

**URBANDALE COMMUNITY SCHOOL DISTRICT
CURRICULUM FRAMEWORK OUTLINE**

SUBJECT:	Mathematics	
COURSE TITLE:	Trigonometry	1 Credits/1 Semesters
PREREQUISITES:	Geometry credits	

COURSE DESCRIPTION:

Trigonometry is the study of triangle measurement and the unit circle. Many real-world problems (e.g., navigation and surveying) require the utilization of triangles in their solutions. Trigonometry also provides an important mathematical connection between geometry and algebra.

STANDARDS AND COURSE BENCHMARKS WITH INDICATORS:

In order that our students may achieve the maximum benefit from their talents and abilities, the students of Urbandale Community School District's Trigonometry course should be able to...

Standard II: Understand quantities.

Benchmark: Reason quantitatively and use units to solve problems. (Iowa Core: HSN.Q.A.1, 2, 3)

Indicators: Use units as a way to understand problems and to guide the solution of multi-step problems.
Choose and interpret units consistently in formulas
Choose and interpret the scale and the origin in graphs and data displays.
Define appropriate quantities for the purpose of descriptive modeling.
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard V: Demonstrate reasoning with equations and inequalities.

Benchmark: Represent and solve equations and inequalities graphically. (Iowa Core: HSA.REI.D.11)

Indicators: Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$.
Find the solutions of the equation $f(x) = g(x)$ approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations, including cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

Standard VI: Understand functions.

Benchmark: Interpret functions that arise in applications in terms of a context. (Iowa Core: HSF.IF.B.4, 5)

- Indicators: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- For a function that models a relationship between two quantities, sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Benchmark: Analyze functions using different representations. (Iowa Core: HSF.IF.C.7)

- Indicators: Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph trigonometric functions, showing period, midline, and amplitude.

Benchmark: Build new functions from existing functions. (Iowa Core: HSF.BF.B.3, 4)

- Indicators: Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs.
- Experiment with cases and illustrate an explanation of the effects on the graph using technology.
- Produce an invertible function from a non-invertible function by restricting the domain.

Benchmark: Extend the domain of trigonometric functions using unit circle. (Iowa Core: HSF.TF.A.1, 2, 3, 4)

- Indicators: Demonstrate an understanding of radian measure of an angle as the length of the arc on the unit circle subtended by the angle

Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$.

Use the unit circle to express the values of sine, cosine, and tangent for $\pi-x$, $\pi+x$, and $2\pi-x$ in terms of their values for x , where x is any real number.

Use the unit circle to explain symmetry (odd and even) of trigonometric functions.

Use the unit circle to explain periodicity of trigonometric functions.

Benchmark: Model periodic phenomena with trigonometric functions. (Iowa Core: HSF.TF.B.5, 6, 7)

Indicators: Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

Demonstrate an understanding that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

Benchmark: Prove and apply trigonometric identities. (Iowa Core: HSF.TF.C.8, 9)

Indicators: Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$.

Use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

Prove the addition and subtraction formulas for sine, cosine, and tangent.

Use the addition and subtraction formulas for sine, cosine, and tangent to solve problems.

Standard VIII: Understand geometry.

Benchmark: Define trigonometric ratios and solve problems involving right triangles. (Iowa Core: HSG.SRT.C.6, 7, 8)

Indicators: Demonstrate an understanding that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

Explain and use the relationship between the sine and cosine of complementary angles.

Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Benchmark: Apply trigonometry to general triangles. (Iowa Core: HSG.SRT.D 9, 10, 11)

- Indicators:
- Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
 - Prove the Laws of Sines and Cosines.
 - Use the Laws of Sines and Cosines to solve problems.
 - Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

No student enrolled in the Urbandale Community School District shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination in the District's programs on the basis of race, color, creed, sex, religion, marital status, ethnic background, national origin, disability, sexual orientation, gender identity, or socio-economic background. The policy of the District shall be to provide educational programs and opportunities for students as needed on the basis of individual interests, values, abilities and potential.