TI-*n*spire CX

Looks like a calc, works like a computer

How to navigate:

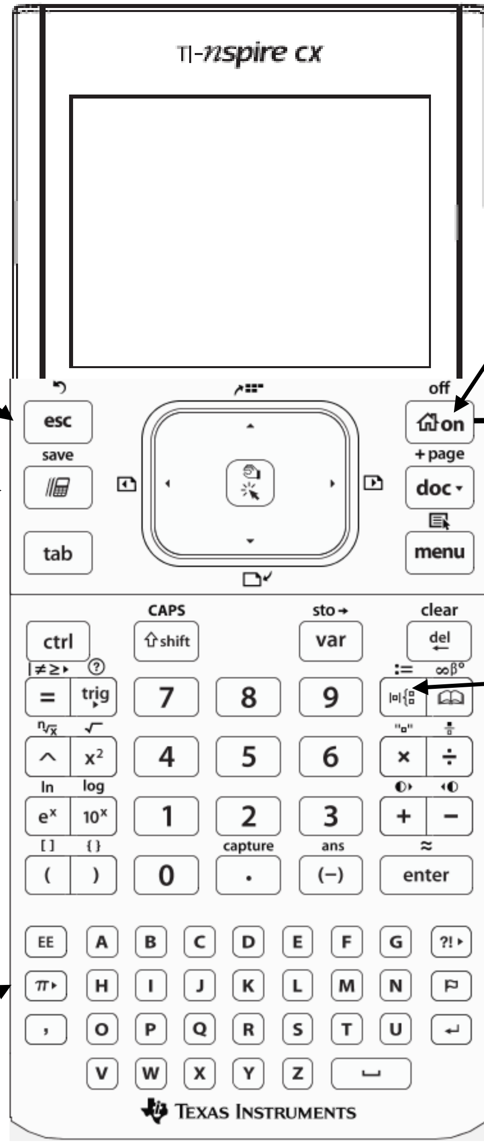
- ______________________________
- ______________________________
- ______________________________

____

STAR KEY!
____
____

____________________ OR
____
____

A ▸ symbol mean:
____
____



____

____
____

____
____

Ctrl & Enter:
____
____

Documents:

Calculator	Graphs	Lists & Spreadsheet	Data & Statistics	Notes	Vernier DataQuest™
					

Deleting documents:

- Delete one document: Press the X button in the top right.
- Delete all documents: Press  → 2: My Documents → Press *Menu* → C: Delete All

TI-*n*spire CX - Teacher Key

Looks like a calc, works like a computer

How to navigate:

- Touchpad
- Arrow Keys (up, down, left, right)
- Number Keys (in menus)

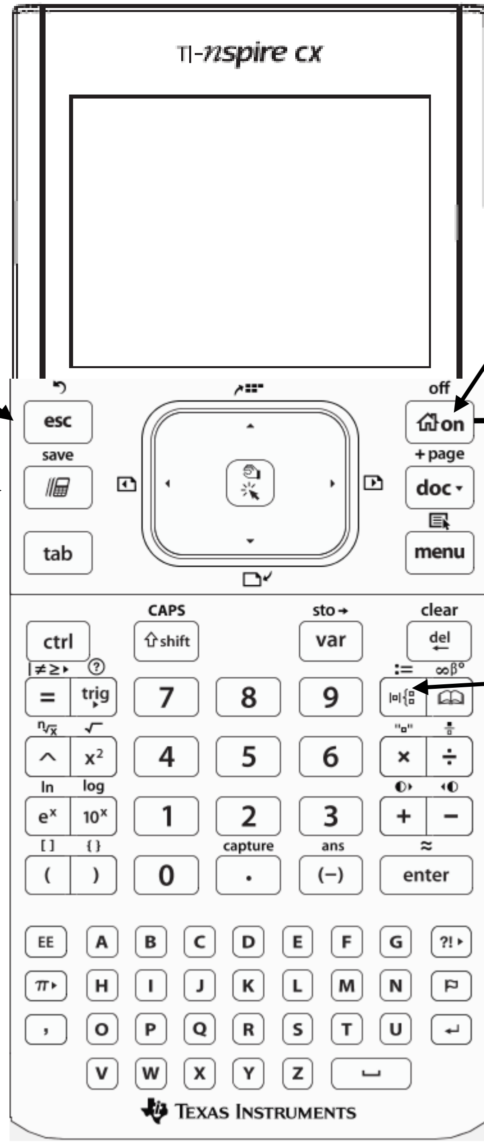
Undo/back/exit

STAR KEY!
Quick Calculator & Graph

TAB over OR to enter equation in graph mode

A ▸ symbol mean:

There are more options!



Home / On

OPTIONS (this changes)

MORE math stuff!

Ctrl & Enter:
Fraction to decimal

Documents:

Calculator

Graphs

Lists & Spreadsheet

Data & Statistics

Notes

Vernier DataQuest™

Deleting documents:

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- Delete all documents: Press  → 2: My Documents → Press *Menu* → C: Delete All

Name: ___________________
period: ________

TI – Nspire Practice

CALCULATOR

Either open up a new calculator document, or use the quick calculator.

1. Do the following problems on your calculator:

   a. $-478 - 381.2$ __________

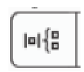
   b. 26.1 times 83.6 ___________

   c. 5^{10} _____________

   d. $3^8 - 4^5$ _______________ (Make sure your screen matches the problem! The answer is NOT 56918137….)

   e. $|-28.87| + 2|19.3|$ ___________

   f. $\sqrt{27}$ ______________ (There are two ways of doing this)

2. Fractions look pretty neat on the Nspire and can be entered in a variety of ways. Usually the easiest way is to use the division sign. For example, 2/3 is the same as 2 divided by 3. If it is a more complicated fraction, it may be easier to use the button  . (The key next to the catalog).

   a. $\frac{3}{5}+\frac{7}{8}=$ _____

   b. $\dfrac{\frac{1}{3}+\frac{1}{5}}{\frac{4}{7}-2}=$ _____

   c. What is your answer from above in decimal form? (Hint: Press "Ctrl" "Enter")

   d. Oops! I made a mistake. I really meant to write +2 instead of -2. Instead of retyping it, you can arrow UP to the problem and press enter. Now arrow over and fix the mistake. What is the correct answer? ___________________

3. Other mathematical symbols

   a. Enter $5 < 6$ in the calculator. What is the calculator output? ____________
      Enter $8 \geq 2$. What is the calculator output? _______________

   b. $\sqrt[3]{27} =$ ________

   c. $\sin(\pi) =$ _______
      $\sin(60°) =$ _______ (Hint: the answer is NOT -0.304811)
      $\sin^{-1}(0) =$ _____

4. Other useful tools.
   a. $1.45^3 - 7.2 =$ _________ (Hint: it is NOT 2.10017)
      What is the answer expressed as a fraction? ______________
      (Go to MENU→ 2: Number→2: Approximate to a fraction)

   b. Compute the number of different combinations of committees that can be formed if you have 10 people and want to make a committee of 4. (Hint: Look in MENU under Probability)

      You will put it in your calculator as nCr (10,4) = _______

   c. Solve $2x^2 + 3x - 2 = 0$. Go to MENU→ 3:Algebra → 3: Polynomial Tools → 1: Find Roots of Polynomial → Degree: 2, Roots: Real
      (Note: You have to specify whether the roots are real or complex, in this case they would be real)

      x = _____________ and x = _____________

GRAPHER

Either open up a new calculator document, or use the quick calculator.

First get rid of the stuff already there: Menu → 1: Actions → 4: Delete all

1. Press Tab slowly but repeatedly. What do you notice?

   ____

2. Graph the function $y = 2(x-3)^2 - 4$.

   a. Move the grid around.

      Hold down the middle of the Touchpad in a white area. Let go and move the fist around. Click the middle again to stop.

   b. Zoom in and out:

      Move the curser over the x- or y-axes. You should see an open hand. Hold down the middle of the touchpad until the hand closes. Use the touchpad to go towards the origin to shrink and away from the origin to enlarge. Click the middle again to stop.

   c. Go to "MENU" to change your window settings (1):

      NOTE: Tab to get to the next line.

      xmin: -5, xmax: 10, xscale: 2
      ymin: -20, ymax: 30, yscale: 5

      Sketch your graph in the box on the right.

   d. Use your graphing calculator to identify the following function features.
      Hint: Menu → Analyze features

      Minimum: ___________
      Hint: Click enter when the dashed line is on the left side of the vertex (lower bound), and click enter again with the dashed line on the right side of the vertex (upper bound). You don't have to be exact or even that close to the vertex.

X – intercepts (zeros): (______ , ________) and (______ , ________)

Hint: You'll do the same thing but for the zeros. You'll do it twice to get both zeros

Additional hint: Can't see the points because they overlap, hover over a point, hold down the middle of the touchpad and move it!

Find 2 other points on the graph: _________ and ___________

Hint: Menu → 5:Trace → 1: Graph Trace

e. Use the trace button to identify the y-value when x is 6. (6, _____)

Hint: This is pretty rad. When you are tracing, just enter the number 6 and ENTER. Pretty cool, eh?

3. Press TAB to add another function. Enter the function $y = 2x$. Find their intersection points. (There should be two)

(____ , _____) AND (____ , _____)

Hint: No hint this time, you can do it!

4. Multiple Representations: Fill out the table for each function

	$f_1(x)$	$f_2(x)$
0		
1		
2		
3		
4		

Hint: To see both the graph and table go to Menu → 7:Table → 1: Split-screen Table
When you are done, remove table by Menu → 2: Table → 1: Remove table

5. Change the equations to inequalities.

$y > 2(x-3)^2 - 4.$

$y < 2x$

Sketch the graph in the box on the right.

Hint: Tab → Arrow up until you get to the function → delete the "="
and replace with the inequality. Notice that once you do this, it then states it is a relation and you'll need to retype it.

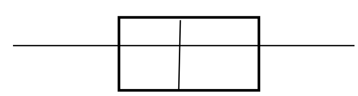
Also notice that you can now ONLY enter relations. To enter functions again, go to Menu→ 3:Graph Entry/Edit → 1: Function

6. Statistics: →  → Lists & Spreadsheet 

a. Enter list: 121, 65, 45, 130, 150, 83

Menu → 4: Statistics → 1:Stat Calculations →1: One-Variable Statistics →OK →OK

	Title	=oneVar		Title	
121	$\bar{x}$ *mean*			Min	
65	∑x (sum of x)			Q1	
45	$\sum x^2$ (sum of x^2)			Median	
130	sx:Stand Dev of sample			Q3	
150	σx:Stand Deviation of assumed total population			Max	
83	n: sample size				



Name: ______________________________
Period: _____

TO THE RACES!

Objective:
I will use mathematical tools to model mathematics and determine features of functions in context.

Baby Mario

Yoshi

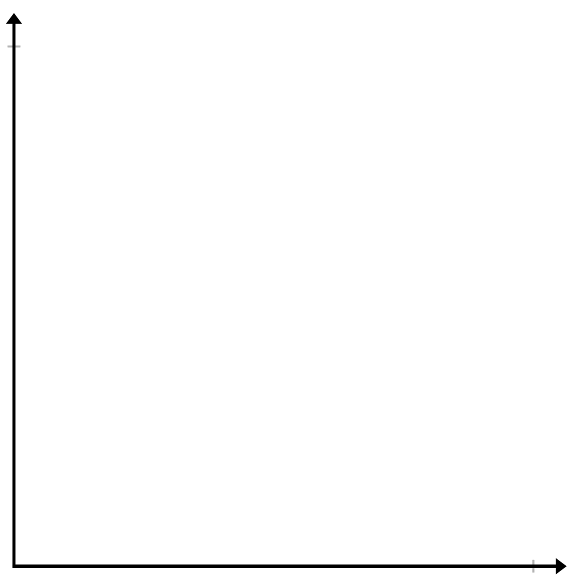
Bowser

Baby Mario, Yoshi, and Bowser are off to the races! Since Baby Mario is slower, they decide to give him the largest head start. Boswer is the heaviest so it takes him the longest to get going from the start line so he also gets a little head start.

1. The following equation represent the racer's distance, in feet, with respect to time, t in seconds. Match each equation to the correct racer.

$a(t) = 1.09^t$	Baby Mario
$b(t) = 0.5t + 50$	Yoshi
$c(t) = 0.05t^2$	Bowser

2. Show as sketch of your graph below. Remember to label your axes!



3. How much of head start did the racers get? Baby Mario: ________ Bowser: _______

4. Who was in the lead:

   a. At 5 seconds? ______________________

   b. At 10 seconds? ______________________

   c. At 15 seconds? ______________________

5. Baby Mario is the slowest so both Yoshi and Bowswer eventually caught up and passed him.

   a. Who passed him first? YOSHI or BOWSER (Circle one)

   b. At what time did Yoshi pass him? _________ seconds

   c. How many feet along the race were they when Yoshi passed Baby Mario? ___________ feet

6. Describe the race in detail. Include who is ahead at the start, when racers are speeding up/slowing down/or constant, and any times when the racers pass each other (There should be 4 times when the racers pass each other). Hint: To find intersections with more than 2 functions, go to MENU→6:Analyze Graph → 4:Intersection, then for the two functions that you want to find the intersection of, click on each function, then do the lower bound, upper bound as you did before.

7. Conclusion: Who would be the winner of the race if it went on for a LONG time? Give the final order for the finish line of the infinite length race in the boxes below.

   1st place: ___________________

   2nd place: __________________

   3rd place: __________________

8. There is a common phrase “Slow and steady wins the race.” When given increasing exponential, linear, and quadratic functions in an infinite length race, which function would eventually always win? Explain,

   Asssume all functions are increasing.

Name: ______________________________ Hour: _____

TO THE RACES!

Objective:
I will use mathematical tools to model mathematics and determine features of functions in context.

Baby Mario

Yoshi

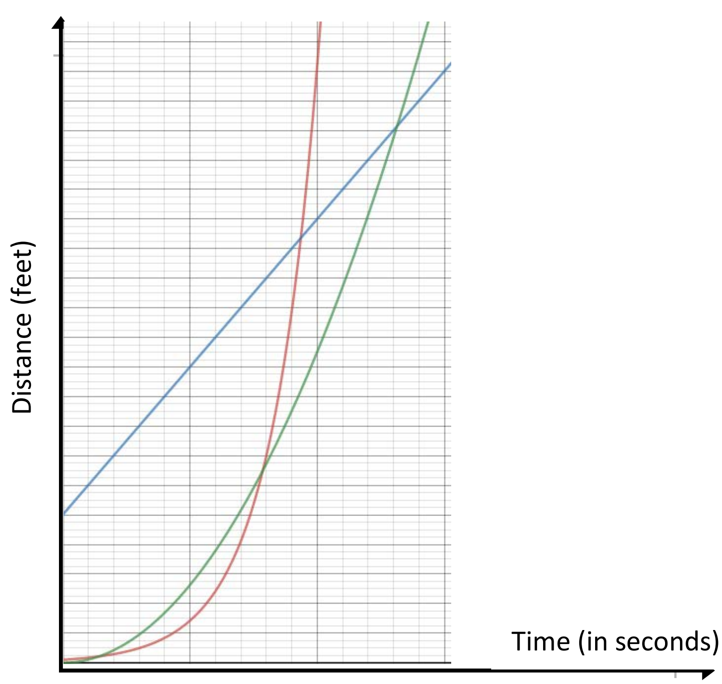
Bowser

Baby Mario, Yoshi, and Bowser are off to the races! Since Baby Mario is slower, they decide to give him the largest head start. Boswer is the heaviest so it takes him the longest to get going from the start line so he also gets a little head start.

1. The following equation represent the racer's distance, in feet, with respect to time, t in seconds. Match each equation to the correct racer.

$a(t) = 1.7^t$	Baby Mario
$b(t) = 10t + 50$	Yoshi
$c(t) = 1.05t^2$	Bowser

2. Show as sketch of your graph below. Remember to label your axes!



3. How much of head start did the racers get? Baby Mario: ______ 50 feet Bowser: _____ 1 foot

4. Who was in the lead:

   a. At 5 seconds? ______________________ Baby Mario
   b. At 10 seconds? ______________________ Boswer
   c. At 15 seconds? ______________________ Bowser

5. Baby Mario is the slowest so both Yoshi and Bowswer eventually caught up and passed him.

   a. Who passed him first? YOSHI or BOWSER (Circle one) Bowser

   b. At what time did **Yoshi** pass him? ________ seconds About 13 seconds

   c. How many feet along the race were they when **Yoshi** passed Baby Mario? ____________ feet

      181 feet

6. Describe the race in detail. Include who is ahead at the start, when racers are speeding up/slowing down/or constant, and any times when the racers pass each other. (There should be 4 times when the racers pass each other)
   Hint: To find intersections with more than 2 functions, go to MENU→6:Analyze Graph → 4:Intersection, then for the two functions that you want to find the intersection of, click on each function, then do the lower bound, upper bound as you did before.

   Baby Mario is in the lead at the start with bowser just a foot ahead of Yoshi at the starting line. Boswer and Yoshi are both slow movers, with Yoshi passing up bowser after 1.42 seconds. Bowser starts picking up the pace and whips past Yoshi at 7.87 seconds after going 65 feet. All this time, Baby Bowser had been moving at a constant rate and has been leading. With Yoshi and Bowser speeding up, Bowser passes Baby Mario at 9.36 seconds and Yoshi takes a little longer to pass Baby Mario, passing at 13.1 seconds.

7. Conclusion: Who would be the winner of the race if it went on for a LONG time? Give the final order for the finish line of the infinite length race in the boxes below.

   1st place: ____________________ Bowser

   2nd place: ___________________ Yoshi

   3rd place: ___________________ Baby Mario

8. There is a common phrase “Slow and steady wins the race.” When given increasing exponential, linear, and quadratic functions in an infinite length race, which function would eventually always win? Explain,

   Asssume all functions are increasing.

   An exponential will eventually ALWAYS win, followed by a quadratic, then a linear.(assuming they are all increasing) So… Slow and steady doesn’t win the race

TI-Nspire™ CX handheld keys

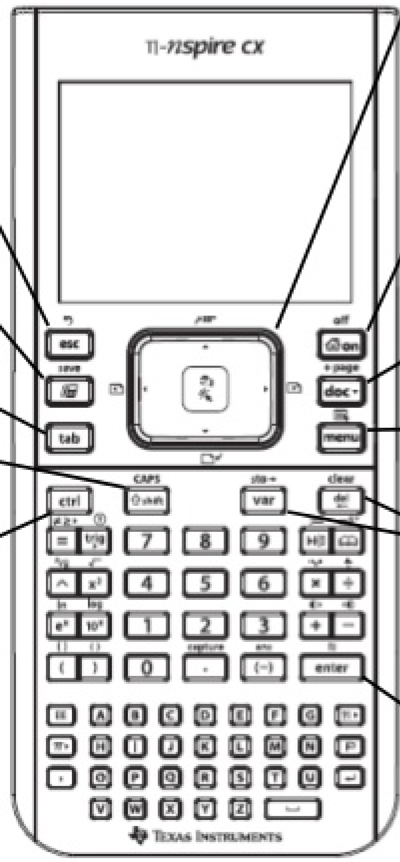
esc Removes menus or dialog boxes from the screen. Also stops a calculation in progress.

Opens the Scratchpad for performing quick calculations and graphing.

tab Moves to the next entry field.

shift Makes the next character typed upper-case.

ctrl Provides access to the function or character shown above each key. Also enables shortcuts in combination with other keys.



Use the **TI-Nspire™ Touchpad** as you would a laptop touchpad. You can also press the outer edges to move right, left, up, and down.

on Turns on the handheld. If the handheld is on, this key displays the home screen.

doc▾ Opens the Document menu.

menu Displays the application or context menu.

del Deletes the previous character.

var Displays stored variables.

enter Evaluates an expression, executes an instruction, or selects a menu item.

Note: A ▶ symbol on a key indicates access to multiple options. To access an option, press ?!▸ repeatedly or use the arrow keys on the touchpad. Press enter or click to select the option.

Standards Involving Technology

Secondary I:

- **A.REI.11** Explain why the *x*-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of the equation *f(x) = g(x)*; find the solutions approximately, e.g., **using technology** to graph the functions, make tables of values, or find successive approximations. Include cases where *f(x)* and/or *g(x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.⋆
- **F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and **using technology** for more complicated cases.⋆
  - a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
  - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period,midline, and amplitude.
- **F.BF.3** Identify the effect on the graph of replacing *f(x) by f(x) + k, kf(x), f(kx), and f(x + k)* for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph **using technology**. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
- **S.ID.8** Compute (**using technology**) and interpret the correlation coefficient of a linear fit.

Secondary II:

- **F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and **using technology** for more complicated cases. ⋆
  - **a.** Graph linear and quadratic functions and show intercepts, maxima, and minima.
  - **b.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- **F.BF.3** Identify the effect on the graph of replacing *f(x) by f(x) + k, kf(x), f(kx), and f(x + k)* for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph **using technology**. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

Secondary III:

- **A.REI.11** Explain why the *x*-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of the equation *f(x) = g(x)*; find the solutions approximately, e.g., **using technology** to graph the functions, make tables of values, or find successive approximations. Include cases where *f(x)* and/or *g(x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.⋆
- **F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and **using technology** for more complicated cases.⋆
  - **b.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
  - **c.** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
  - **e.** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
- **F.BF.3** Identify the effect on the graph of replacing *f(x) by f(x) + k, kf(x), f(kx), and f(x + k)* for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph **using technology**. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
- **F.LE.4** For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where *a, c*, and *d* are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm **using technology**.

What are tools of mathematics?

The eight Standards for Mathematical Practice are:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. **Use appropriate tools strategically**
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Students should consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Students make decisions about when each of these tools might be helpful, recognizing both the strengths and weaknesses. For example, students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the situation, explore, and compare predictions with data. They are able to use technological tools to explore and deepen their understanding of concepts.