 🔗
- Scientific notation with negative exponent 🔗

Section 5.6 (6 Topics*)
- Product rule with positive exponents: Multivariate 🔗
- Multiplying a univariate polynomial by a monomial with a positive coefficient 🔗
- Multiplying binomials with leading coefficients of 1 🔗
- Multiplying binomials with leading coefficients greater than 1 🔗
- Multiplying conjugate binomials: Univariate 🔗
- Squaring a binomial: Univariate 🔗

Section 5.7 (1 Topic)
- Dividing a polynomial by a monomial: Univariate 🔗

(*) Some topics in this section are also covered in a previous section of this Objective. Topics are only counted once towards the total number of topics for this Objective.

Chapter 6: Factoring Polynomials (12 Topics)

Section 6.1 (4 Topics)
- Greatest common factor of 2 numbers 🔗
- Factoring a linear binomial 🔗
- Factoring out a monomial from a polynomial: Univariate 🔗
- Factoring out a binomial from a polynomial: GCF factoring, basic 🔗

Section 6.2 (1 Topic)
- Factoring out a constant before factoring a quadratic 🔗

Section 6.3 (2 Topics)
- Factoring a quadratic with leading coefficient greater than 1: Problem type 1 🔗
- Factoring a quadratic with a negative leading coefficient 🔗

Section 6.5 (2 Topics)
- Factoring a perfect square trinomial with leading coefficient 1 🔗
- Factoring a difference of squares in one variable: Basic 🔗

Section 6.6 (1 Topic)
- Factoring a sum or difference of two cubes 🔗

Section 6.7 (2 Topics)
- Finding the roots of a quadratic equation of the form $ax^2 + bx = 0$ 🔗
- Finding the roots of a quadratic equation with leading coefficient 1 🔗

Chapter 7: Rational Expressions and Equations (24 Topics)

Section 7.1 (5 Topics)
- Restriction on a variable in a denominator: Linear 🔗
- Simplifying a ratio of factored polynomials: Linear factors 🔗
- Simplifying a ratio of factored polynomials: Factors with exponents 🔗
- Simplifying a ratio of polynomials using GCF factoring 🔗
- Simplifying a ratio of polynomials: Problem type 1 🔗

Section 7.2 (5 Topics)
- Multiplying rational expressions involving multivariate monomials 🔗
- Multiplying rational expressions made up of linear expressions 🔗

- Dividing rational expressions involving multivariate monomials ⬈
- Dividing rational expressions involving linear expressions ⬈
- Complex fraction without variables: Problem type 1 ⬈

Section 7.3 (1 Topic)
- Finding the LCD of two fractions ⬈

Section 7.4 (4 Topics)
- Adding rational expressions with different denominators and a single occurrence of a variable ⬈
- Adding rational expressions with denominators ax and bx: Basic ⬈
- Adding rational expressions with linear denominators without common factors: Basic ⬈
- Adding rational expressions with denominators ax-b and b-ax ⬈

Section 7.5 (1 Topic)
- Complex fraction involving univariate monomials ⬈

Section 7.6 (6 Topics)
- Solving a linear equation with several occurrences of the variable: Variables on both sides and fractional coefficients ⬈
- Solving a rational equation that simplifies to linear: Denominators a, x, or ax ⬈
- Solving a rational equation that simplifies to linear: Like binomial denominators ⬈
- Solving a rational equation that simplifies to linear: Factorable quadratic denominator ⬈
- Solving a rational equation that simplifies to quadratic: Proportional form, basic ⬈
- Solving for a variable in terms of other variables in a rational equation: Problem type 2 ⬈

Section 7.7 (2 Topics)
- Solving a proportion of the form $(x+a)/b = c/d$ ⬈
- Solving a proportion of the form $a/(x+b) = c/x$ ⬈

Chapter 8: Relations and Functions (2 Topics)

Section 8.1 (2 Topics)
- Domain and range from ordered pairs ⬈
- Domain and range from the graph of a discrete relation ⬈

Chapter 9: More Equations and Inequalities (8 Topics)

Section 9.3 (2 Topics)
- Solving an absolute value equation: Problem type 1 ⬈
- Solving an absolute value equation of the form $|ax+b| = |cx+d|$ ⬈

Section 9.4 (3 Topics)
- Solving an absolute value inequality: Problem type 1 ⬈
- Writing an absolute value inequality given a graph on the number line ⬈
- Solving an absolute value inequality: Problem type 3 ⬈

Section 9.5 (3 Topics)
- Graphing a linear inequality in the plane: Vertical or horizontal line
- Graphing a linear inequality in the plane: Slope-intercept form
- Graphing a system of two linear inequalities: Basic

Chapter 10: Radicals and Complex Numbers (29 Topics)

Section 10.1 (3 Topics)
- Square root of a perfect square monomial ⬈
- Cube root of an integer ⬈
- Domain of a square root function: Advanced ⬈

Section 10.2 (5 Topics)
- Rational exponents: Unit fraction exponents and whole number bases ⬈
- Rational exponents: Negative exponents and fractional bases ⬈
- Rational exponents: Quotient rule ⬈

- Rational exponents: Products and quotients with negative exponents ⬀
- Rational exponents: Power of a power rule ⬀

Section 10.3 (4 Topics)

- Simplifying a radical expression with an even exponent ⬀
- Simplifying a radical expression with an odd exponent ⬀
- Simplifying a radical expression with two variables ⬀
- Simplifying a higher radical expression: Multivariate ⬀

Section 10.4 (2 Topics)

- Square root addition or subtraction ⬀
- Simplifying a sum or difference of radical expressions: Univariate ⬀

Section 10.5 (6 Topics)

- Square root multiplication: Basic ⬀
- Square root multiplication: Advanced ⬀
- Simplifying a product of radical expressions: Univariate ⬀
- Simplifying a product of radical expressions: Multivariate ⬀
- Simplifying a product of higher radical expressions ⬀
- Special products of radical expressions: Conjugates and squaring ⬀

Section 10.6 (5 Topics)

- Simplifying a quotient of square roots ⬀
- Rationalizing a denominator: Quotient involving square roots ⬀
- Rationalizing a denominator: Square root of a fraction ⬀
- Rationalizing a denominator using conjugates: Integer numerator ⬀
- Rationalizing a denominator: Quotient involving higher radicals and monomials ⬀

Section 10.7 (4 Topics)

- Solving a radical equation that simplifies to a linear equation: Two radicals ⬀
- Solving a radical equation that simplifies to a quadratic equation: One radical, basic ⬀
- Solving an equation with a root index greater than 2: Problem type 2 ⬀
- Solving an equation with exponent 1/a: Problem type 1 ⬀

Chapter 11: Quadratic Equations and Functions (11 Topics)

Section 11.1 (2 Topics)

- Solving an equation of the form $x^2 = a$ using the square root property ⬀
- Completing the square ⬀

Section 11.2 (2 Topics)

- Applying the quadratic formula: Exact answers ⬀
- Discriminant of a quadratic equation ⬀

Section 11.3 (1 Topic)

- Solving an equation that can be written in quadratic form: Problem type 1 ⬀

Section 11.4 (3 Topics)

- Graphing a parabola of the form $y = ax^2$
- Graphing a parabola of the form $y = ax^2 + c$
- Domain and range from the graph of a parabola ⬀

Section 11.5 (3 Topics)

- Finding the vertex, intercepts, and axis of symmetry from the graph of a parabola ⬀
- Graphing a parabola of the form $y = x^2 + bx + c$
- Finding the maximum or minimum of a quadratic function ⬀

Chapter 12: Exponential and Logarithmic Functions and Applications (9 Topics)

Section 12.1 (1 Topic)

- Horizontal line test

Section 12.2 (1 Topic)
- Graphing an exponential function and its asymptote: $f(x) = a(b)^x$

Section 12.3 (1 Topic)
- Converting between logarithmic and exponential equations ⬀

Section 12.4 (2 Topics)
- Expanding a logarithmic expression: Problem type 2
- Writing an expression as a single logarithm ⬀

Section 12.6 (4 Topics)
- Solving a multi-step equation involving a single logarithm ⬀
- Solving an equation involving logarithms on both sides: Problem type 1 ⬀
- Solving an exponential equation by finding common bases: Linear exponents ⬀
- Solving an exponential equation by using logarithms: Decimal answers, basic ⬀

Chapter 13: Conic Sections (1 Topic)

Section 13.1 (1 Topic)
- Distance between two points in the plane: Exact answers ⬀

Chapter 15: Transformations, Piecewise-Defined Functions, and Probability (Online) (2 Topics)

Section 15.1 (2 Topics)
- Choosing a graph to fit a narrative: Basic ⬀
- Choosing a graph to fit a narrative: Advanced ⬀