Real Life Math Applications

This document reviews real life applications of the math taught in UVU Math courses. This handout is specifically helpful for students in *MAT 980, MAT 1010* and *1015, MATH 1050* and *1055* as well as *MATH 1060.*

Logarithms

How loud is a rock concert? Noise is measured in decibels, a logarithmic scale that is easier to use than the sound-energy measurement of watts per square meter. Logarithms are utilized to show data that exponentially grows or shrinks really fast. The number of bacteria on a dish could start at 500, but after just 30 minutes the population of germs could reach one million. Fast growth like that would be difficult to show on a normal, linear graph. A logarithmic graph doesn't have that issue. Logarithms are also used in equations to helps simplify problems with rates and area. These types of problems show up in *physics, biology, medicine,* and *finance*. Logarithms also show up in everyday life. Logarithmic scales are used in newspapers, speakers, and automobiles as well as in scientific research.

Matrices

Matrices are the backbone of computing and scientific advancement. Matrices are *the* most efficient way to use and store large amounts of related data. Matrices are used in:

- astronomy
- weather forecasting
- statistics
- machine learning
- economics
- archeology
- water management
- chicken production
- airline travel routes
- investment banking
- marketing studies
- medical research
- grocery price comparison
- stock trading

All these fields need to efficiently use huge matrices of information. Everyday, matrices help airlines determine the most profitable way to assign flight plans and deliver people safely all over the world.

Polar Coordinates

Polar coordinates provide the framework needed to map the earth. The everyday method of graphing with four rectangular quadrants doesn't work for graphing 3D shapes like spheres and circles; that's where polar coordinate graphing shines. Circular shapes are measured and shown on circular graphs. Navigators on ships and airplanes use the language of polar coordinates to specify the direction and speed of travel. Astronomers use polar coordinates to plot the paths of planets and stars with respect to a viewing position on Earth. Polar coordinates are *the language of exploration.*

Polynomial Functions

Second-degree polynomial functions, also known as quadratics, describe how *fast* objects fall through the air and where they land. Both catapulting boulders and throwing a baseball can be described using second degree polynomials as well. Larger polynomial functions with degrees three or greater can model the volume of objects. *How much* water is in the cup? *How big* of a fridge will fit in the kitchen? Polynomials also help with financial planning. Long-term investing uses a polynomial function to track the money that is invested each year. Polynomial functions in financial planning help people learn how to save money for their children's education and their own retirement.

Proportions

What is the correct amount milk to put into a bowl of cereal? That information is a ratio, also called a proportion. Changing the proportion of flour and milk in cookies could turn it into pancakes or hard biscuits. Proportions show the relationship between different things, like milk and flour in a recipe. Proportions are used by cartographers to make maps. Cartographers need to scale down distances so that large pieces of land can be viewed on a single sheet of paper. For example, the state of Illinois is too big to draw at full size, as it is approximately 370 miles long. The map makers use the proportions of length, width, and height to place a representation of Illinois on a 25 cm long sheet of paper.

Quadratic Functions

Quadratic functions help to maximize profits and minimize losses. Using the vertex of the curve, the best ratio of two things can be found. Applications of quadratic functions commonly refer to "maximizing" or "minimizing" a quantity. For example, a business owner would be interested in the greatest profit his or her company can attain based on the sales of its products. On the other hand, fireworks engineers use quadratics to ensure rockets explode at the right height and angle for the audience to enjoy.

Sequences

Sequences are mathematical patterns. Discrete and predictable patterns show up everywhere in real-life: the value of an automobile, camera aperture, music notes, or predicting the timing of an eruption. For car value, the current price is calculated using sequences with its original price, depreciation rate, and age. The order of DNA is a genetic sequence. Without this order, living organisms wouldn't know how to build cells or proteins.

Series

Series allow for the examination of predictable discrete patterns. A doctor knows how much of a drug to prescribe each day based on how today's dose will interact with what is left of yesterday's dose still in your bloodstream. Doctors want to maintain a certain level of the medication in the patient's system over time. Their prescriptions are based on a mathematical series of the total amount of drug accumulated in the bloodstream each day.