### Trigonometry

**General Outcome:** Develop trigonometric reasoning.

**Specific Outcomes**  
It is expected that students will:

- **12P.T.1.** Demonstrate an understanding of angles in standard position, expressed in degrees and radians.  
  \([C, \, CN, \, ME, \, R, \, V]\)

- **12P.T.2.** Develop and apply the equation of the unit circle.  
  \([CN, \, R, \, V]\)

- **12P.T.3.** Solve problems, using the six trigonometric ratios for angles expressed in radians and degrees.  
  \([C, \, ME, \, R, \, T, \, V]\)

- **12P.T.4.** Graph and analyze the trigonometric functions sine, cosine and tangent to solve problems.  
  \([C, \, CN, \, PS, \, T, \, V]\)

- **12P.T.5.** Solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians.  
  \([C, \, CN, \, PS, \, R, \, T, \, V]\)

- **12P.T.6.** Prove trigonometric identities, using:  
  - reciprocal identities  
  - quotient identities  
  - Pythagorean identities  
  - sum or difference identities (restricted to sine, cosine and tangent)  
  - double-angle identities (restricted to sine, cosine and tangent).  
  \([C, \, R, \, T, \, V]\)

### Relations and Functions

**General Outcome:** Develop algebraic and graphical reasoning through the study of relations.

**Specific Outcomes**  
It is expected that students will:

- **12P.R.1.** Demonstrate an understanding of operations on, and compositions of, functions.  
  \([CN, \, R, \, T, \, V]\)

- **12P.R.2.** Demonstrate an understanding of the effects of horizontal and vertical translations on the graphs of functions and their related equations.  
  \([C, \, CN, \, R, \, V]\)

- **12P.R.3.** Demonstrate an understanding of the effects of horizontal and vertical compressions and stretches on the graphs of functions and their related equations.  
  \([C, \, CN, \, R, \, V]\)

- **12P.R.4.** Apply translations, compressions and stretches to the graphs and equations of functions.  
  \([C, \, CN, \, R, \, V]\)

- **12P.R.5.** Demonstrate an understanding of the effects of reflections on the graphs of functions and their related equations, including reflections through the:  
  - \(x\)-axis  
  - \(y\)-axis  
  - line \(y = x\).  
  \([C, \, CN, \, R, \, V]\)

- **12P.R.6.** Demonstrate an understanding of inverses of relations.  
  \([C, \, CN, \, R, \, V]\)

- **12P.R.7.** Demonstrate an understanding of logarithms.  
  \([C, \, CN, \, ME, \, R]\)

- **12P.R.8.** Demonstrate an understanding of the product, quotient and power laws of logarithms.  
  \([C, \, CN, \, T]\)

- **12P.R.9.** Graph and analyze exponential and logarithmic functions.  
  \([C, \, CN, \, T]\)

- **12P.R.10.** Solve problems that involve exponential and logarithmic equations.  
  \([C, \, CN, \, PS, \, R]\)

- **12P.R.11.** Demonstrate an understanding of factoring polynomials of degree greater than 2 (limited to polynomials of degree \(\leq 5\) with integral coefficients).  
  \([C, \, CN, \, ME]\)

- **12P.R.12.** Graph and analyze polynomial functions (limited to polynomial functions of degree \(\leq 5\)).  
  \([C, \, CN, \, PS, \, T, \, V]\)

- **12P.R.13.** Graph and analyze radical functions (limited to functions involving one radical).  
  \([C, \, CN, \, R, \, T, \, V]\)

- **12P.R.14.** Graph and analyze rational functions (limited to numerators and denominators that are monomials, binomials or trinomials).  
  \([C, \, CN, \, R, \, T, \, V]\)

### Permutations, Combinations and Binomial Theorem

**General Outcome:** Develop algebraic and numeric reasoning that involves combinatorics.

**Specific Outcomes**  
It is expected that students will:

- **12P.P.1.** Apply the fundamental counting principle to solve problems.  
  \([C, \, CN, \, PS, \, R, \, V]\)

- **12P.P.2.** Determine the number of permutations of \(n\) elements taken \(r\) at a time to solve problems.  
  \([C, \, PS, \, R, \, V]\)

- **12P.P.3.** Determine the number of combinations of \(n\) different elements taken \(r\) at a time to solve problems.  
  \([C, \, PS, \, R, \, V]\)

- **12P.P.4.** Expand powers of a binomial in a variety of ways, including using the binomial theorem (restricted to exponents that are natural numbers).  
  \([C, \, CN, \, R, \, V]\)

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Processes:  
- C – Communication  
- CN – Connections  
- ME – Mental Mathematics and Estimation  
- PS – Problem Solving  
- R – Reasoning  
- T – Technology  
- V – Visualization