

FIRST SEMESTER

ACC Math 1 – Unit 1 – Characteristics of Functions

MA1A1. Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.

- a. Represent functions using function notation.
- b. Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3 , $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = 1/x$.
- c. Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x - and y -axes.
- d. Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.
- e. Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.
- f. Recognize sequences as functions with domains that are sets of whole numbers.
- g. Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families.
- h. Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither.

MA1G2. Students will understand and use the language of mathematical argument and justification.

- a. Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.
- b. Understand and use the relationships among a statement and its converse, inverse, and contrapositive.

ACC Math 1 – Unit 2 – Polygons in the Plane

MA1G1. Students will investigate properties of geometric figures in the coordinate plane.

- a. Determine the distance between two points.
- b. Determine the distance between a point and a line.
- c. Determine the midpoint of a segment.
- d. Understand the distance formula as an application of the Pythagorean theorem.
- e. Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.

MA1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

- a. Determine the sum of interior and exterior angles in a polygon.
- b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.
- c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).
- d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.
- e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

ACC Math 1 – Unit 3 – Circles and Spheres

MA1G4. Students will understand the properties of circles.

- a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.
- b. Understand and use properties of central, inscribed, and related angles.
- c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.
- d. Justify measurements and relationships in circles using geometric and algebraic properties.

MA1G5. Students will find and compare the measures of spheres.

- a. Use and apply surface area and volume of a sphere.
- b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

SECOND SEMESTER

ACC Math 1 – Unit 4 – The Chance of Winning

MA1D1. Students will determine the number of outcomes related to a given event.

- a. Apply the addition and multiplication principles of counting.
- b. Calculate and use simple permutations and combinations.

MA1D2. Students will use the basic laws of probability.

- a. Find the probabilities of mutually exclusive events.
- b. Find the probabilities of dependent events.
- c. Calculate conditional probabilities.
- d. Use expected value to predict outcomes.

MA1D3. Students will relate samples to a population.

- a. Compare summary statistics (mean, median, quartiles, and interquartile range) from one sample data distribution to another sample data distribution in describing center and variability of the data distributions.

- b. Compare the averages of the summary statistics from a large number of samples to the corresponding population parameters.
- c. Understand that a random sample is used to improve the chance of selecting a representative sample.

MA1D4. Students will explore variability of data by determining the mean absolute deviation (the average of the absolute values of the deviations).

MA1D5. Students will determine an algebraic model to quantify the association between two quantitative variables.

- a. Gather and plot data that can be modeled with linear and quadratic functions.
- b. Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and eyeballing.
- c. Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.

ACC Math 1 – Unit 5 – Quadratics, Factoring, and Imaginary Numbers

MA1N1. Students will represent and operate with complex numbers.

- a. Write square roots of negative numbers in imaginary form.
- b. Write complex numbers in the form $a + bi$.
- c. Add, subtract, multiply, and divide complex numbers.
- d. Simplify expressions involving complex numbers.

MA1A1. Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.

- i. Understand that any equation in x can be interpreted as the equation $f(x) = g(x)$, and interpret the solutions of the equation as the x -value(s) of the intersection point(s) of the graphs of $y = f(x)$ and $y = g(x)$.

MA1A2. Students will simplify and operate with radical expressions, polynomials, and rational expressions.

- a. Simplify algebraic and numeric expressions involving square root.
- b. Perform operations with square roots.
- c. Add, subtract, multiply, and divide polynomials.
- d. Add, subtract, multiply, and divide rational expressions.
- e. Factor expressions by greatest common factor, grouping, trial and error, and special products limited to the formulas below.

$$(x + y)^2 = x^2 + 2xy + y^2$$

$$(x \cdot y)^2 = x^2 \cdot 2xy + y^2$$

$$(x + y)(x \cdot y) = x^2 \cdot y$$

$$(x + a)(x + b) = x^2 + (a + b)x + ab$$

$$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

$$(x \cdot y)^3 = x^3 \cdot 3x^2y + 3xy^2 \cdot y$$

f. Use area and volume models for polynomial arithmetic.

MA1A3. Students will analyze quadratic functions in the forms $f(x) = ax^2 + bx + c$ and $f(x) = a(x - h)^2 + k$.

- Convert between standard and vertex form.
- Graph quadratic functions as transformations of the function $f(x) = x^2$.
- Investigate and explain characteristics of quadratic functions, including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, intervals of increase and decrease, and rates of change.
- Explore arithmetic series and various ways of computing their sums.
- Explore sequences of partial sums of arithmetic series as examples of quadratic functions.

MA1A4. Students will solve quadratic equations and inequalities in one variable.

- Solve equations graphically using appropriate technology.
- Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula.
- Analyze the nature of roots using technology and using the discriminant.
- Solve quadratic inequalities both graphically and algebraically, and describe the solutions using linear inequalities.

ACC Math 1 – Unit 6– Putting the Pieces Together (Absolute Value, Step, and Piecewise Defined Functions)

MA1A5. Students will investigate step and piecewise functions, including greatest integer and absolute value functions.

- Write absolute value functions as piecewise functions.
- Investigate and explain characteristics of a variety of piecewise functions including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, points of discontinuity, intervals over which the function is constant, intervals of increase and decrease, and rates of change.
- Solve absolute value equations and inequalities analytically, graphically, and by using appropriate technology.

MA1D5. Students will determine an algebraic model to quantify the association between two quantitative variables.

- a. Gather and plot data that can be modeled with linear and quadratic functions.
- b. Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the **median-median line** and eyeballing.
- c. Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.