# Algebra 2 <br> Khan Academy Video Correlations <br> By SpringBoard Activity 

| SB Activity | Video(s) |
| :---: | :---: |
| Unit 1: Equations, Inequalities, Functions |  |
| Activity 1 <br> Creating Equations <br> 1-1 Learning Targets: <br> - Create an equation in one variable from a real-world context. <br> - Solve an equation in one variable. <br> 1-2 Learning Targets: <br> - Create equations in two variables to represent relationships between quantities. <br> - Graph two-variable equations <br> 1-3 Learning Targets: <br> - Write, solve, and graph absolute value equations. <br> - Solve and graph absolute value inequalities. | One-Variable Equations |
|  | Representing a relationship with a simple equation |
|  | Linear equation word problem |
|  | Word problem: solving equations |
|  | Solving equations with the distributive property |
|  | Ex 2: Multi-step equation |
|  | Variables on both sides |
|  | Two-Variable Equations |
|  | Constructing linear equations to solve word problems |
|  | Exploring linear relationships |
|  | Graphs of linear equations |
|  | Application problem with graph |
|  | Absolute Value Equations and Inequalities |
|  | Absolute value equations |
|  | Absolute value equations |
|  | Absolute value equations 1 |
|  | Absolute value equation example |
|  | Absolute value equations example 1 |
|  | Absolute value equation example 2 |
|  | Absolute value equation with no solution |
|  | Absolute Value Inequalities |
|  | Absolute value inequalities |
|  | Absolute value inequalities example 1 |
|  | Absolute inequalities 2 |
|  | Absolute value inequalities example 3 |
| Activity 2 <br> Graphing to Find Solutions <br> 2-1 Learning Targets: <br> - Write equations in two variables to represent relationships between quantities. | Writing Linear Equations |
|  | Constructing linear equations to solve word problems |
|  |  |
|  | Graphing and Interpreting Two-Variable Equations |
|  | Graphing a line in slope intercept form |

- Graph equations on coordinate axes with labels and scales.
2-2 Learning Targets:
- Represent constraints by equations or inequalities.
- Use a graph to determine solutions of a system of inequalities.


## Activity 3

Systems of Linear Equations
3-1 Learning Targets:

- Use graphing, substitution, and elimination to solve systems of linear equations in two variables.
- Formulate systems of linear equations in two variables to model real-world situations.
3-2 Learning Targets:
- Solve systems of three linear equations in three variables using substitution and Gaussian elimination.
- Formulate systems of three linear equations in three variables to model a real-world situation.
3-3 Learning Targets:
- Add, subtract, and multiply matrices.
- Use a graphing calculator to perform operations on matrices.
3-4 Learning Targets:
- Solve systems of two linear equations in two variables by using graphing calculators with matrices.
- Solve systems of three linear equations in three variables by using graphing calculators with matrices.

Interpreting intercepts of linear functions

## Graphing Systems of Inequalities

Graphing systems of inequalities
Graphing systems of inequalities 2
Visualizing the solution set for a system of inequalities

Solving Systems of Two Equations in Two Variables: Graphing
Solving linear systems by graphing
Solving systems graphically
Graphing systems of equations
Graphical systems application problem
Example 2: Graphically solving systems
Example 3: Graphically solving systems
Solving Systems of Two Equations in Two Variables: Substitution
Example 1: Solving systems by substitution
Example 2: Solving systems by substitution
Example 3: Solving systems by substitution
The substitution method
Substitution method 2
Substitution method 3
Practice using substitution for systems
Solving Systems of Two Equations in Two Variables: Elimination
Example 1: Solving systems by elimination
Example 2: Solving systems by elimination
Example 3: Solving systems by elimination
Addition elimination method 1
Addition elimination method 2
Addition elimination method 3
Addition elimination method 4
Simple elimination practice
Systems with elimination practice
Consistent, Inconsistent, Dependent, and Independent Systems

|  | Consistent and inconsistent systems <br> Independent and dependent systems |
| :--- | :--- |
|  | Solving Systems of Three Equations in Three Variables |

5-2 Learning Targets:

- Write functions that describe the relationship between two quantities.
- Explore the composition of two functions through a real-world scenario.
5-3 Learning Targets:
- Write the composition of two functions.
- Evaluate the composition of two functions.


## Activity 6

## Inverse Functions

6-1 Learning Targets:

- Find the inverse of a function.
- Write the inverse using the proper notation.
6-2 Learning Targets:
- Use composition of functions to determine if functions are inverses of each other.
- Graph inverse functions and identify the symmetry.

Introduction to function composition
Creating new function from composition
Evaluating composite functions example
Modeling with function composition

| Inverse Functions |
| :--- |
| Introduction to function inverses |
| Introduction to the inverse of a function |
| Function inverse example 1 |
| Function inverses example 2 |
| Function inverses example 3 |

Introduction to the inverse of a function
Function inverse example 1
Function inverses example 2
Function inverses example 3

## Unit 2: Quadratic Functions

## Activity 7

Applications of Quadratic Functions
7-1 Learning Targets:

- Formulate quadratic functions in a problem-solving situation.
- Graph and interpret quadratic functions.

7-2 Learning Targets:

- Factor quadratic expressions of the form $x^{2}$ $+b x+c$.
- Factor quadratic expressions of the form $a x^{2}+b x+c$.
7-3 Learning Targets:
- Solve quadratic equations by factoring.
- Interpret solutions of a quadratic equation.
- Create quadratic equations from solutions.

7-4 Learning Targets:

- Solve quadratic inequalities.
- Graph the solutions to quadratic inequalities.

Analyzing a Quadratic Function
Graphing a parabola with a table of values
Parabola vertex and axis of symmetry
Finding the vertex of a parabola example
Graphing a parabola by finding the roots and vertex
Graphing a parabola using roots and vertex
Multiple examples graphing parabolas using roots and vertices

## Factoring Quadratic Expressions

Factoring quadratic expressions
Examples: Factoring simple quadratics
Example 1: Factoring quadratic expressions
Example 1: Factoring trinomials with a common factor
Solving Quadratic Equations by Factoring
Solving a quadratic equation by factoring
Dimensions from volume of box

## More Uses for Factors

Quadratic inequalities
Quadratic inequalities (visual explanation)
The Imaginary Unit, i
Introduction to i and imaginary numbers

8-1 Learning Targets:

- Know the definition of the complex number i.
- Know that complex numbers can be written as $a+b i$, where $a$ and $b$ are real numbers.
- Graph complex numbers on the complex plane.
8-2 Learning Targets:
- Add and subtract complex numbers.
- Multiply and divide complex numbers.

8-3 Learning Targets:

- Factor quadratic expressions using complex conjugates.
- Solve quadratic equations with complex roots by factoring.


## Activity 9

Solving $a x^{2}+b x+c=0$
9-1 Learning Targets:

- Solve quadratic equations by taking square roots.
- Solve quadratic equations $a x^{2}+b x+c=0$ by completing the square.
9-2 Learning Targets:
- Derive the Quadratic Formula.
- Solve quadratic equations using the Quadratic Formula.
9-3 Learning Targets:
- Solve quadratic equations using the Quadratic Formula.
- Use the discriminant to determine the nature of the solutions of a quadratic equation.


## Activity 10

Writing Quadratic Equations
10-1 Learning Targets:

- Derive a general equation for a parabola based on the definition of a parabola.
- Write the equation of a parabola given a graph and key features.
10-2 Learning Targets:
- Explain why three points are needed to determine a parabola.
- Determine the quadratic function that passes through three given points on a plane.

Imaginary roots of negative numbers
$i$ as the principal root of -1 (a little technical)
Plotting complex numbers on the complex plane

## Operations with Complex Numbers

Calculating i raised to arbitrary exponents

## Adding complex numbers

Subtracting complex numbers
Multiplying complex numbers
Complex conjugates example
Dividing complex numbers

Completing the Square and Taking Square Roots
Solve quadratic equations by square roots
Solving quadratic equations by completing the square
Example 1: Completing the square
Example 2: Completing the square
Example 3: Completing the square

## The Quadratic Formula

Proof of quadratic formula
How to use the quadratic formula

## Solutions of Quadratic Equations

Example: Complex roots for a quadratic
Discriminant of quadratic equations
Discriminant for types of solutions for a quadratic

Parabolas and Quadratic Equations
Parabola intuition example 1
Focus and directrix introduction
Writing the Equation of a Parabola
Using the focus and directrix to find the equation of a parabola
Equation for parabola from focus and directrix
Finding focus and directrix from vertex
10-3 Learning Targets:

- Find a quadratic model for a given table of data.
- Use a quadratic model to make predictions.


## Activity 11

Transformations of $y=x^{2}$
11-1 Learning Targets:

- Describe translations of the parent function $f(x)=x^{2}$.
- Given a translation of the function $f(x)=x^{2}$, write the equation of the function.
11-2 Learning Targets:
- Describe transformations of the parent function $f(x)=x^{2}$.
- Given a transformation of the function $f(x)$ $=x^{2}$, write the equation of the function.
11-3 Learning Targets:
- Write a quadratic function in vertex form.
- Use transformations to graph a quadratic function in vertex form.


## Activity 12

Graphing Quadratics and Quadratic Inequalities
12-1 Learning Targets:

- Write a quadratic function from a verbal description.
- Identify and interpret key features of the graph of a quadratic function.
12-2 Learning Targets:
- Write a quadratic function from a verbal description.
- Identify and interpret key features of the graph of a quadratic function.
12-3 Learning Targets:
- Identify key features of a quadratic function from an equation written in standard form.
- Use key features to graph a quadratic function.
12-4 Learning Targets:
- Use the discriminant to determine the nature of the solutions of a quadratic equation.

Key Features of Quadratic Functions
Parabola vertex and axis of symmetry

## Graphing Quadratic Functions

Examples: Graphing and interpreting quadratics
Graphing a parabola with a table of values
Finding the vertex of a parabola example
Graphing a parabola by finding the roots and vertex
Graphing a parabola using roots and vertex
Multiple examples graphing parabolas using roots and vertices

The Discriminant
Discriminant of quadratic equations
Discriminant for types of solutions for a quadratic

- Use the discriminant to help graph a quadratic function.
12-5 Learning Targets:
- Graph a quadratic inequality in two variables.
- Determine the solutions to a quadratic inequality by graphing.


## Activity 13

Systems of Linear and Nonlinear Equations 13-1 Learning Targets:

- Use graphing to solve a system consisting of a linear and a nonlinear equation.
- Interpret the solutions of a system of equations.
13-2 Learning Targets:
- Use substitution to solve a system consisting of a linear and nonlinear equation.
- Determine when a system consisting of a linear and nonlinear equation has no solution.


## Systems of Nonlinear Equations

Non-linear systems of equations 1
Non-linear systems of equations 2
Non-linear systems of equations 3
Systems of nonlinear equations 1
Systems of nonlinear equations 2
Systems of nonlinear equations 3

## Unit 3: Polynomials

## Activity 14

Introduction to Polynomials
14-1 Learning Targets:

- Write a third-degree equation that represents a real-world situation.
- Graph a portion of this equation and evaluate the meaning of a relative maximum.
14-2 Learning Targets:
- Sketch the graphs of cubic functions.
- Identify the end behavior of polynomial functions.
14-3 Learning Targets:
- Recognize even and odd functions given an equation or graph.
- Distinguish between even and odd functions and even-degree and odddegree functions.


## End Behavior Of Polynomial Functions

Polynomial end behavior

## Polynomial end behavior example

Another polynomial end behavior example
Polynomial end behavior exercise example

## Even and Odd Functions

Recognizing odd and even functions
Connection between even and odd numbers and functions

Activity 15
Polynomial Operations

Adding and Subtraction Polynomials
Addition and subtraction of polynomials

15-1 Learning Targets:

- Use a real-world scenario to introduce polynomial addition and subtraction.
- Add and subtract polynomials.

15-2 Learning Targets:

- Add, subtract, and multiply polynomials.
- Understand that polynomials are closed under the operations of addition, subtraction, and multiplication.
15-3 Learning Targets:
- Determine the quotient of two polynomials.
- Prove a polynomial identity and use it to describe numerical relationships.


## Activity 16

Binomial Theorem
16-1 Learning Targets:

- Find the number of combinations of an event.
- Create Pascal's triangle.

16-2 Learning Targets:

- Know the Binomial Theorem.
- Apply the Binomial Theorem to identify the coefficients or terms of any binomial expansion.


## Activity 17

Factors of Polynomials
17-1 Learning Targets:

- Determine the linear factors of polynomial functions using algebraic methods.
- Determine the linear or quadratic factors of polynomials by factoring the sum or difference of two cubes and factoring by grouping.
17-2 Learning Targets:
- Know and apply the Fundamental Theorem of Algebra.
- Write polynomial functions, given their degree and roots.


## Multiplying Polynomials

Multiplying polynomials example
Multiplying polynomials example 2

## Dividing Polynomials

Polynomial division
Polynomial divided by monomial
Dividing polynomials 1
Dividing polynomials with remainders
Dividing polynomials with remainders example

Pascal's Triangle
Pascal's triangle for binomial expansion

## Binomial Theorem

Binomial theorem
Determining coefficient in binomial expansion
Connecting Pascal's triangle to binomial combinatorics
Algorithm for mentally computing binomial expansion coefficients
Binomial theorem combinatorics connection

Factoring Polynomials: Algebraic Methods
Factor by grouping and factoring completely
Example: basic grouping
Example 1: Factoring by grouping
Example 2: Factoring by grouping
Example 3: Factoring by grouping
Example 4: Factoring by grouping
Example 5: Factoring by grouping
Example 6: Factoring by grouping
Difference of cubes factoring
Factoring sum of cubes
The Fundamental Theorem of Algebra
Fundamental theorem of algebra
Fundamental theorem of algebra for quadratic

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| Activity 18 |
| Graphs of Polynomials |
| 18-1 Learning Targets: |
| - |
| $\left.\quad \begin{array}{l}\text { Graph polynomial functions by hand or } \\ \\ \\ \\ \text { using technology, identifying zeros when } \\ \text { suitable factorizations are available, and } \\ \text { - }\end{array}\right\}$Recognize even and odd functions from <br>  <br> their algebraic expressions. |

18-2 Learning Targets:

- Know and apply the Rational Root Theorem and Descartes' Rule of Signs.
- Know and apply the Remainder Theorem and the Factor Theorem.
18-3 Learning Targets:
- Compare properties of two functions each represented in a different way.
- Solve polynomial inequalities by graphing.

Possible number of real roots

Graphing Polynomial Functions

## Polynomial end behavior

Polynomial end behavior example
Another polynomial end behavior example
Polynomial end behavior exercise example
Recognizing odd and even functions
Connection between even and odd numbers and functions

Finding the Roots of a Polynomial Function
Synthetic division
Synthetic division example 2
Why synthetic division works
Polynomial remainder theorem
Polynomial remainder theorem example
Polynomial remainder theorem to test factor
Polynomial remainder theorem proof
Comparing Polynomial Functions

Recognizing features of functions (example 1)
Recognizing features of functions (example 2)
Recognizing features of functions (example 3)

## Unit 4: Series, Exponential and Logarithmic Functions

Activity 19
Arithmetic Sequences and Series
19-1 Learning Targets:

- Determine whether a given sequence is arithmetic.
- Find the common difference of an arithmetic sequence.
- Write an expression for an arithmetic sequence, and calculate the nth term.
19-2 Learning Targets:
- Write a formula for the nth partial sum of an arithmetic series.


## Arithmetic Sequences

Explicit and recursive definitions of sequences
Arithmetic sequences
Finding the 100th term in a sequence
Equations of sequence patterns

## Arithmetic Series

Explicitly defining a series

## Sigma Notation

Sigma notation for sums
Writing a series in sigma notation

- Calculate partial sums of an arithmetic series.
19-3 Learning Targets:
- Identify the index, lower and upper limits, and general term in sigma notation.
- Express the sum of a series using sigma notation.
- Find the sum of a series written in sigma notation.


## Activity 20

Geometric Sequences and Series
20-1 Learning Targets:

- Identify the index, lower and upper limits, and general term in sigma notation.
- Express the sum of a series using sigma notation.
- Find the sum of a series written in sigma notation.
20-2 Learning Targets:
- Derive the formula for the sum of a finite geometric series.
- Calculate the partial sums of a geometric series.
20-3 Learning Targets:
- Determine if an infinite geometric sum converges.
- Find the sum of a convergent geometric series.


## Activity 21

Exponential Functions and Graphs 21-1 Learning Targets:

- Identify data that grow exponentially.
- Compare the rates of change of linear and exponential data.
21-2 Learning Targets:
- Identify and write exponential functions.
- Determine the decay factor or growth factor of an exponential function.
21-3 Learning Targets:
- Determine when an exponential function is increasing or decreasing.
- Describe the end behavior of exponential functions.


## Exponential Functions

Understanding linear and exponential models
Exponential growth and decay word problems
Decay of cesium 137 example
Modeling ticket fines with exponential function

## Graphs of Exponential Functions

Graphing exponential functions
Constructing linear and exponential functions from graphs

- Identify asymptotes of exponential functions.
21-4 Learning Targets:
- Explore how changing parameters affects the graph of an exponential function.
- Graph transformations of exponential functions.
21-5 Learning Targets:
- Graph the function $f(x)=e^{x}$.
- Graph transformations of $f(x)=e^{x}$.


## Activity 22

Logarithms and Their Properties
22-1 Learning Targets:

- Complete tables and plot points for exponential data.
- Write and graph an exponential function for a given context.
- Find the domain and range of an exponential function.
22-2 Learning Targets:
- Use technology to graph $\mathrm{y}=\log \mathrm{x}$.
- Evaluate a logarithm using technology.
- Rewrite exponential equations as their corresponding logarithmic equations.
- Rewrite logarithmic equations as their corresponding exponential equations.


## 22-3 Learning Targets:

- Make conjectures about properties of logarithms.
- Write and apply the Product Property and Quotient Property of Logarithms.
- Rewrite logarithmic expressions by using properties.
22-4 Learning Targets:
- Make conjectures about properties of logarithms.
- Write and apply the Power Property of Logarithms.
- Rewrite logarithmic expressions by using their properties.


## Activity 23

Inverse Functions: Exponential and Logarithmic Functions

## Logarithms in Other Bases

Change of base formula
Change of base formula proof

23-1 Learning Targets:

- Use composition to verify two functions as inverse.
- Define the logarithm of $y$ with base $b$.
- Write the Inverse Properties for logarithms.
23-2 Learning Targets:
- Apply the properties of logarithms in any base.
- Compare and expand logarithmic expressions.
- Use the Change of Base Formula.

23-3 Learning Targets:

- Find intercepts and asymptotes of logarithmic functions.
- Determine the domain and range of a logarithmic function.
- Write and graph transformations of logarithmic functions.


## Activity 24

Logarithmic and Exponential Equations and Inequalities
24-1 Learning Targets:

- Write exponential equations to represent situations.
- Solve exponential equations.

24-2 Learning Targets:

- Solve exponential equations using logarithms.
- Estimate the solution to an exponential equation.
- Apply the compounded interest formula.

24-3 Learning Targets:

- Solve logarithmic equations.
- Identify extraneous solutions to logarithmic equations.
- Use properties of logarithms to rewrite logarithmic expressions.
24-4 Learning Targets:
- Solve exponential inequalities.
- Solve logarithmic inequalities.

Graphing Logarithmic Functions
Graphing logarithmic functions
Graphs of logarithmic functions

Exponential Equations
Solving exponential equation
Solving exponential equation with logarithm
Logarithmic Equations
Solving logarithmic equations
Solving logarithmic equations

## Application: Compound Interest

Introduction to compound interest and e
Compound interest and e (part 2)
Compound interest and e (part 3)
Compound interest and e (part 4)

Unit 5: Radical and Rational Functions

## Activity 25

Square Root and Cube Root Functions
25-1 Learning Targets:

- Graph and describe transformations of the square root function $\mathrm{y}=\mathrm{V} \mathrm{x}$.
- Interpret key features of a graph that models a relationship between two quantities.
25-2 Learning Targets:
- Solve square root equations.
- Identify extraneous solutions.

25-3 Learning Targets:

- Graph transformations of the cube root function $\mathrm{y}=3 \mathrm{~V} \mathrm{x}$. .
- Identify key features of a graph that models a relationship between two quantities.
25-4 Learning Targets:
- Solve cube root equations.
- Check the reasonableness of solutions.


## Activity 26

Inverses: Roots, Squares, and Cubes
26-1 Learning Targets:

- Graph and write the inverse of square root functions.
- Find a square root model for a given table of data.
26-2 Learning Targets:
- Graph and write the inverse of square root functions.
- Find the inverse relations of quadratic functions.
26-3 Learning Targets:
- Graph and write the inverse of cube root functions.
- Find the inverse relations of cubic functions.

Flipping and shifting radical functions
Matching radical functions with graphs exercise example

## Solving Radical Equations

Equations for radical functions example
Solving radical equations
Solving radical equations 1
Solving radical equations 2
Solving radical equations 3
Extraneous solutions to radical equations
Applying Radical Equations
Applying radical equations 1
Applying radical equations 2
Applying radical equations 3

Inverse Functions
Introduction to function inverses
Function inverses example 2
Function inverses example 3

## Activity 27

Introduction to Rational Functions
27-1 Learning Targets:

- Formulate rational equations that model real-world situations.
- Graph equations on coordinate axes.

27-2 Learning Targets:

Graphs of Rational Functions

Matching rational functions to their graphs

- Formulate rational equations that model real-world situations.
- Graph equations on coordinate axes.

27-3 Learning Targets:

- Determine the horizontal and vertical asymptotes of a rational function.
- Graph a rational function on the coordinate plane.


## Activity 28

Inverse Variation and Rational Functions
28-1 Learning Targets:

- Create, solve, and graph an equation involving inverse variation.
- Solve an equation involving combined variation.
28-2 Learning Targets:
- Describe transformations of the parent function $f(x)=1 / x$ and sketch the graphs.
- Identify the $x$-intercepts, $y$-intercepts, and asymptotes of transformations of the parent function $\mathrm{f}(\mathrm{x})=1 / \mathrm{x}$.


## Activity 29

Simplifying Rational Expressions
29-1 Learning Targets:

- Simplify rational expressions.
- Multiply and divide rational expressions.

29-2 Learning Targets:

- Add and subtract rational expressions.
- Simplify complex fractions.

29-3 Learning Targets:

- Identify the vertical asymptotes of rational functions by finding the domain values that make the functions undefined.
- Use the degrees of the numerator and denominator of rational functions to identify the horizontal asymptotes.
29-4 Learning Targets:
- Analyze and graph rational functions, identifying any asymptotes, intercepts, and holes.
- Analyze and graph rational functions representing real-world scenarios.

Another rational function graph example
A third example of graphing a rational function
Asymptotes of Rational Functions
Asymptotes of rational functions
Horizontal and vertical asymptotes of function

## Direct and Inverse Variation

Direct and inverse variation
Recognizing direct and inverse variation

Multiplying and Dividing Rational Expressions
Simplifying rational expressions introduction
Simplifying rational expressions 1
Simplifying rational expressions 2
Simplifying rational expressions 2
Simplifying rational expressions 3
Multiplying and simplifying rational expressions
Multiplying and dividing rational expressions 1
Multiplying and dividing rational expressions 2
Multiplying and dividing rational expressions 3
Adding and Subtracting Rational Expressions
Adding and subtracting rational expressions
Adding and subtracting rational expressions 2
Subtracting rational expressions
Simplifying first for subtracting rational expressions
Rationalizing denominators of expressions
Finding Horizontal and Vertical Asymptotes

|  | Asymptotes of rational functions <br> Horizontal and vertical asymptotes of function |
| :---: | :---: |
|  | Graphing Rational Functions |
|  | Matching rational functions to their graphs <br> Another rational function graph example <br> A third example of graphing a rational function |
| Activity 30 <br> Rational Equations and Inequalities <br> 30-1 Learning Targets: <br> - Solve rational equations, identifying any extraneous solutions. <br> - Create and solve rational equations that represent work problems. <br> 30-2 Learning Targets: <br> - Solve rational inequalities by graphing. <br> - Solve rational inequalities by finding the sign of the inequality on either side of the numerator and denominator zeros. | Solving Rational Equations |
|  | Ex 1: Multi step equation |
|  | Rational equations |
|  | Solving rational equations 1 |
|  | Solving rational equations 2 |
|  | Solving rational equations 3 |
|  | Applying rational equations 1 |
|  | Applying rational equations 2 |
|  | Applying rational equations 3 |
|  | Extraneous solutions to rational equations |
|  | Solving Rational Inequalities |
|  | Rational inequalities |
|  | Rational inequalities 2 |
| Unit 6: Trigonometry |  |
| Activity 31 <br> Understanding Radian Measure <br> 31-1 Learning Targets: <br> - Develop formulas for the length of an arc. <br> - Describe radian measure. <br> 31-2 Learning Targets: <br> - Develop and apply formulas for the length of an arc. <br> - Apply radian measure. | Radian Measure |
|  | Introduction to radians <br> Introduction to the unit circle <br> Rotation by radians and quadrants |
|  | Arc Length |
|  | Arc length as a fraction of circumference <br> Finding arc length from radian angle measure |
|  | Radian and Degree Measure |
|  | Example: Radian measure and arc length |
|  | Radians and degrees |
|  | Example: Converting degrees to radians |
|  | Example: Converting radians to degrees |
|  | Radian and degree conversion practice |
| Activity 32 <br> Trigonometric Functions 32-1 Learning Targets: | The Unit Circle |
|  | Introduction to the unit circle |
|  | Solving triangle in unit circle |

- Explore angles drawn in standard position on the coordinate plane.
- Find the sine of $\theta$ and the cosine of $\theta$.

32-2 Learning Targets:

- Find the sine of $\theta$ and the cosine of $\theta$ using special right triangles.
- Find the tan of $\theta$.


## Activity 33

Trigonometric Identities: Pythagorean Connection
33-1 Learning Targets:

- Prove the Pythagorean identity.
- Use the Pythagorean identity to find $\sin \theta$, $\cos \theta$, or $\tan \theta$, given the value of one of these functions and the quadrant of $\theta$.
33-2 Learning Targets:
- Define the three reciprocal trigonometric functions.
- Use the Pythagorean identity and the reciprocal trigonometric functions to prove other trigonometric identities.


## Activity 34

Graphs of Trigonometric Functions
34-1 Learning Targets:

- Identify periodic functions.
- Find the period, midline, and amplitude of periodic functions.
34-2 Learning Targets:
- Graph the sine function, $\mathrm{y}=\mathrm{a} \sin \mathrm{b} x$.
- Find the period, midline, and amplitude of sine functions.
34-3 Learning Targets:
- Graph the cosine function, $\mathrm{y}=\mathrm{a} \cos \mathrm{bx}$.
- Find the period, midline, and amplitude of cosine functions.
34-4 Learning Targets:
- Graph the tangent function, $\mathrm{y}=\mathrm{a} \tan \mathrm{bx}$.
- Find the period, and midline of tangent functions.
34-5 Learning Targets:
- Describe and graph functions of the form $y$ $=a \sin b(x-h)+k, y=a \cos b(x-h)+k$, and $\mathrm{y}=\mathrm{a} \tan \mathrm{b}(\mathrm{x}-\mathrm{h})+\mathrm{k}$.
- Find the period, amplitude, and midline of these trigonometric functions.

Trigonometric Ratios
Matching ratios to trig functions

## Pythagorean Identities

Pythagorean trig identity from soh cah toa
Pythagorean trig identity from unit circle
Using the Pythagorean trig identity
Examples using pythagorean identities to simplify trigonometric expressions

## Reciprocal Functions

Secant (sec), cosecant (csc) and cotangent (cot) example

Example: Using trig to solve for missing information

## Periodic Functions

Midline, amplitude and period of a function
Example: Amplitude and period
Plotting maxima, minima and midline intersections of trig function

## Sine Function

Example: Graph, domain, and range of sine function

## Cosine Function

Example: Graph of cosine
Example: Intersection of sine and cosine

## Transformations

Example: Amplitude and period transformations
Example: Amplitude and period cosine transformations

## Tangent Function

Tangent graph

## Activity 35

Choosing Functions to Model Periodic Phenomena 35-1 Learning Targets:

- Use trigonometric functions to model realworld periodic phenomena.
- Identify key features of these functions.

Modeling annual temperature variation with trigonometry

Applying inverse trig function with model
Modeling temperature through the day

## Day length in Alaska

Example: Figure out the trig function
Determining the equation of a trig function

## Unit 7: Probability and Statistics

## Activity 36

## Normal Distribution

36-1 Learning Targets:

- Represent distribution with appropriate data plots.
- Interpret shape of a distribution and relate shape to measures of center and spread.
36-2 Learning Targets:
- Recognize characteristics of a normal distribution.
- Use mean and standard deviation to completely describe a normal distribution.
36-3 Learning Targets:
- Estimate probabilities associated with zscores using normal curve sketches.
- Determine probabilities for z-scores using a standard normal table.
36-4 Learning Targets:
- Determine probabilities for z-scores using technology.
- Use a normal distribution, when appropriate, as a model for a population from which a sample of numeric data has been drawn.


## Activity 37

Random Sampling
37-1 Learning Targets:

- Explain why random sampling is advantageous when conducting a survey
37-2 Learning Targets:
- Explain why random allocation of treatments is critical to a good experiment.
37-3 Learning Targets:


## Sampling

Introduction to random sampling
Random sampling intuition
Reasonable samples
Inferring population mean from sample mean

| - .Identify a confounding variable in an observational study. |  |
| :---: | :---: |
| Activity 38 Simulations | N/A |
| Activity 39 <br> Margin of Error <br> 39-1 Learning Targets: <br> - Use margin of error in an estimate of a population proportion. <br> - Use simulation models for random samples. <br> 39-2 Learning Targets: <br> - Use margin of error in an estimate of a population proportion. <br> - Relate margin of error to the population proportion and to the sample size. | Error <br> Standard error of the mean <br> Population standard deviation <br> Sample standard deviation and bias <br> Sampling distribution of the sample mean <br> Sampling distribution of the sample mean 2 <br> Sampling distribution example problem |
| Activity 40 Designing and Conducting Simulations | N/A |

