Course Syllabus

QUANTITATIVE REASONING 1 (Math 110)

Description: A first course to assist students in developing fundamental mathematical concepts and processes. Coursework is a combination of (1) in-class collaborative problem solving and algebraic skill building, and (2) an on-line component presenting tutorials in, and aiming for mastery of, skill-based algebraic content within the realm of Intermediate Algebra. Completion of this course, or placement higher, is required 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.

Credit Hours: 2 Cr.

Audience: Students are recommended to take this course based on the Mathematics Placement Exam and their background in mathematics. Students recommended for this course are not yet eligible for many natural science and general education courses.

Prerequisites: None

Format: 200 minutes in class & computer lab per week plus out of class work on-line. The course is usually available in both the first and second seven week terms of the Fall and as needed in Spring semesters. Summer offerings may be available when there is sufficient demand.

Text / Software: ALEKS 360 Access Card for Beginning and Intermediate Algebra, 5th Ed, by Miller, O’Neil, and Hyde (McGraw Hill, ISBN 9781259936371). This on-line platform will be used throughout. Students are encouraged to bring their own devices (tablets, laptops) to class; a small number of extras will be available during class periods.

Internet: Blackboard may be used by course instructors.

Ability-Related Support: The Access & 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: In the event class is cancelled, you will be notified through your Valparaiso University e-mail account.

Course Information, Math 110, Quantitative Reasoning I.
Revised 09/2016.
Student Learning Objectives:

Students will:

A. Demonstrate mastery of a range of algebraic topics in the realm of Intermediate Algebra.

B. Demonstrate college-ready organizational, problem-solving, and mathematical communication skills.

C. Demonstrate college-ready ability to work in groups and interact in peer-to-peer communication.

Topics Include:

See attached detailed (representative) syllabus from ALEKS 360.
Course Name: MATH 110 F1B: Quantitative Reasoning I - TR 10:30am - 12:10pm
Course Code: YK6HM-6VNUL

ALEKS Course: Beginning and Intermediate Algebra Combined
Instructor: Luther

Course Dates: Begin: 08/14/2017    End: 12/17/2017
Course Content: 203 topics / 171 accessible topics


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

Course Readiness  (1 topic, no due date)

Course Readiness  (1 topic)
* Interpreting a bar graph

Chapter 1 - The Set of Real Numbers  (37 topics, no due date)

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, no due date)
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, no due date)
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, no due date)

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, no due date)

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, no due date)

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, no due date)

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

**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

**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

**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, no due date)

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, no due date)

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, no due date)

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, no due date)

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, no due date)

Section 15.1 (2 topics)

- Choosing a graph to fit a narrative: Basic
- Choosing a graph to fit a narrative: Advanced