DES MoS

Beyond the Graphing Calculator

Hailey Garrou and Amanda Harrington
St. Stephens High School
Never used **Desmos**? Here’s a quick intro!

Making a graph
Welcome to Desmos! To create a new graph, just type your expression in the expression list bar. As you are typing your expression, the calculator will immediately draw your graph on the graph paper.

- **Open Graph**
  - Revisit your saved graphs and example graphs here.

- **Add Item**
  - Add a new expression, table, text box, folder, or image.

- **Hide**
  - Click here to hide individual expressions. Long-press to change the color or style.

- **Delete all**
  - Delete all of your expressions here.

- **Change color**
  - Choose a new color for the expression.

- **Convert to table**
  - Generate a table from the expression.

- **Duplicate**
  - Add a copy of the expression below the current one.

- **Save As or Rename**
  - Click here to save a copy of your graph or rename it. You can also press control-shift-s.

- **Save**
  - Click here to save your graph or press control+s.

- **Hide List**
  - Push your expressions list to the side to give full attention to your graph.

- **Undo and Redo**
  - You can also press control+z to undo and control+y to redo.

- **Edit List**
  - Delete, duplicate, change color, or convert to table.

- **Delete**
  - Click here to remove your expression.

The NC TEST version of Desmos looks just like the online version and kids can also access Desmos on their cell phone.
**Variables & Sliders**

You can graph a single line by entering an expression like $y = 2x + 3$. To make the graph more dynamic, you can use parameters instead of constants: for example, $y = mx + b$. Add sliders for the undefined parameters by clicking the prompt or define the parameters yourself by entering $m=2$ and $b=3$. When you give constant values to parameters like $m$ and $b$, the calculator will automatically allow you to adjust their values with sliders. Adjusting $m$ with the slider changes the slope of the line, and adjusting $b$ with the slider changes the intercept.

Any time you have free variables in an expression, the calculator will offer to let you define them with sliders:

![Graphs with sliders](image1)

You can use the same variables in several expressions to plot curves that will change together. For example:

![Graphs with different expressions](image2)

The value of $c$ defines two parallel lines that move up and down together. These two lines stay perpendicular to each other for any value of $m$.

![Graph with limits adjustment](image3)

To adjust the limits and interval of your slider, click either of the values at the ends of the slider bar. Input your desired values and click the expression or the graph to complete the adjustment.

**Examples**

**Demonstrating Least-Squares Regressions**

**Parallel & Perpendicular Lines—Slope Relationships**

For more info click here.
Dive deeper into data with tables! You can create a new table or convert an existing expression into a table. You can even copy/paste two column data from a spreadsheet into an empty expression box to quickly create a new table.

**Add Table**
Click the “Add Item” button to create a new table.

**Add Column**
Make a new column by hitting the right arrow key or clicking in the top cell of the column.

**Add Row**
Make a new row by hitting the down arrow key or clicking in the cell.

**Options Menu**
Click the icon to change color, connect or hide the points, or insert a new column.

In edit mode, click the “convert to table” icon to create a table from your expression.

---

**EXAMPLES**

**Performing a Quadratic Regression**

**Finding Points from an Expression**

For more info click here.
Lists & Statistics

You can make lists in Desmos using square brackets like this: \([1,1,2,3,5,8]\)

You can create lists with evenly spaced elements. \([1,\ldots,10]\) is a list of the integers between 1 and 10. \([1,3,\ldots,11]\) is a list of the odd integers between 1 and 11.

\[a = [1,2,3]\]
\[y = a \cdot \sin(x)\]

You can use lists anywhere in expressions that you would use a number.

\[\text{mean}([1,2,3,4])\]
\[\text{length}([1,1,1,1])\]

Statistics functions like mean, median, min, max, and stdev take a list as an argument and return a number.

Table columns are available as lists in the rest of the system.

\[\begin{array}{c|c}
 x_i & y_i \\
 1.7 & 10.4 \\
 3 & 12.1 \\
 4.7 & 13.7 \\
 6 & 15 \\
 7.5 & 16.3 \\
\end{array}\]

\[\text{min}(x_i)\]
\[\text{total}(y_i)\]

Examples

5 Number Summary

&

Creating Boxplots and Histograms

For more info click here.
~ is our magic regression symbol. Basically, if you connect two lists of data with a ~, we adjust every free parameter to make the lists as close to each other as possible.

Since table columns are each lists, the easiest way to make a regression is to create a new table of data, and then write an equation like $y_1 = mx_1 + b$. Here, we'll adjust $m$ & $b$ to find the best linear model. If you instead type $y_1 = ax_1^2 + bx_1 + c$, we'll find the best quadratic fit.

If $x_1$ and $y_1$ are table columns, then $y_1 = mx_1 + b$ is a regression that finds the least squares values of $m$ and $b$ and plots the best fit line.

You can click to plot residuals, or use residuals in other expressions. For example $\text{mean}(e_i^2)$ is the mean of the squares of the residuals.

Try the regressions tour in the help menu for a guided introduction to creating regressions in the calculator.

For more info click here.
Want to learn more? Click on the links below.

- **GEOMETRY** - Learn how to use the point, line and circle tools and perform various constructions.
- **SCIENTIFIC CALCULATOR** - Learn how to use Desmos as a basic scientific calculator with some advanced features.
- **HIGHER LEVELS** - Derivatives, Integrals, Parametric Equations, Polar Graphing, Summations, Trigonometry & More!
Students forgetting midpoint & Distance formula?

\[
\text{midpoint}((\text{coordinate1}),(\text{coordinate2}))
\]

\[
(-4,4),(6,-3)
\]

\[
\text{midpoint}((-4,4),(6,-3))
\]

\[
\text{distance}((\text{coordinate1}),(\text{coordinate2}))
\]

\[
\text{distance}((-4,4),(6,-4)) = 12.8062484749
\]
Desmos is much more than just a graphing calculator.

Did you know that there is an entire library of **FREE** digital activities at teacher.desmos.com?
**Why Use Desmos Activities?**

Click [here](#) to explore Desmos classroom activities.
Types of Activities

- **Card Sorts** - You can do your favorite matching activities without the hassle of cutting and sorting cards. Great for FALs!
- **Polygraphs** - Similar to the game “Guess Who” with graphs. Students ask questions about key features to determine which graph their classmate chose.
- **Marble Slides** - Students use transformations to manipulate graphs in order to collect all the stars as the marbles slide along the graphs.
**Middle School**

- Polygraph: Transformations
- Expressions Mash-Up
- Marcellus the Giant

**Math I**

- Card Sort: Linear Systems
- Polygraph: Lines
- Marbleslides: Lines
Math 2

Polygraph: Parabolas
Marbleslides: Parabolas
Transformation Golf: Non-Rigid Motion

Math 3

Polygraph: Polynomials
Sector Area
Circle Patterns
To make sure the activity is appropriate for your curriculum, click on Student Preview. This will allow you to view the activity from a student’s perspective.
Click the + sign in the top right corner of your screen to bookmark the activity so you can find it easily later.
If you find an activity you love but want to make adjustments, click the 3 dots menu in the top right corner, and choose Copy and Edit. This will duplicate the activity so you can make changes to it.
When you are ready to do the activity, click on **Create Class Code**. Then click the 3 dots menu next to the code, and click on **Student Link**. This will give you a screen to display for your students to join the activity or a link you can post in Google Classroom.

Hey, students!

Go to [student.desmos.com](student.desmos.com) and type in: **YYJ STV**

Post in Google Classroom:

https://student.desmos.com/?prepopulateCod
Let’s Try One!
How to Create Your Own Desmos Activity
Activity Builder Components

- Graph
- Table
- Sketch
- Media
- Note
- Input
- Choice

Click [here](#) for video tutorials on how to use each component.
How to Create Your Own Desmos Activity

Click here to see a step-by-step guide with pictures for using the Desmos Activity Builder.

Click here for detailed instructions from Andrew Stadel (@mr_stadel) on creating card sorts in Desmos.
Sample Desmos Activities

Click [here](#) to see a Desmos activity based on the FAL Representing Quadratic Functions Graphically. There is also an [answer sheet](#) to go along with the activity so students can fill in the missing information on each card.

Click [here](#) to see a Desmos activity based on the FAL Representing Data with Boxplots.