

## FIRST SEMESTER

### Math 4 – Unit 1 – Data Analysis

**MM4D1.** Using simulation, students will develop the idea of the central limit theorem.

**MM4D2.** Using student-generated data from random samples of at least 30 members, students will determine the margin of error and confidence interval for a specified level of confidence.

**MM4D3.** Students will use confidence intervals and margins of error to make inferences from data about a population. Technology is used to evaluate confidence intervals, but students will be aware of the ideas involved.

### Math 4 – Unit 2 – Sequences and Series

**MM4A9.** Students will use sequences and series.

- Use and find recursive and explicit formulas for the terms of sequences.
- Recognize and use simple arithmetic and geometric sequences.
- Find and apply the sums of finite and, where appropriate, infinite arithmetic and geometric series.
- Use summation notation to explore finite series.

### Math 4 – Unit 3 – Rational Functions

**MM4A1.** Students will explore rational functions.

- Investigate and explain characteristics of rational functions, including domain, range, zeros, points of discontinuity, intervals of increase and decrease, rates of change, local and absolute extrema, symmetry, asymptotes, and end behavior.
- Find inverses of rational functions, discussing domain and range, symmetry, and function composition.
- Solve rational equations and inequalities analytically, graphically, and by using appropriate technology.

## SECOND SEMESTER

### Math 4– Unit 4 – Introduction to Trigonometry

**MM4A2.** Students will use the circle to define the trigonometric functions.

- Define and understand angles measured in degrees and radians, including but not limited to  $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ , their multiples, and equivalences.
- Understand and apply the six trigonometric functions as functions of general angles in standard position.
- Find values of trigonometric functions using points on the terminal sides of angles in the standard position.
- Understand and apply the six trigonometric functions as functions of arc length on the unit circle.
- Find values of trigonometric functions using the unit circle.

## Math 4 – Unit 5 – Graphs and Inverses of Trigonometric Functions

**MM4A3. Students will investigate and use the graphs of the six trigonometric functions.**

- Understand and apply the six basic trigonometric functions as functions of real numbers.
- Determine the characteristics of the graphs of the six basic trigonometric functions.
- Graph transformations of trigonometric functions including changing period, amplitude, phase shift, and vertical shift.
- Apply graphs of trigonometric functions in realistic contexts involving periodic phenomena.

**MM4A8. Students will investigate and use inverse sine, inverse cosine, and inverse tangent functions.**

- Find values of the above functions using technology as appropriate.
- Determine characteristics of the above functions and their graphs.

## Math 4 – Unit 6 – Trigonometric Identities

**MM4A5. Students will establish the identities below and use them to simplify trigonometric expressions and verify equivalence statements.**

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

$$\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta$$

$$\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$$

$$\sin(2\theta) = 2 \sin \theta \cos \theta$$

$$\cos(2\theta) = \cos^2 \theta - \sin^2 \theta$$

## Math 4 – Unit 7 – Extended Trigonometry

**MM4A6. Students will solve trigonometric equations both graphically and algebraically.**

- a. Solve trigonometric equations over a variety of domains, using technology as appropriate.
- b. Use the coordinates of a point on the terminal side of an angle to express  $x$  as  $\theta \cos r$  and  $y$  as  $\theta \sin r$ .
- c. Apply the law of sines and the law of cosines.

**MM4A7. Students will verify and apply – to find the area of a triangle.**

**MM4A10. Students will understand and use vectors.**

- a. Represent vectors algebraically and geometrically.
- b. Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.
- c. Add, subtract, and compute scalar multiples of vectors.
- d. Use vectors to solve realistic problems.

### **Math 4 – Unit 8 – Investigations of Functions**

**MM4A4. Students will investigate functions.**

- a. Compare and contrast properties of functions within and across the following types: linear, quadratic, polynomial, power, rational, exponential, logarithmic, trigonometric, and piecewise.
- b. Investigate transformations of functions.
- c. Investigate characteristics of functions built through sum, difference, product, quotient, and composition.