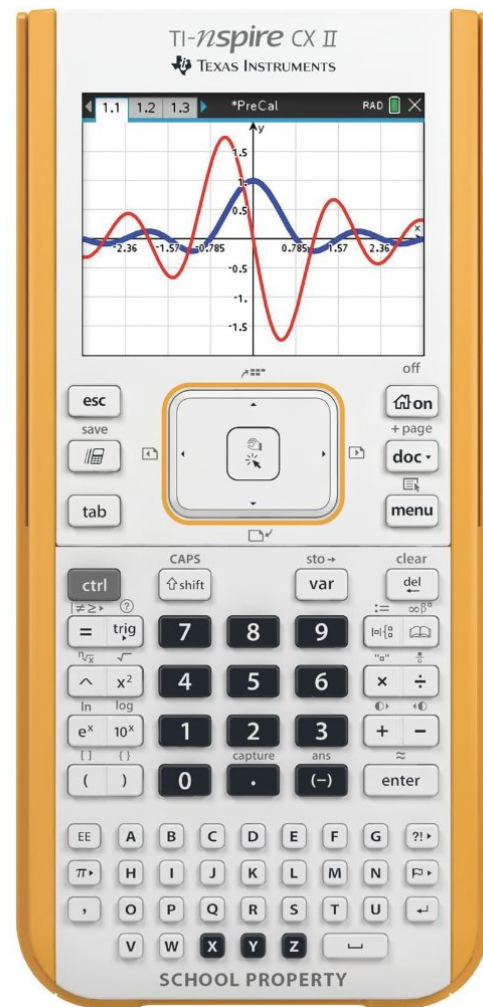


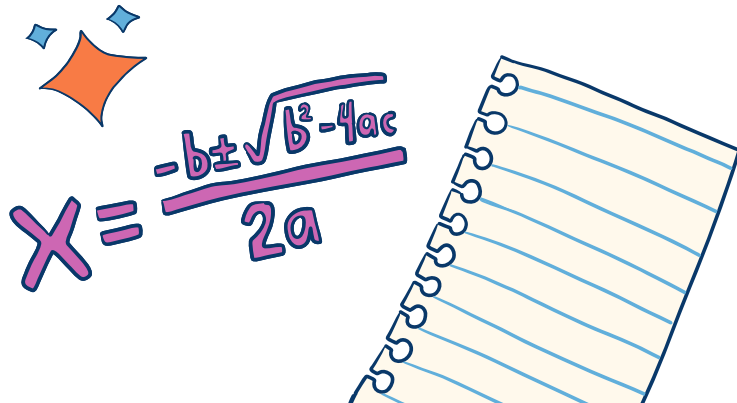
# Visualizing Algebra I: Harnessing TI-Nspire™ for Conceptual Mastery

Stefanie Stamatis  
New York School for the Deaf  
October 2024



# Stefanie Stamatis

(she/her)



- Math Teacher of the Deaf and Hard of Hearing (14 years)
  - Additional roles held within my 14 years of teaching: Math department chair, part-time math coordinator
  - NYS teaching certification in Deaf & HH and Mathematics 7-12
- BA in Deaf Education and a mathematics concentration with an educational psychology minor (IUP)
- M.A. Degree in TESOL (Stony Brook)
- Advanced Certificate in School Building Leadership (St. John's University)

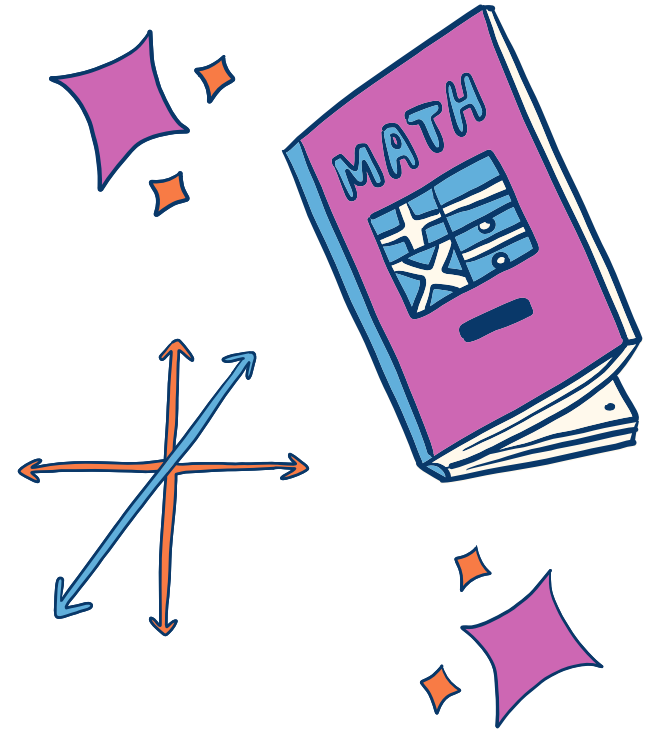


# Agenda

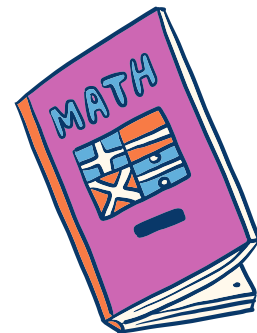
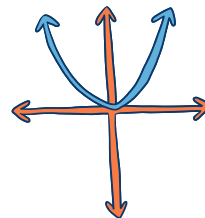
1. Introductions
2. What does the ti-nspire calculator have to offer?
3. Q & A
4. Time to play!
  - Test out some of the TI-nspire activities

# Raise your hand if you are a....

1. Teacher of the Deaf
2. Interpreter
3. Speech Language Specialist (SLP)
4. School administrator
5. Other?



## Poll: 5 minutes



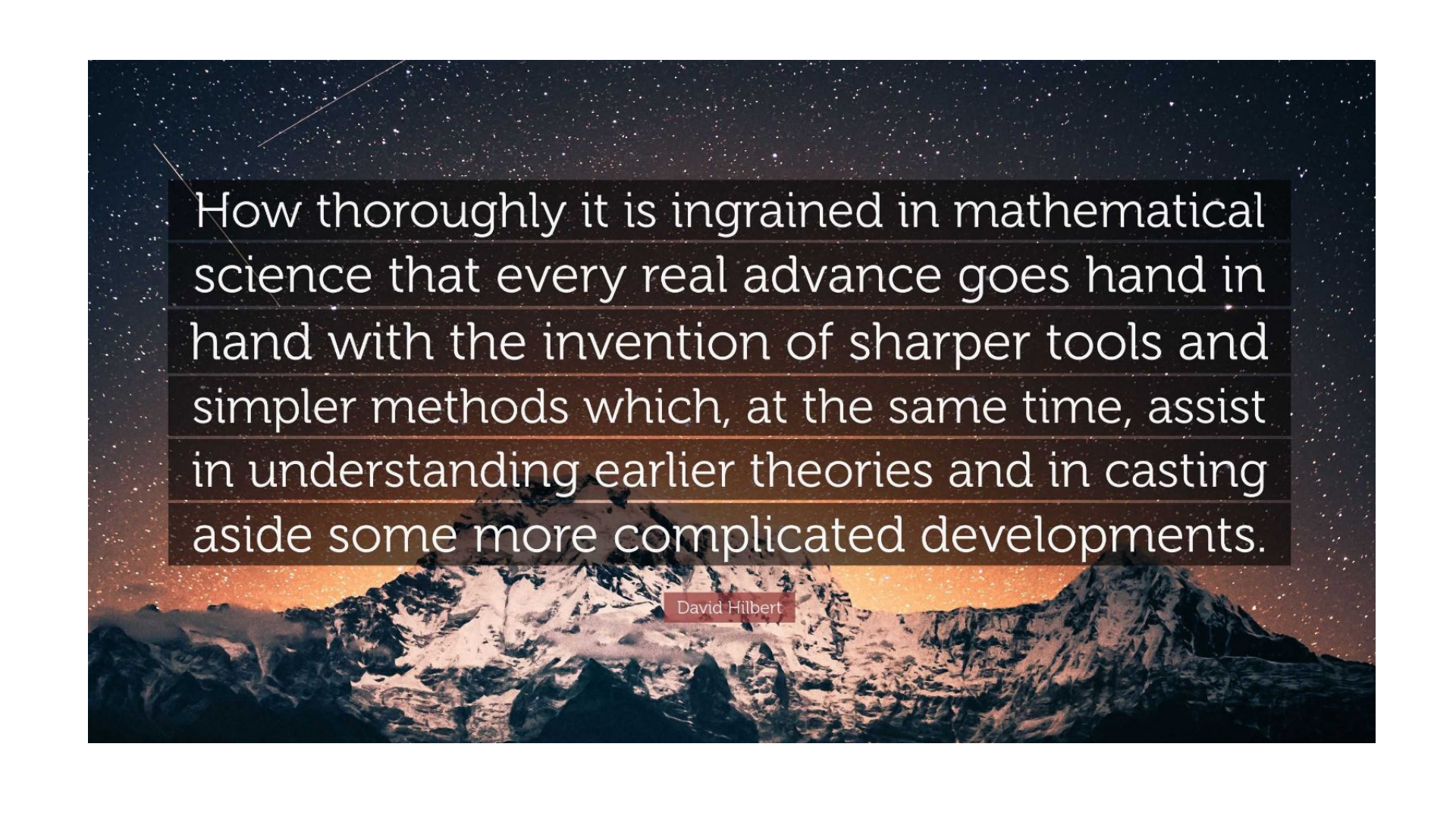
01 What calculators are you currently using in your classroom?

02 What do you wish your calculators would do?  
(What improvements do you want to see?)

03 What do you hope to learn here today?

Google Form:



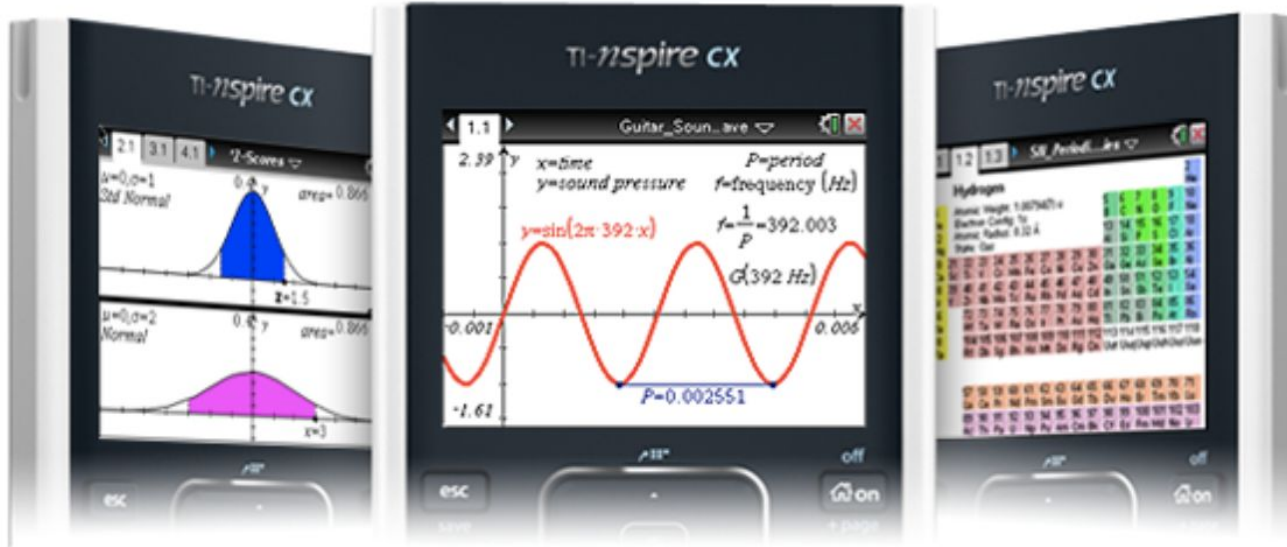


How thoroughly it is ingrained in mathematical science that every real advance goes hand in hand with the invention of sharper tools and simpler methods which, at the same time, assist in understanding earlier theories and in casting aside some more complicated developments.

David Hilbert



# Meet the TI-nspire calculator



Math. Science. All on one graphing calculator.

The TI-Nspire™ CX handheld is a robust, hands-on learning tool that satisfies math and science curriculum needs from middle school through college.

# Meet the TI-nspire calculator



## Calculator

Perform computations and enter expressions, equations and formulas in proper math notation.



## Graphs

Plot and explore functions, equations and inequalities, animate points on objects and graphs, use sliders to explain their behavior and more.



## Geometry

Construct and explore geometric figures and create animations.



## Vernier DataQuest™ Application

Create a hypothesis graphically and replay data collection experiments all in a single application



## Lists & Spreadsheet

Perform mathematical operations on data and visualize the connections between the data and their plots.



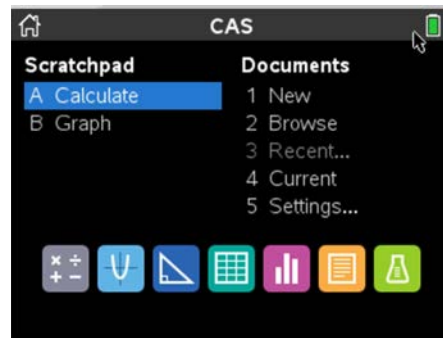
## Notes

Enter notes, steps, instructions and other comments on the screen alongside the math.



## Data & Statistics

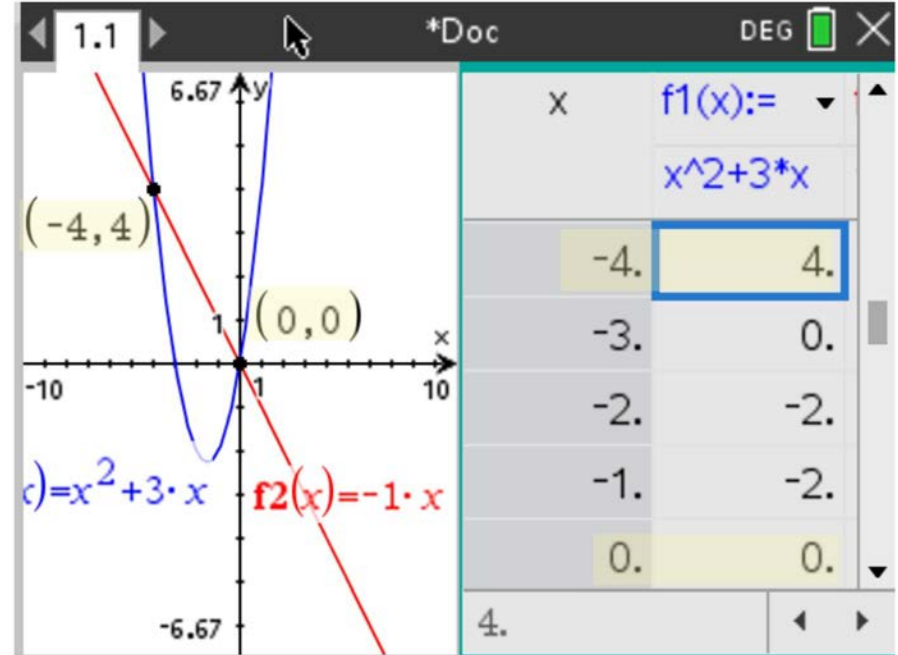
Summarize and analyze data using different graphical methods such as histograms, box plots, bar and pie charts and more.





# Students testimonials

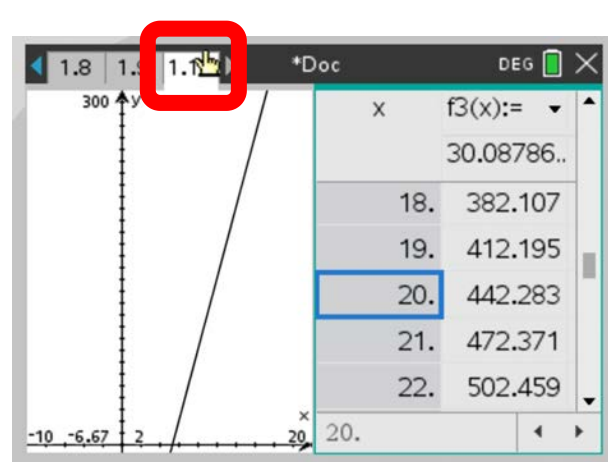
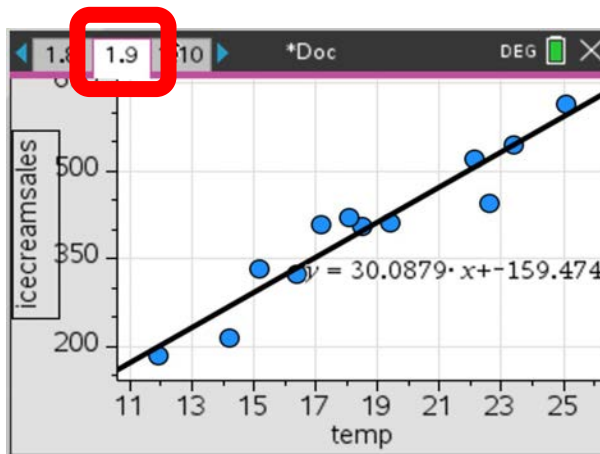
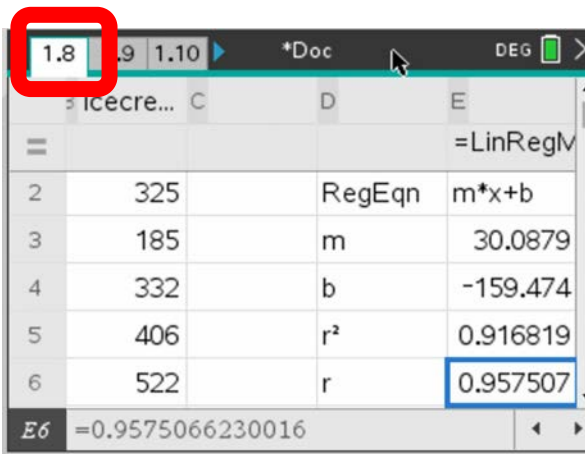
Student “KA”: “I like that you can see the systems of equations, labeled with the equation name next to each graph and with the colors matching. Then, I can find the intersection and check it with the table of values, side by side on 1 screen all together.” (translated from ASL)



# Students testimonials

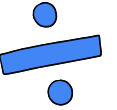
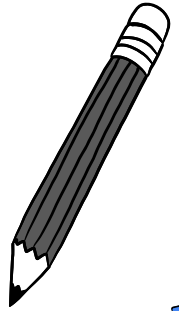
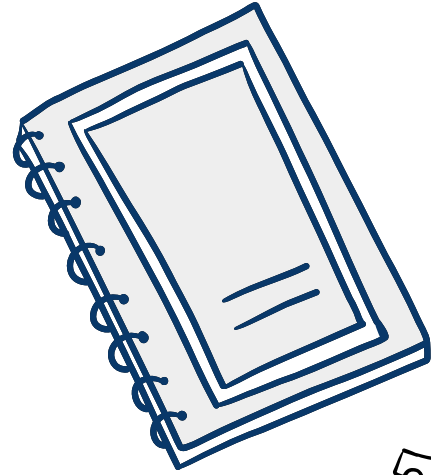
Student “MP”: I like how I can have many tabs open at once like the internet, so I can go back and forth between the scatter plot graph, the data information, the x/y graph and the regular calculator.” (translated from ASL)

Example:

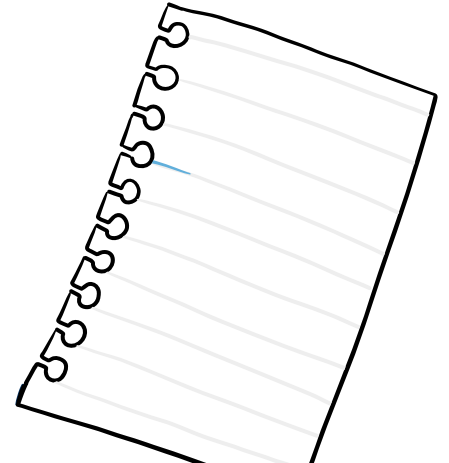


# Math in Action

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



$$a^2 + b^2 = c^2$$



# Algebra I task: Systems of Equations

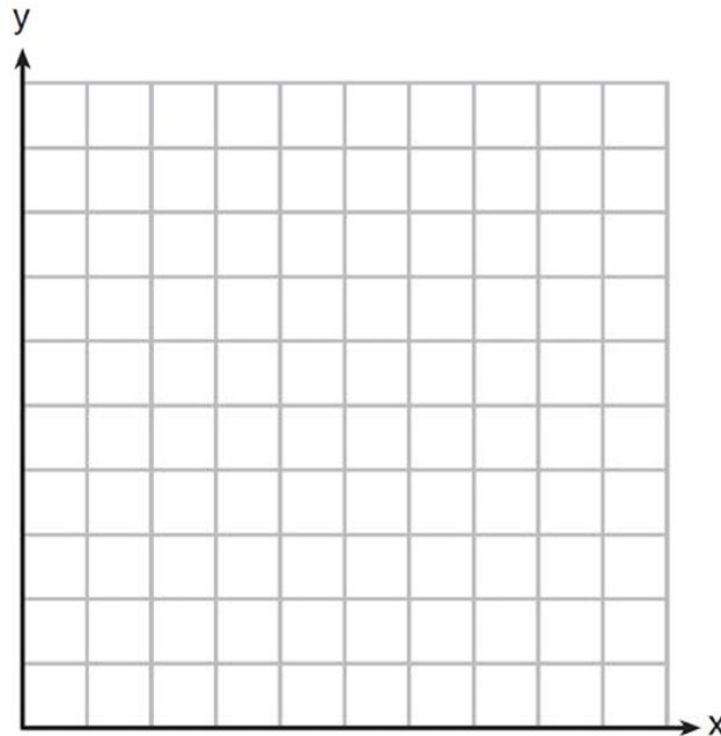
NYS Algebra  
Regents Exam  
Question

Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for \$19.

Caryl bought 2 packages of cupcakes and 4 packages of brownies for \$24.

Let  $x$  equal the price of one package of cupcakes and  $y$  equal the price of one package of brownies.

- Write a system of equations that describes the given situation.
- Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.



# Algebra I task: Systems of Equations

## The Student's work:

Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for \$19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for \$24. Let  $x$  equal the price of one package of cupcakes and  $y$  equal the price of one package of brownies. Write a system of equations that describes the given situation. On the set of axes below, graph the system of equations.

$x$  = cupcakes  
 $y$  = brownies

**Standard form:**  
 $Ax + By = C$

OR

**Slope intercept form:**  
 $Y = mx + b$

Franco:  $3x + 2y = 19$

$$\begin{array}{r} \cancel{-3x} \qquad \qquad \qquad -3x \\ \hline 2y = 19 - 3x \\ \hline \cancel{2} \qquad \qquad \qquad 2 \end{array}$$

$$y = -3/2x + 19/2$$

Caryl:  $2x + 4y = 24$

$$\begin{array}{r} \cancel{-2x} \qquad \qquad \qquad -2x \\ \hline 4y = 24 - 2x \\ \hline \cancel{4} \qquad \qquad \qquad 4 \end{array}$$

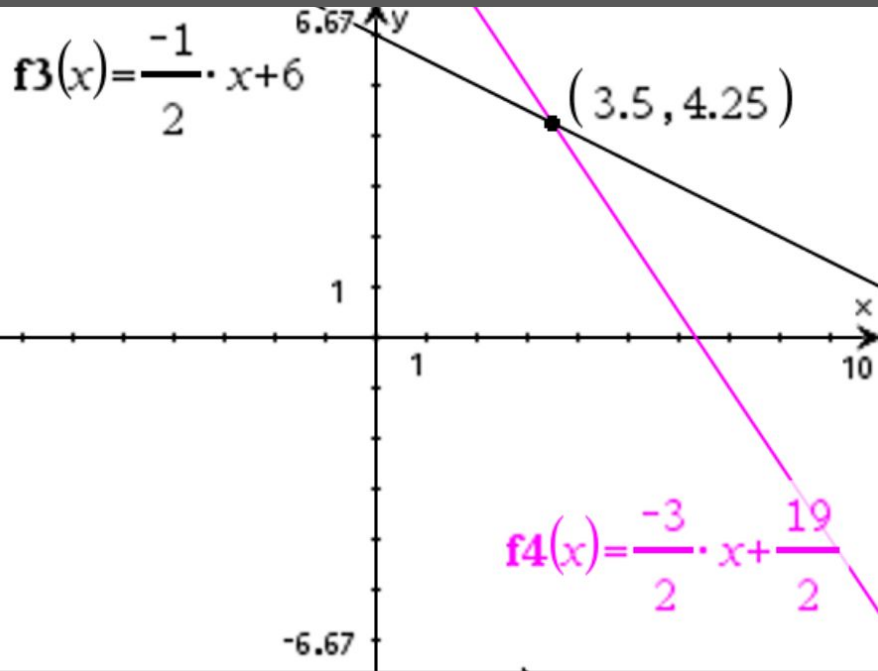
$$y = \frac{-1x + 6}{2}$$

# Algebra I task: Systems of Equations

Franco  $y = -\frac{3}{2}x + \frac{19}{2}$

Caryl  $y = \frac{-1}{2}x + 6$

Let's graph it on the TI-nspire now!



Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

$(3.5 \text{ cupcakes}, 4.25 \text{ brownies})$

1 package of cupcakes = \$3.50

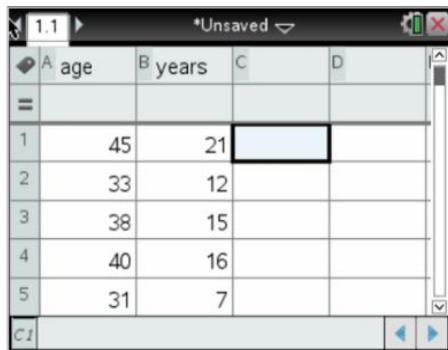
1 package of brownies = \$4.25

**Justification:** I used my calculator to graph the equations and find the intersection point.

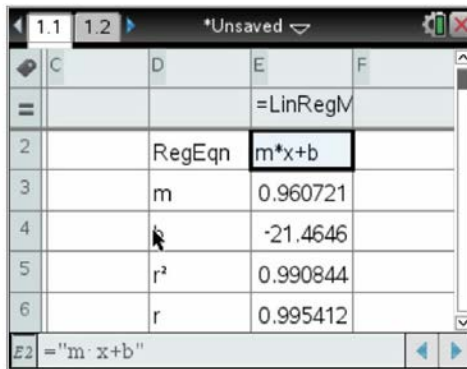
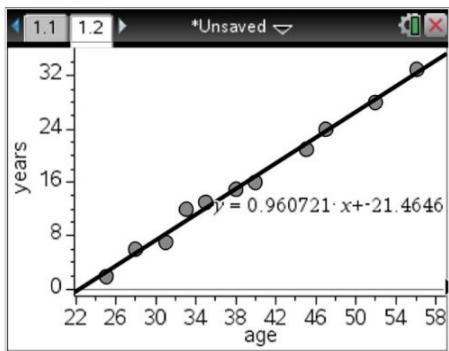
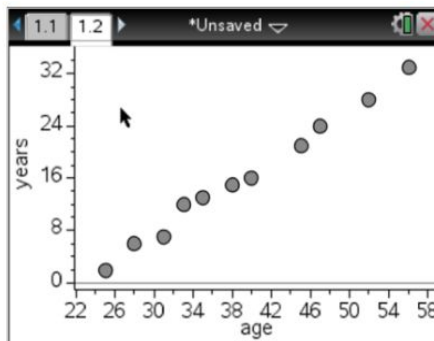


# Linear Regression (Scatterplots)

This is included  
in your  
handouts!



	A	B	C	D
=	age	years		
1	45	21		
2	33	12		
3	38	15		
4	40	16		
5	31	7		



	C	D	E	F
=			=LinRegV	
2		RegEqn	$m \cdot x + b$	
3		m	0.960721	
4		b	-21.4646	
5		$r^2$	0.990844	
6		r	0.995412	

$E2 = "m \cdot x + b"$

The full TI-Nspire  
handout only



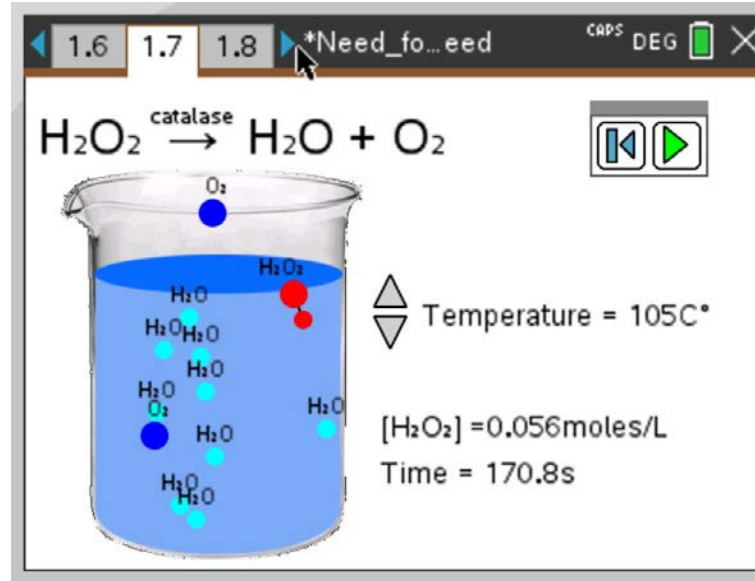
Directions with a  
signed video



# Scatterplots, Data collection & Biology Simulation

Lesson: "Biology: Need for Speed" Texas Instruments Simulation

Let's test it out!



"Biology: Need for Speed" the full lesson and materials



# Scatterplots, Data collection & Exponential regression:

In your session handouts to try out later:

## Exponential Growth or Decay

**Situation #1: Round Goby Fish are a big problem for the Great Lakes.**



1) Based on the Round Goby information fill out the table below.

Year	Round Goby fish population
0	2
1	
2	
3	
4	
5	



Round Gobies can produce offspring six times in just one summer, their populations can increase in a small amount of time.

2) Use your ti-nspire calculator to find the exponential regression equation.

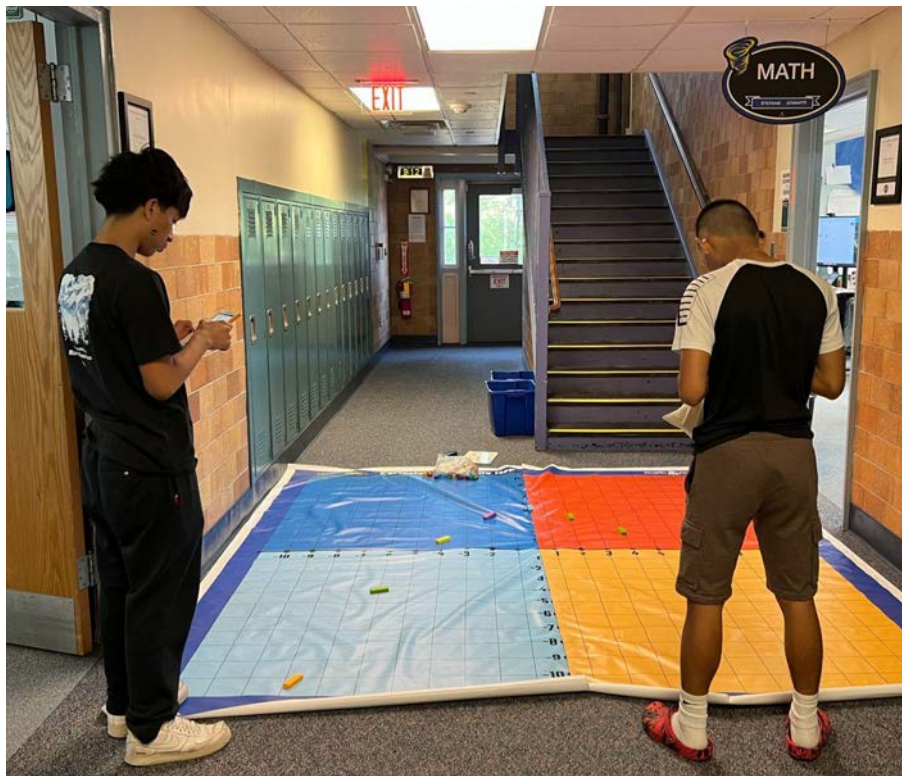
(HINT: Ti-nspire calculator  
Lists & Spreadsheets   
Data & Statistics page   
back to "lists & spreadsheets"  
Menu > Statistics > Stat calc >  
Exponential regression



Digital resources  
Modeling  
Exponential  
regression

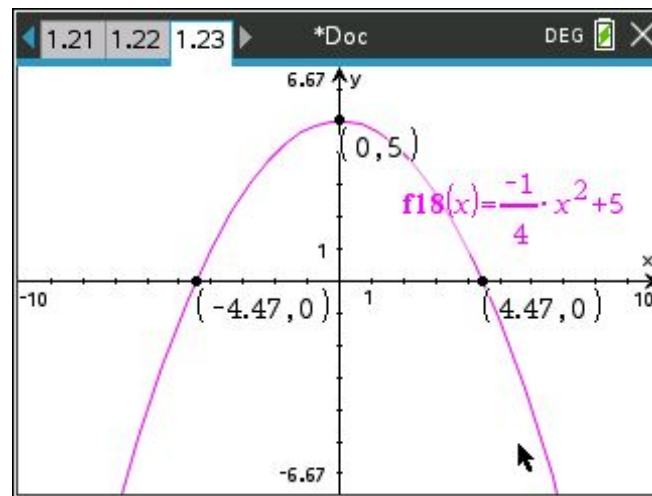


# The TI-nspire and the Math and Movement Coordinate Grid



## Task for the students:

- Graph the quadratic function given
- Label and discuss key characteristics of the function (vertex, roots, axis of symmetry)
- Discuss the transformation of the graph from its' parent graph.

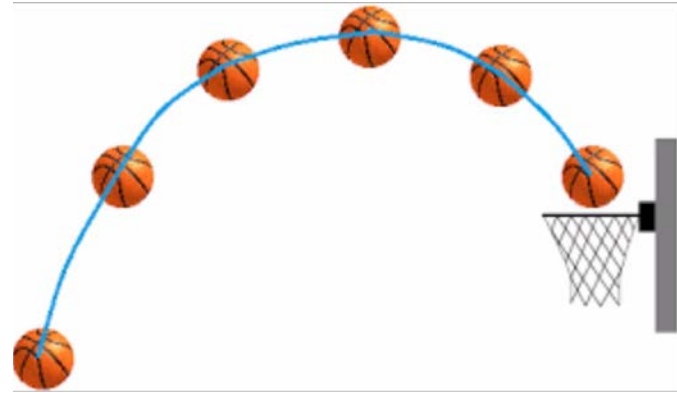


From a student's calculator using the

<https://nspireconnect.ti.com/nsc/>

## Let's try it out!

**Task:** A basketball player takes a shot. The height of the ball,  $h$ , in meters, can be modeled by the function  $h(t) = -4t^2 + 8t + 3$ , where  $t$  is time in seconds.



- a) What is the maximum height of the basketball?
- b) At what time does the basketball reach its maximum height?
- c) What is the height of the ball after 2 seconds?
  - Look at the table of values
  - Substitute your  $x$  value
- d) When will the ball hit the ground? (hint: menu, analyze, then what are we looking for?)

## Later: Try it out!

You have another quadratic functions task in your handouts to try at the end of this presentation!

### Quadratic Functions: Interpreting Key Characteristics

**Task:**

The STEAM class built rockets. The height of one student's rocket,  $h$ , in meters, can be modeled by the function  $h(t) = -4.9t^2 + 50t + 1$ , where  $t$  is time in seconds.

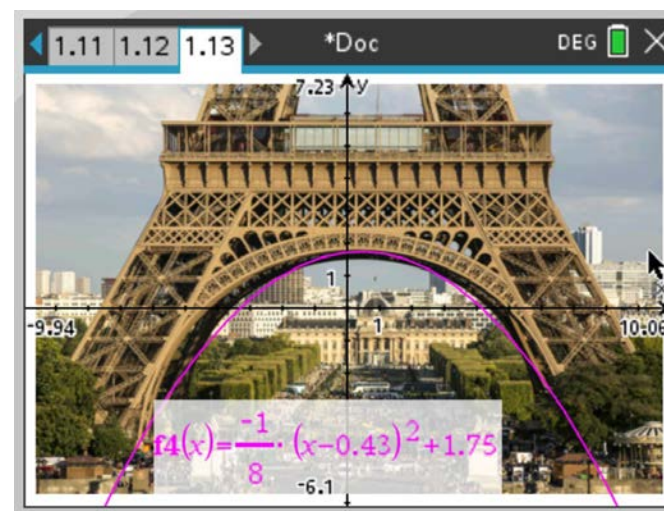
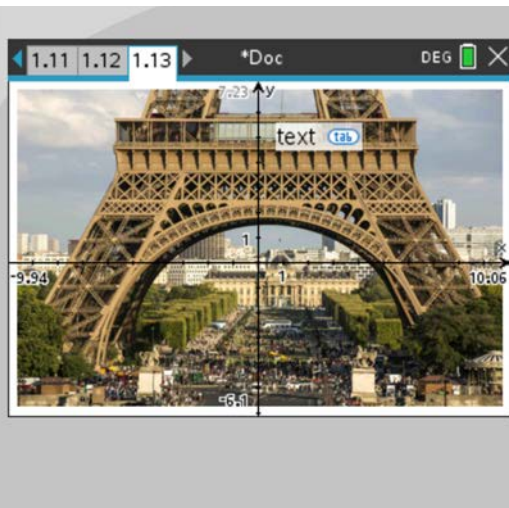
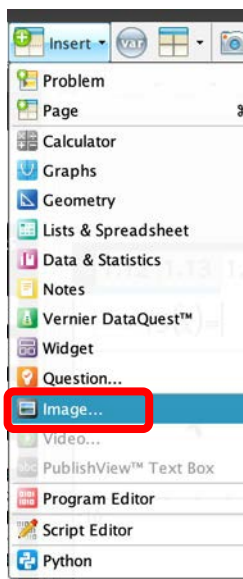


- Graph the function on your TI-Nspire calculator.  
Adjust the window so you can see the graph appropriately.



# Exploring math in the real world

Task: The student's will find a picture modeling a quadratic function (parabola). Upload your picture to the TI-nspire program. The student's will work in pairs to figure out the equation following the picture demonstrating and applying their knowledge of vertex form and their knowledge of transformations.



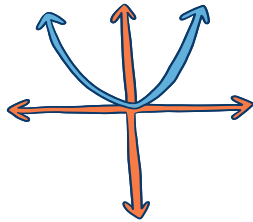
Note: You can also do this with the Desmos online graphing calculator.

# TI-Nspire lessons (pre-made): Science and Math

+ **Pros:** Fun and Interactive lessons

- **Cons:** Students have said that the lessons on the calculator are small and hard to see.

➔ **What can we do?** Download the student TI-Nspire software onto student laptops.



Algebra I/Math Nspired

<https://education.ti.com/en/timathnspired/us/algebra-1>



Science Nspired

<https://education.ti.com/en/tisciencespired/us/home>

Welcome to Math Nspired

About Math Nspired

Use an LMS With TI-Nspire™ Math Activities

Middle Grades Math

**Algebra I**

Equivalence

Equations

Linear Functions

Linear Inequalities

Systems of Linear Equations

Functions and Relations

Quadratic Functions

Exponential Functions

Geometry

Algebra II

Precalculus

Calculus

Statistics

Mathematical Modeling

Explorations with Coding

## Algebra I

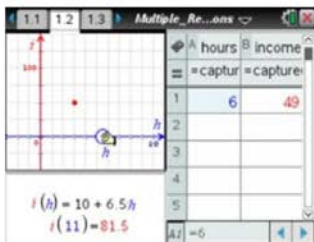
### Find activities that support your lesson plans

Challenge students to use and think about how technology can be used to model, analyze and explain math with standards-aligned activities in eight algebra I topics.

Activities can be used as is or edited to support specific objectives, align with popular text books and include technology tips to help you focus the learning and address student misconceptions.

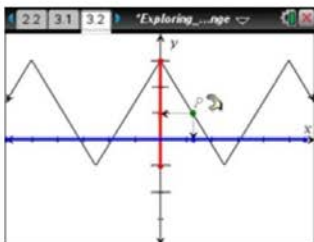


### Featured Activities



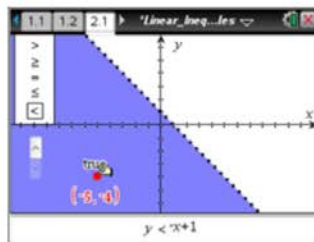
#### Multiple Representations

This lesson involves the concept of interpreting slope as a rate of change in the context of a real-world problem situation. »»



#### Exploring Domain and Range

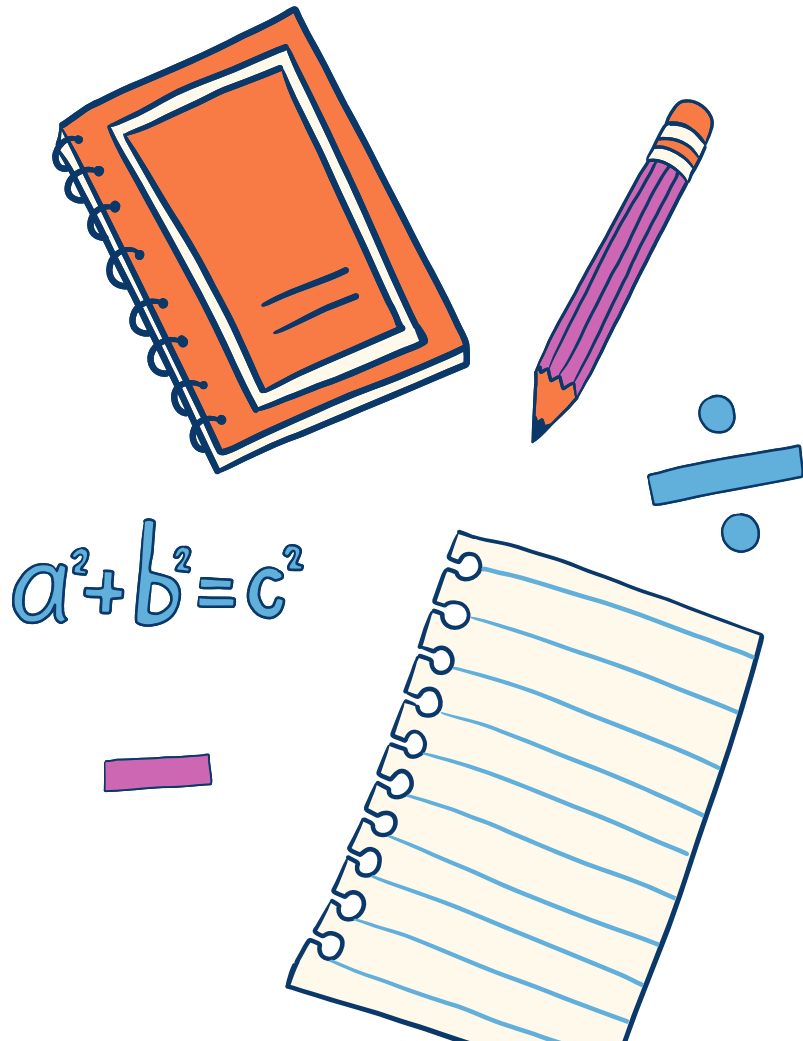
This lesson involves identifying a set of x-values in both symbols and words, identifying the set of x-values used in generating the function as the



#### Linear Inequalities in Two Variable

This lesson involves the basics of graphing linear inequalities. As a result, students will formulate the





## Sharing student work in the classroom with the TI-nspires

- Have your students present and share their work on their calculator

<https://nspireconnect.ti.com/nsc/>

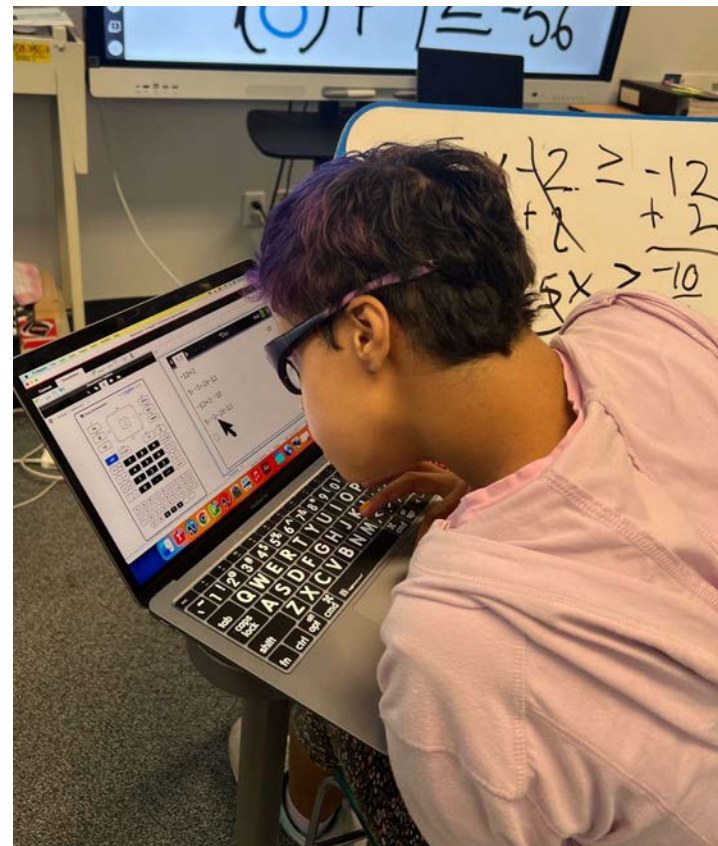
- Let me show you in real time!



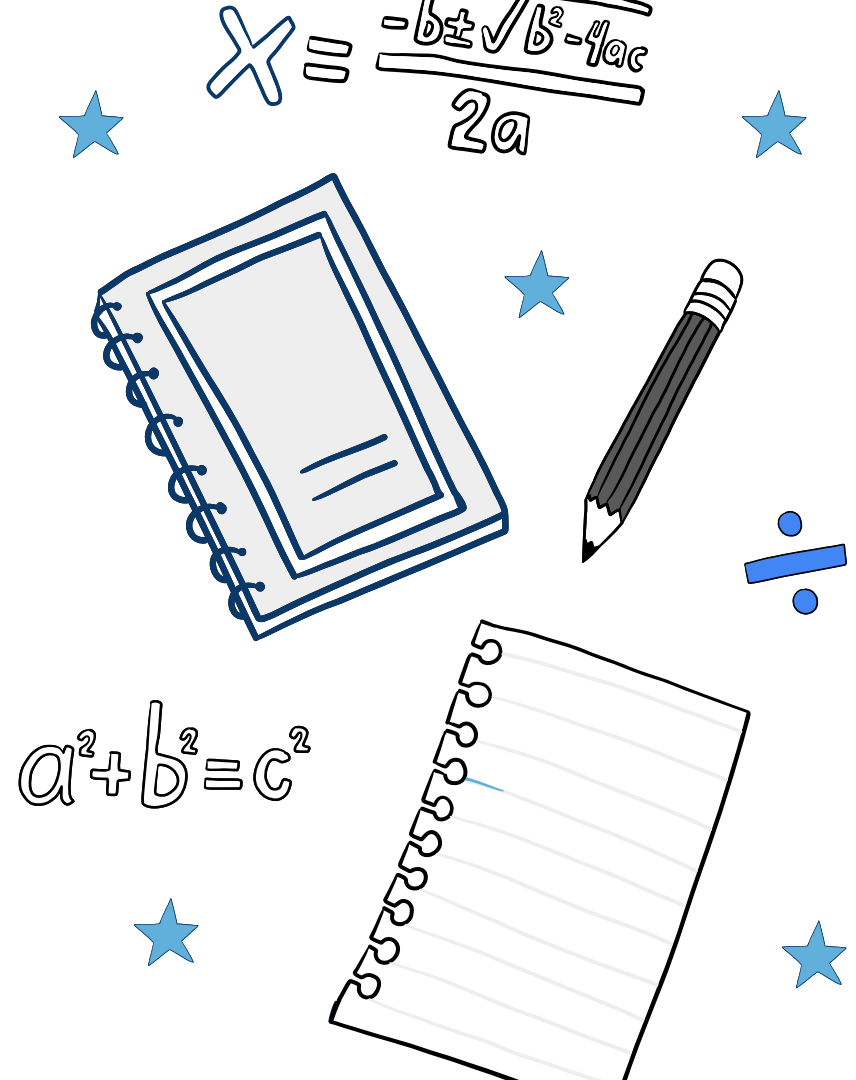
# Do you have students with low vision?

Download the TI-nspire software on a computer.

Just make sure  
to give vision  
breaks to the  
students!



# Basic Coding with the Ti-nspire





# TI-Innovator Rover



TI Graphing Calculator



TI-Innovator™ Rover



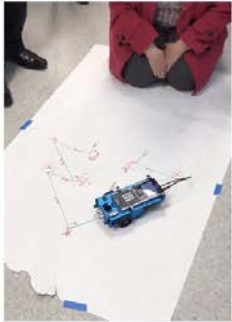
TI-Innovator™ Hub



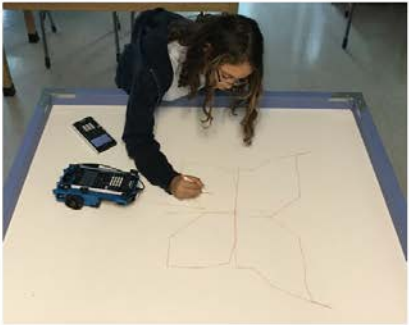
# Other ideas with the TI-Rover for the student's to explore!



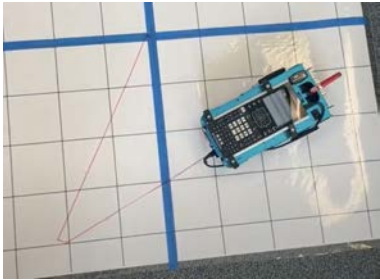
Drive an obstacle course



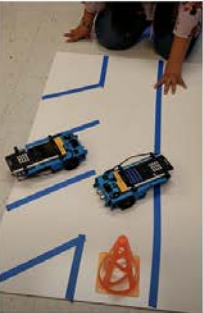
Drive a design



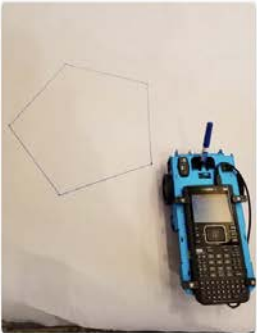
Draw artwork



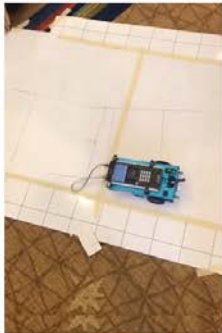
Algebra I: Code & apply slope intercept form



Park your Rover



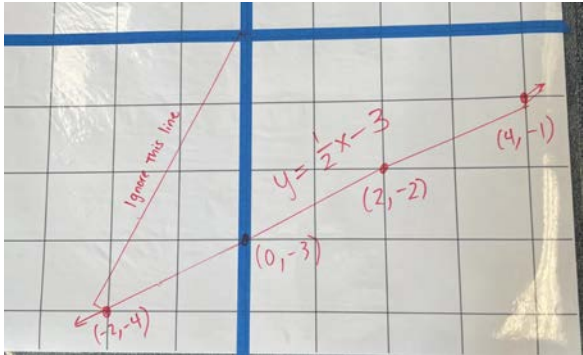
Use a For loop to draw polygons



Write your name



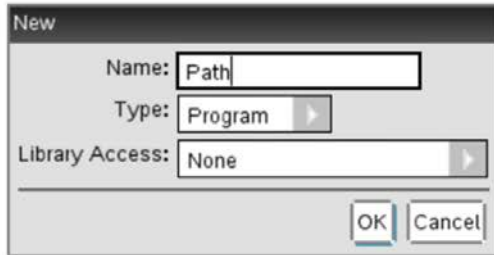
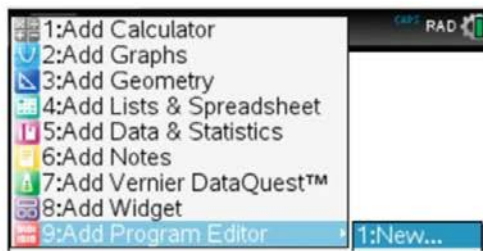
Navigate a map



# Quick-start Guide to driving the TI-Rover

Programming help: Write your own program to drive the Rover using the directions and commands below. This is designed to be an exploratory activity where you investigate the available commands.

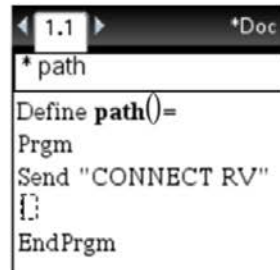
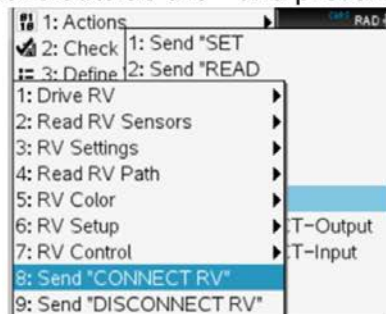
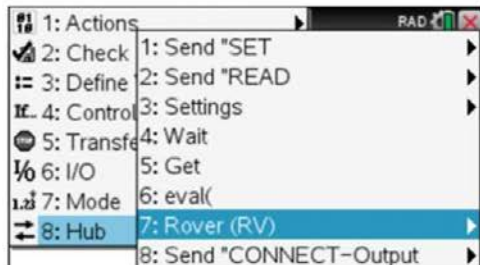
Press the program menu and select new and create a program called PATH.



```
Define path()=  
Prgm  
[ ]  
EndPrgm
```

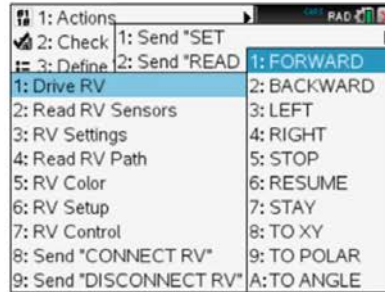
**Each time you want to enter a new command you will need to press the menu key to access the menus**

We need the Innovator Hub to communicate with the Rover and Connect. Press menu, 8:Hub, 7:Rover(RV), 8:Send "CONNECT RV". You will need to move outside the " and presenter for a new command line.



# Continued: Quick-start Guide to driving the TI-Rover

We next need to drive the Rover. Each time we need to send a command to the Rover we need to press Menu, arrow to HUB, choose 7: Rover (RV), 1: Drive RV, and select the command.



The two commands below tell the Rover to drive forward 20 cm and turn right 60 degrees.

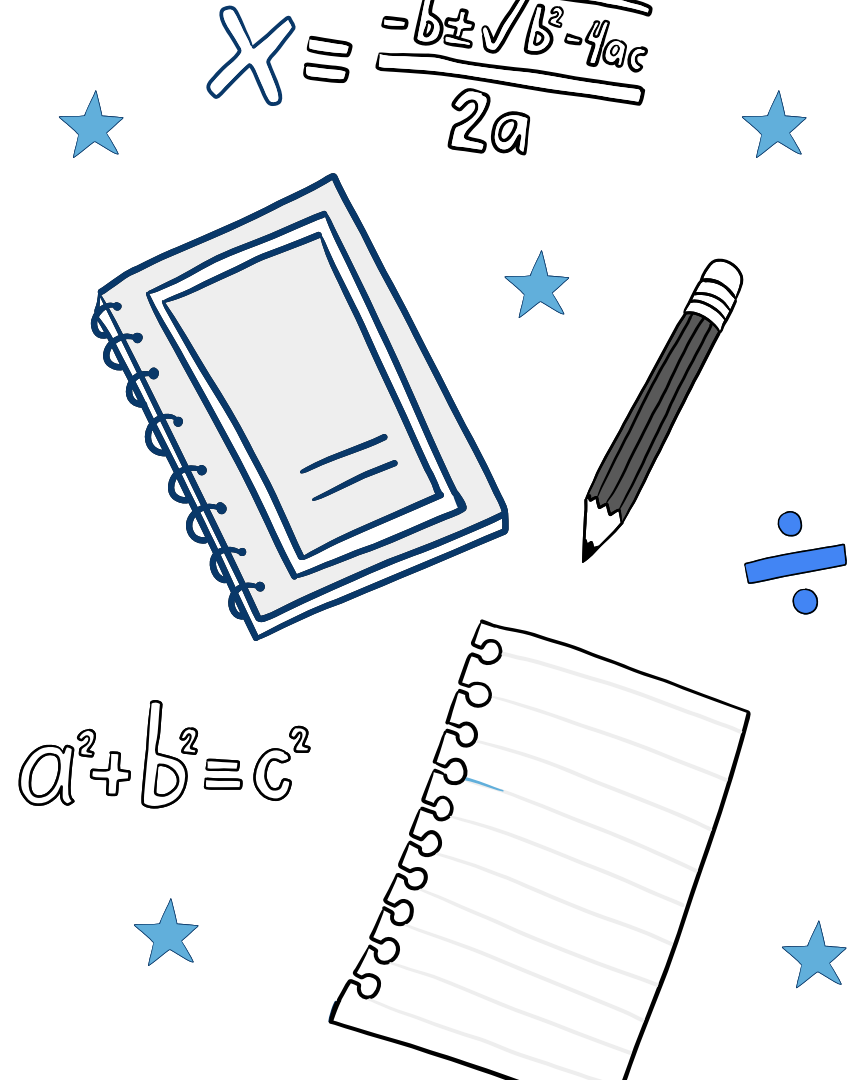
```
1.1 1.2 *Doc
* path
Define path()=
Prgm
Send "CONNECT RV"
Send "RV FORWARD 2"
EndPrgm
```

To run your program press ctrl then the r key. This will check for syntax, save your program and insert the program command on a new calculator page as shown below. Simply press the enter key to run the program and drive your Rover.

```
1.1 1.2 *Doc
path()
```



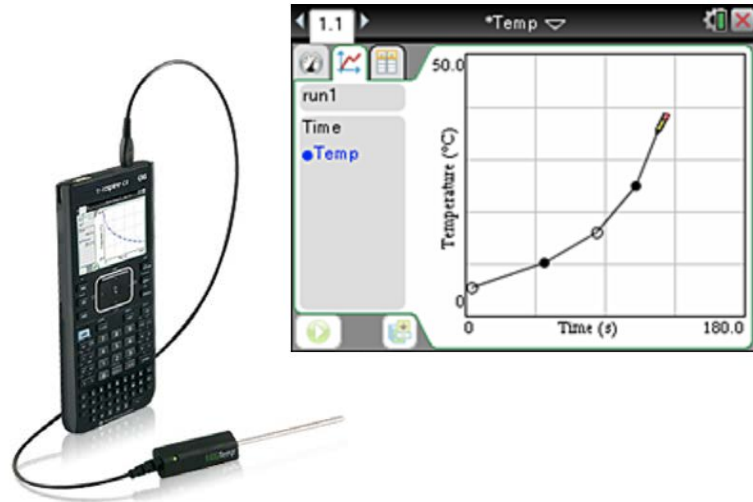
# Data Collection with the Ti-nspire





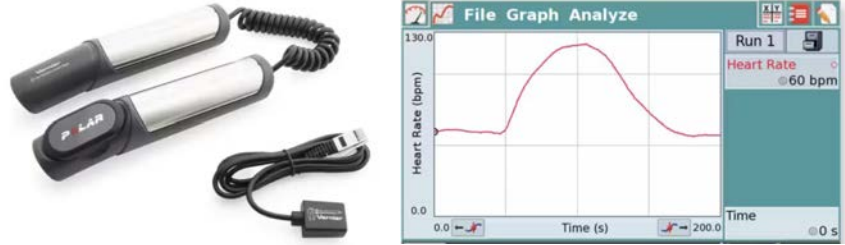
# A Few Examples: Other TI-nspire data collection sensors (probes)

Vernier Vernier EasyLink™ USB Interface  
with the temperature probe



Full list of Data-collection  
sensors that pair with the  
TI-Nspire technology

Vernier Hand-Grip Heart Rate Monitor



Vernier CBR2: Motion detector



# Experiments

Home > Experiment > What Goes Up – Position and Time for a Cart on a Ramp



## What Goes Up – Position and Time for a Cart on a Ramp

Experiment #9 from *Real-World Math with Vernier*

Education Level

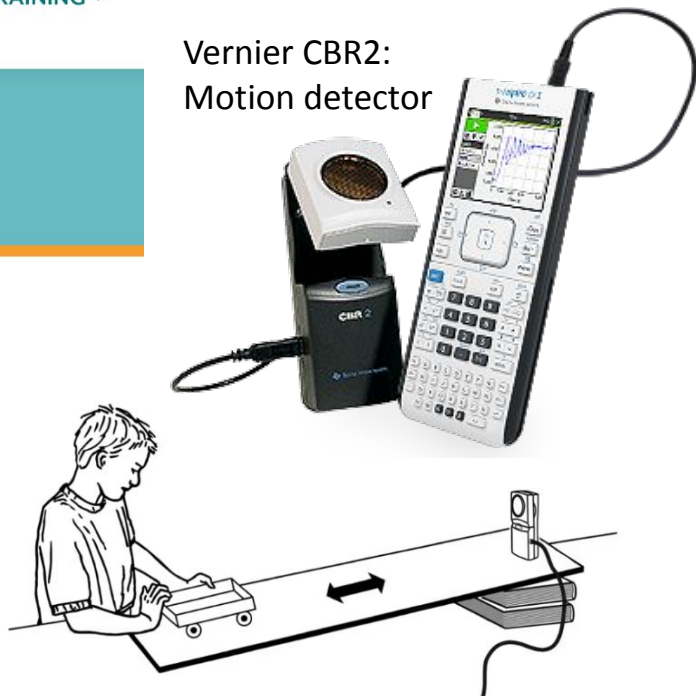
HIGH SCHOOL

### Introduction

When a cart is given a brief push up a ramp, it will roll back down again after reaching its highest point. Algebraically, the relationship between the position and elapsed time for the cart is quadratic in the general form

$$y = ax^2 + bx + c$$

Vernier CBR2:  
Motion detector



Vernier  
resources  
(general website)





# Do you want to try Ti-nspire computer software?

- Email our New York & Pennsylvania TI Educational Technology Consultant, Mr. Dana Morse and state that you attended my session. He will offer free Teacher ti-nspire software.
- Do you have students with visual impairments? Mr. Dana Morse will offer free student software.

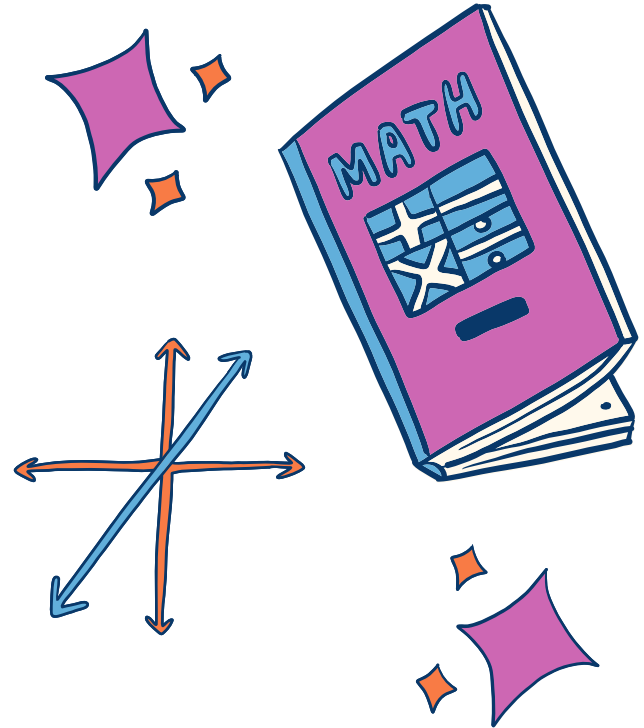
**Mr. Dana F. Morse (He/Him)**

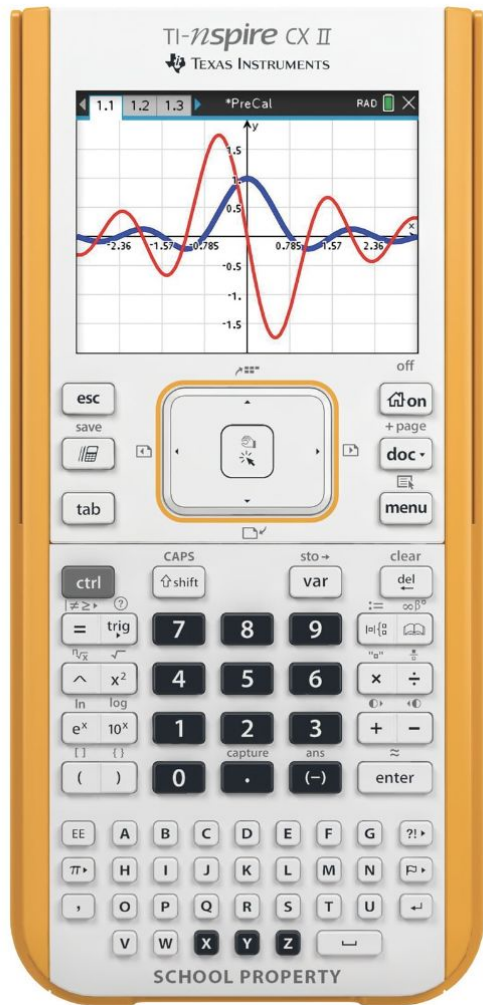
*Educational Technology Consultant*

*New York & Pennsylvania*

*Texas Instruments Incorporated*

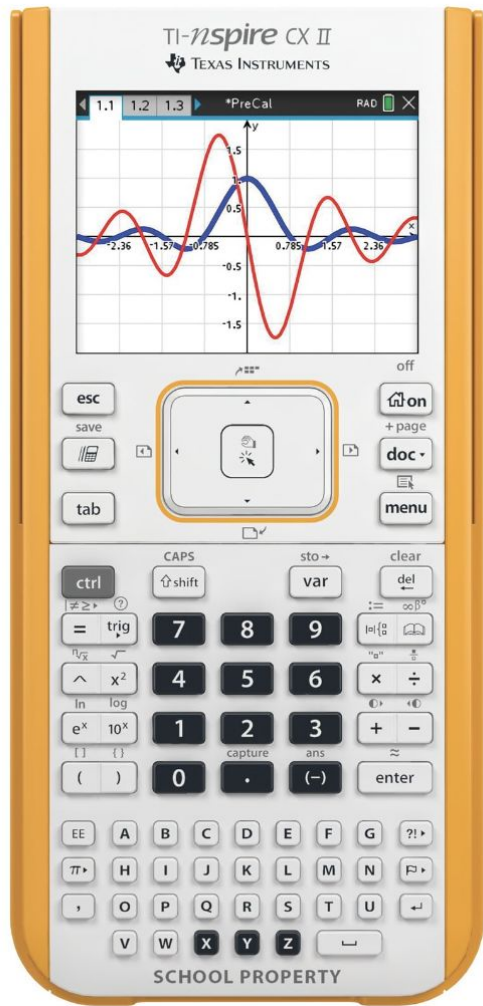
[dmorse@ti.com](mailto:dmorse@ti.com)





**Q & A?**





# Time to play!



Follow some of the activities in  
the printed handouts and  
test out the TI-Nspire!

All handouts for this  
presentation are here:

