

## **Knowledge and Skills for Mathematics**

### **Number Sense**

- Students compute with and simplify rational expressions and those containing exponents.
- Students extend the number system to include complex numbers and perform operations with them.
- Students demonstrate understanding of and facility working with sequences, series and matrices.

### **Algebra and Functions**

- Students classify and identify attributes of basic families of functions (linear, quadratic, power, exponential, absolute value, simple polynomial, rational and radical).
- Students demonstrate understanding of the concept of a function, identify its attributes, and determine the results of operations performed on function.
- Students demonstrate facility with algebraic manipulations, perform algebraic computations easily and routinely, and rewrite expressions and equations to gain information and find solutions.
- Students identify and demonstrate understanding about cyclic phenomena and situations that give rise to quadratic equations in two variables.
- Students graph polynomial, rational, step and piecewise-defined functions and explain the relationship between their equations and their graphs.
- Students understand the inverse relationship between exponential and logarithms, and use this relationship to solve problems.
- Students analyze and explain the connections between algebraic and geometric representations of mathematical objects.
- Students use direct and recursive methods to prove and derive formulas and statements.
- Students investigate periodic behavior, identify the characteristics of, and graph trigonometric functions.
- Students perform operations with vectors in the coordinate plane and solve practical problems using vectors.
- Students understand the use of matrices to organize information and perform simple operations.
- Students justify and use properties from number systems to combine and simplify functions and matrices.

### **Measurement and Geometry**

- Students select and use appropriate units, tools, geometric properties and degrees of accuracy to solve problems involving geometric and non-geometric measures.
- Students identify, formulate and confirm conjectures, find missing measures, and solve problems involving angles, right triangles, other polygons and circles.
- Students deepen their understanding of the interrelationships among two- and three-dimensional geometric objects and visualize and describe objects, paths and regions in space.
- Students demonstrate understanding of an axiomatic system, and the nature of proof.

- Students understand and use periodic functions and trigonometric relationships.
- Students use vectors to represent and answer questions about quantities.
- Students use graph theory to determine properties of and answer questions about problems which involve networks.

### **Problem Solving and Mathematical Reasoning**

- Students make decisions about how to approach problems.
- Students select and use appropriate concepts and techniques from different areas of mathematics to find solutions.

**Pajaro Valley Unified School  
District**

**District Standards  
For  
Trigonometry**

**Grades 8-12**

## State Standards For Trigonometry

Trigonometry is a discipline that utilizes the techniques of both the algebra and geometry that students have previously learned. The trigonometric functions studied are defined geometrically, rather than in terms of algebraic equations. Facility with these functions as well as being able to prove basic identities regarding them is especially important for students intending to study calculus, more advanced mathematics, physics and other sciences, and engineering in college.

1. Students understand the notion of angle, and how to measure it, both in degrees and radians. They can convert between degrees and radians.
2. Students know the definition of sine and cosine as y and x coordinates of points on the unit circle, and are familiar with the graphs of the sine and cosine functions.
3. Students know the identity  $\cos^2(x) + \sin^2(x) = 1$ .
  - 3.1 Students prove that this identity is equivalent to the Pythagorean theorem (e.g., students can prove this identity using the Pythagorean theorem, and conversely they can prove the Pythagorean theorem as a consequence of this identity).
  - 3.2 Students prove other trigonometric identities, and simplify others using the identity  $\cos^2(x) + \sin^2(x) = 1$  (e.g., students use this identity to prove that  $\sec^2(x) = \tan^2(x) + 1$ ).
4. Students graph functions of the form  $f(t) = A\sin(Bt + o)$  or  $f(t) = A\cos(Bt + o)$ , and interpret A, B, and o in terms of amplitude, frequency, period, and phase shift.
5. Students know the definition of the tangent and cotangent functions, and can graph them.
6. Students know the definitions of the secant and cosecant functions, and can graph them.
7. Students know that the tangent of the angle a line makes with the x-axis is equal to the slope of the line.
8. Students know the definitions of the inverse trigonometric functions, and can graph the functions.
9. Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.
10. Students demonstrate understanding of the addition formulas for sine's and cosines, their proofs, and use them to prove and/or simplify other trigonometric identities.
11. Students use trigonometry to determine unknown sides or angles in right triangles.
12. Students know the Laws of Sine's and the Law of Cosines, and apply them to problems.
13. Students determine the area of a triangle given one angle and the two adjacent sides.
14. Students are familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates, and vice versa.
15. Students represent equations given in rectangular coordinates in terms of polar coordinates.
16. Students represent equations given in rectangular coordinates in terms of polar coordinates.
17. Students are familiar with complex numbers. They can represent a complex number in polar form, and know how to multiply complex numbers in their polar form.
18. Students know De Moivre's Theorem, and can give n-th roots of a complex number given in polar form.
19. Students are adept at using trigonometry in a variety of applications and word problems.