Conceptual Activities

Use these interactive open education and/or Desmos resources to build conceptual understanding of mathematical ideas. (*Note*: Activity links will be monitored and repaired or replaced as necessary.)

Relationships Between Quantities and Reasoning with Equations

- Desmos. "Function Carnival."

  http://www.walch.com/ca/01006

  This activity focuses attention on graphs as expressing relationships between variables. It lays the informal groundwork for the more formal definitions and properties of functions.

- Desmos. "Polygraph: Linear Inequalities."

  http://www.walch.com/ca/10000

  In this activity, students will engage in vocabulary-rich conversations about linear inequalities. Key vocabulary terms that may appear in student questions include *shading*, *above*, *below*, *boundary*, *solid*, *dotted*, *horizontal*, *vertical*, *slanted*, *axis*, and *quadrant*.

- Desmos. "Put the Point on the Line."

  http://www.walch.com/ca/01009

  The focus of this activity is slope. Participants are asked to estimate, calculate, and notice proportionality as they place points on an imaginary line.

- Desmos. "Solving One-Step Equations."

  http://www.walch.com/ca/10027

  Students will connect solutions to one-step equations with manipulations on the number line.

Linear and Exponential Relationships As Functions

- Desmos. "Avi and Benita's Repair Shop."

  http://www.walch.com/ca/01014

  Compare linear and exponential growth in the context of daily payments. One plan increases by $100 each day, while another grows by doubling the previous day's payment. This activity is appropriate for students who have studied linear functions but may not have an experience with exponential growth.

- Desmos. "Card Sort: Functions."

  http://www.walch.com/ca/01005

  Sort graphs, equations, and contexts according to whether each one represents a function.
- Desmos. "Card Sort: Linear Functions."

  http://www.walch.com/ca/01010

  Notice and use properties of linear functions to make groups of three. Different properties will lead to different groupings by different participants.
- Desmos. "Function Carnival, Part 2."

  http://www.walch.com/ca/01007

  This activity follows up on "Function Carnival" by using the contexts in that activity to develop an understanding of function notation.
- Desmos. "Game, Set, Flat."

  http://www.walch.com/ca/01015

  Develop understanding of the exponential relationship that describes a bouncing tennis ball. Learn to examine successive terms in a sequence to determine if it represents an exponential relationship or not, and how to construct the exponential equation itself.
- Desmos. "What Comes Next?"

  http://www.walch.com/ca/01020

  Predict "what comes next" for linear and exponential functions based first on graphs and then on tables of values, then explore connections between graphs, tables, and equations of linear and exponential functions.

Linear and Exponential Functions, Systems, and Sequences

- Desmos. "The Intersection."

  http://www.walch.com/ca/01011

  Predict the point of intersection for a system of two linear equations: first without a grid, then with one. With the grid in play, participants are able to use the slope of the lines (formally or informally) to improve the accuracy of their predictions.
- Desmos. "Marbleslides: Exponentials."

  http://www.walch.com/ca/01016

  Restrict, reposition, and otherwise transform exponential curves at will by modifying the basic form $y = b^x$, and use precision in describing these transformations using words and/or symbols.

- Desmos. "Match My Line."

  http://www.walch.com/ca/01013

  Work through a series of scaffolded linear graphing challenges to develop proficiency with direct variation, slope-intercept, point-slope, and other linear function forms.

- Desmos. "Polygraph: Exponentials."

  http://www.walch.com/ca/01019

  This Custom Polygraph is designed to spark vocabulary-rich conversations about exponentials, including how they differ from linear functions. Key vocabulary terms that may appear in student questions include *increasing*, *decreasing*, *intercept*, *rate*, *asymptote*, and *curve*.

- Desmos. "Predicting Movie Ticket Prices."

  http://www.walch.com/ca/01018

  Build a model to describe the relationship between average movie ticket prices and time, then use that model to make predictions about past and future ticket prices. Participants also interpret the parameters of their equation in context.

- Desmos. "Sequences and Series."

  http://www.walch.com/ca/10010

  This page contains a group of related activities that can be used to introduce sequences and series. The focus of this activity is to develop a solid conceptual understanding of sequences and finite sums.

- Desmos. "Solutions to Systems of Linear Equations."

  http://www.walch.com/ca/01001

  This activity will help students understand what it means for a point to be a solution to a system of equations—both graphically and algebraically.

- Desmos. "Systems of Linear Inequalities."

  http://www.walch.com/ca/10026

  This activity reviews how to graph a single inequality, and then extends this knowlege to solving a system of two inequalities by graphing.

- Desmos. "Systems of Two Linear Equations."

  http://www.walch.com/ca/01002

  This resource gives a progression of written explanations, equations, and graphs to explain what the algebraic or graphical solution to a system of equations represents.

Descriptive Statistics

- Desmos. "LEGO Prices."

  http://www.walch.com/ca/01012

  Use the concept of linear regression to predict the cost of a LEGO set with *x* pieces. (This activity does NOT use the calculator, just the concept. Participants draw the line on the graph, and Desmos calculates the equation.)

- Desmos. "Polygraph: Histograms."

  http://www.walch.com/ca/01024

  This activity is designed to spark vocabulary-rich conversations about histograms. Key vocabulary terms that may appear in student questions include *shape*, *center*, *spread*, *roughly symmetric*, *skew right*, *skew left*, *mean*, *median*, *range*, *peak*, *unimodal*, and *bimodal*.

- Desmos. "Standard Deviation in a Normal Distribution."

  http://www.walch.com/ca/10025

  In this activity, students will become acquainted with percentages under the normal curve by dragging lines around a graph.

Expressions and Equations

- Desmos. "Card Sort: Parabolas."

  http://www.walch.com/ca/01022

  Find the shape of a parabola by using its form to reveal its characteristics. The activity begins with a review of both the characteristics and forms of a parabola, then moves on to determine characteristics of the graph of a parabola given in standard form, vertex form, or intercept form.

- Desmos. "Sum and Difference of Squares."

  http://www.walch.com/ca/10009

  This resource provides a visual answer to why a difference of squares is factorable but the sum of squares is not.

- Illustrative Mathematics. "Egyptian Fractions II."

  http://www.walch.com/ca/10011

  This activity is designed to develop understanding of operations with rational expressions. Students will examine the structures of rational expressions though a historical lens.

Quadratic Functions and Modeling

- Desmos. "Build a Bigger Field."

  http://www.walch.com/ca/01021

  Use quadratic models to optimize the area of a field for a given perimeter.

- Desmos. "Card Sort: Parabolas."

  http://www.walch.com/ca/01022

  Find the shape of a parabola by using its form to reveal its characteristics. The activity begins with a review of both the characteristics and forms of a parabola, then moves on to determine characteristics of the graph of a parabola given in standard form, vertex form, or intercept form.

- Desmos. "Composing Functions Exploration."

  http://www.walch.com/ca/10028

  This series of 12 related activities is designed to develop conceptual understanding of function composition. A teacher guide is available.

- Desmos. "Domain and Range Introduction."

  http://www.walch.com/ca/01049

  In this activity, students practice finding the domain and range of piecewise functions. Students begin with an informal exploration of domain and range using a graph, and build up to representing the domain and range of piecewise functions using inequalities.

- Desmos. "Free-Range Functions."

  http://www.walch.com/ca/01028

  This activity challenges students to strengthen their ideas about the range of quadratic functions.

- Desmos. "Match My Parabola."

  http://www.walch.com/ca/01017

  A series of graphing challenges builds understanding of quadratic functions in various forms and graphing transformations of quadratic functions.

- Desmos. "Penny Circle."

  http://www.walch.com/ca/01023

  Gather data, build a model, and use that model to answer the question, "How many pennies fit in a large circle?"

- Desmos. "Polygraph: Absolute Value."

  http://www.walch.com/ca/01050

  This activity is designed to spark vocabulary-rich conversations about transformations of the absolute value parent function. Key vocabulary terms that may appear in student questions include *translation*, *shift*, *slide*, *dilation*, *stretch*, *horizontal*, *vertical*, and *reflect*.

- Desmos. "Polygraph: Piecewise Functions."

  http://www.walch.com/ca/01052

  This activity is designed to spark vocabulary-rich conversations about piecewise functions. Key vocabulary terms that may appear in student questions include *piecewise*, *continuous*, and *interval*.

- Desmos. "Polygraph: Square Root Functions."

  http://www.walch.com/ca/01032

  This activity is designed to spark vocabulary-rich conversations about transforming square root functions. Key vocabulary terms that may appear in student questions include *translation*, *reflection*, *intercept*, and *quadrant*.

- Desmos. "Rational Function Calculator."

  http://www.walch.com/ca/10012

  This interactive Desmos calculator allows users to manipulate a rational function with sliders to see the effect horizontal and vertical shifts have on the graph of the function.

- Illuminations. "Function Matching."

  http://www.walch.com/ca/10010

  This is a graphing tool/activity for students to deepen their understanding of polynomial functions and their corresponding graphs.