

Advanced Practical Applications of Mathematics

Course Description

This course answers the question, "When will I ever use this?" The course provides real world integrated practical applications of algebra, geometry, statistics, and trigonometry.

Course Code: *This course does NOT have a separate code but the material can be infused into existing Math or STS courses.*

Program of Study to which the course applies

All STS Programs of Study

	Course Content	Reference/Source	Nebraska Academic Standard	Common Core
Standard 1	Students will be able to practically apply algebraic concepts			
Benchmark 1.1	Evaluating functions and relations as they apply to practical problems	CCSS,NDE		
Sample Performance Indicator 1.1.1	Create and solve a function to determine the spacing between shelves given the shelf thickness and floor to ceiling height.			
Sample Performance Indicator 1.1.2	Compute the stopping distance of a car traveling at a given speed. Discuss other ways to compute stopping distance.	PUMAS		
Sample Performance Indicator 1.1.3	Research the total operating costs of two different vehicles. Choose the best buy and explain your reasoning.			
Benchmark 1.2	Modeling functions and relations using life applications	CCSS,NDE		
Sample Performance Indicator 1.2.1	Measure the arm span and height of several students, graph the results. Use the graph to make predictions of other students' height.			
Sample Performance Indicator 1.2.2	Using ratios, create a scale orthographic drawing of a given object, and then recreate the object in 3D.			
Sample Performance Indicator 1.2.3	Given the hourly wages of two workers, total hours spent on a project and total wages, graph the system of equations to determine how many hours each person worked.			

Standard 2

Students will be able to practically apply geometric concepts

Benchmark 2.1

Analyzing characteristics, properties, and relationships among geometric shapes and objects in a practical sense

CCSS,NDE

Sample Performance Indicator 2.1.1

Given the dimensions of a building determine the appropriate size of an air conditioning unit.

Sample Performance Indicator 2.1.2

Determine the difference in a length of string laid out on the equator versus a string that is 1/2" off the surface.

Sample Performance Indicator 2.1.3

How much additional material is needed if the pitch of a roof is changed

Benchmark 2.2

Applying units, systems, and formulas to solve problems utilizing coordinate geometry

CCSS,NDE

Sample Performance Indicator 2.2.1

Calculate the sheet metal used to build a closed right cylindrical metal tank given the diameter and length.

Sample Performance Indicator 2.2.2

Given a length of fencing, determine the geometric shape with the largest area for an animal pen.

Sample Performance Indicator 2.2.3

Given a can size, determine the optimum box size to package a dozen cans

Benchmark 2.3

Visualizing and utilizing spatial reasoning and geometric modeling to solve problems including geometric transformations

CCSS,NDE

Sample Performance Indicator 2.3.1

How much land is needed to build four baseball fields with given distance between each field

Sample Performance Indicator 2.3.2

Determine the number of gallons of water your local swimming pool holds

Sample Performance Indicator 2.3.3

Determine the distance between two GPS coordinates.

Standard 3

Students will be able to practically apply trigonometric concepts

Benchmark 3.1

Applying trigonometric identities

CCSS,NDE

Sample Performance Indicator 3.1.1

Determine the height of a flagpole by at least two methods.

Sample Performance Indicator 3.1.2

Use SOH CAH TOA to solve trigonometric problems. ie Given the vertical drop (in feet) and angle of elevation (in degrees) of a ski run estimate the length.

Sample Performance Indicator 3.1.3

Given a sloped ceiling angle and the length of the two adjacent sides use the law of cosines to find the length of a central wooden beam connecting the walls.

Benchmark 3.2

Using the unit circle

CCSS,NDE

Sample Performance Indicator 3.2.1	Given a small and large gear rotating together, what is the angle through which the larger gear is rotated when the smaller one makes one revolution	
Sample Performance Indicator 3.2.2	Given a diameter of a cogwheel determine the ordered pairs (cos, sin) of the position of the teeth at 15 degree intervals.	
Sample Performance Indicator 3.2.3	Given its 10 am on a clock what is the angle in radians between the hands.	See additional resources
Benchmark 3.3	Modeling periodic phenomena	CCSS,NDE
Sample Performance Indicator 3.3.1	Determine the characteristics of periodic waveforms within electricity, heartbeats, vibrating strings, springs, music, pistons, etc.	See additional resources
Standard 4		
Benchmark 4.1	Students will be able to practically apply statistical concepts Interpreting categorical and quantitative data with real life examples	CCSS,NDE
Sample Performance Indicator 4.1.1	Given a set of data determine the measures of central tendency and variance. ie Students' height	
Sample Performance Indicator 4.1.2	Determine the expected waiting time at a stoplight	PUMAS
Benchmark 4.2	Generating inferences and justifying conclusions in practical situations	CCSS,NDE
Sample Performance Indicator 4.2.1	Develop a quality control chart to determine when a corn moisture meter needs to be recalibrated.	
Sample Performance Indicator 4.2.2	Conduct a correlational study of student's choice to determine if a significant linear correlation exists between two paired variables. ie. GPA vs ACT or number of sports vs GPA	
Sample Performance Indicator 4.2.3	Conduct a scientific experiment using a control group to determine effectiveness of an intervention or treatment. ie Drinking a sports drink before a test	
Benchmark 4.3	Using probability to make decisions in the real world	CCSS,NDE
Sample Performance Indicator 4.3.1	Given a normally distributed population what is the probability of an event. ie. grades, blood pressure, errors in measurement	
Sample Performance Indicator 4.3.2	Determine the probability of an event given that another event has already occurred. ie mutually exclusive, inclusive, dependent, or independent events	
Sample Performance Indicator 4.3.3	Using a standard deck of cards determine the probability of various hands occurring	