

Online Calculator and Graphing Tool Manual

PSSA and Keystone Exams



Note: This manual is not to be used during testing.

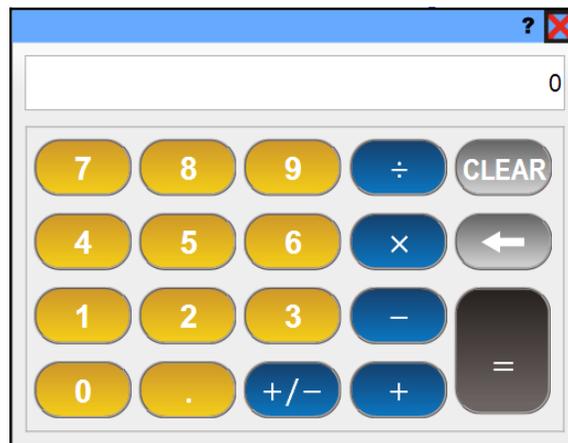


ONLINE CALCULATORS

Students can access a calculator by clicking the calculator icon, , located in the toolbar at the top of the screen. The Basic Calculator performs the four basic operations of arithmetic. The Scientific Calculator can perform exponential, logarithmic, and trigonometric operations, as well as the four basic arithmetic operations. Each calculator can be clicked and dragged around the screen. Each calculator can also be removed from the screen by clicking the red X located in the upper right corner of the calculator. This will close the pop-up window for the calculator.

BASIC CALCULATOR

By selecting **Basic** from the drop down menu of the calculator icon, students can access the Basic Calculator as shown below.



The Basic Calculator can be used to perform the operations of addition, subtraction, multiplication, and division. It also has the ability to recognize both positive and negative numbers. However, it does not recognize or apply the order of operations. For example, entering $2 + 3 \times 5 =$ would result with the calculator displaying “25”. The calculator does each operation in the order it is entered, as opposed to following the order of operations with multiplication done before addition.

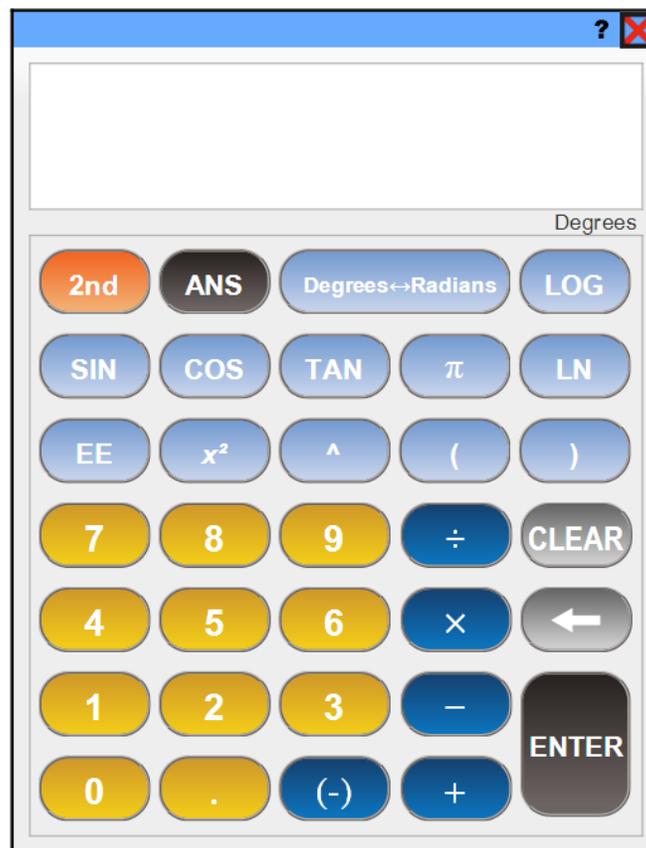
The table below gives the functions and keyboard shortcuts for the buttons on the Basic Calculator.

Button	Keyboard Shortcut	Function
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Enters digits 0 through 9
+	+	Adds
-	-	Subtracts
×	*	Multiplies
÷	/	Divides
.	.	Inserts decimal point
+/-		Switches between positive and negative numbers
=	Enter	Performs previously entered operation(s)
↶	Delete or Backspace	Deletes last digit, button, or keystroke entered
CLEAR	Alt and Delete	Resets calculator and clears memory



SCIENTIFIC CALCULATOR

By selecting **Scientific** from the drop down menu of the calculator icon, students can access the Scientific Calculator. The Scientific Calculator can be used to determine values of exponential, logarithmic, and trigonometric functions. It can also perform the operations of addition, subtraction, multiplication, and division. The Scientific Calculator also recognizes both positive and negative numbers. The picture below shows the buttons available on the first screen of the Scientific Calculator.



Unlike the Basic Calculator, the Scientific Calculator recognizes and applies the order of operations. For example, entering $2 + 3 \times 5$ ENTER would result with the Scientific Calculator reading "17." It also recognizes multiplication as a default for parenthesis.

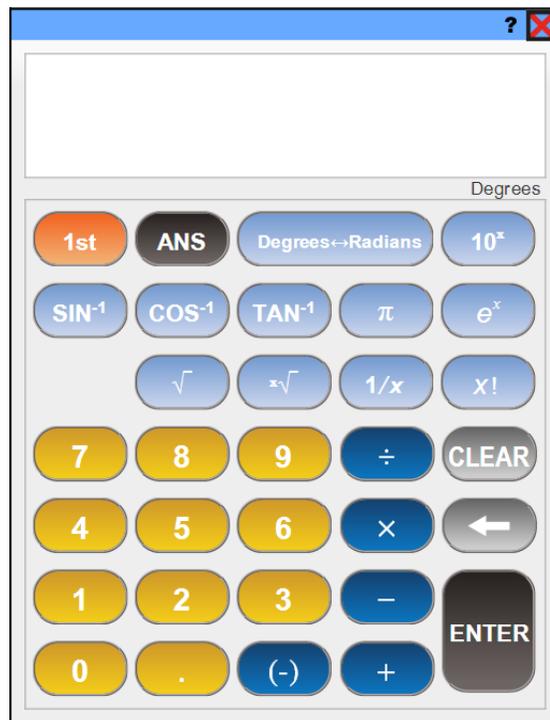
The screen on the Scientific Calculator allows for a 12-digit result display. If the absolute value of a result is between or equal to 10^{-11} and 10^{11} , it will not be displayed in scientific notation. Likewise, if the absolute value of a result is less than 10^{-11} or greater than 10^{11} , it will be displayed in scientific notation.

The square root, x root, factorial, trigonometric, and logarithmic functions will automatically show on the screen with an open parenthesis. The operation will be performed on the Scientific Calculator regardless if a closed parenthesis is included or not with the expression. For instance, entering LOG (100 ENTER would result with the Scientific Calculator displaying "2." The same result would appear on the screen if LOG (100) was also entered.



SCIENTIFIC CALCULATOR (CONTINUED)

The inverses of the trigonometric functions, the inverses of the exponential functions, the square root function, the x root function, and the factorial function are displayed on the second screen. By clicking the 2nd button on the Scientific Calculator, the new set of buttons will appear (other buttons will be removed) as shown below.



Students can return to the first or default screen by selecting the 1st button.

The table below gives the functions and keyboard shortcuts for the buttons on the Scientific Calculator.

Button	Keyboard Shortcut	Function	Availability on 1 st Screen	Availability on 2 nd Screen
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Enters digits 0 through 9	✓	✓
+	+	Adds	✓	✓
-	-	Subtracts	✓	✓
×	*	Multiplies	✓	✓
÷	/	Divides	✓	✓
.	.	Inserts decimal point	✓	✓
(-)	-	Inserts negative sign	✓	✓
ENTER	Enter	Performs previously entered operation(s)	✓	✓
←	Delete or Backspace	Deletes last digit, button, or keystroke entered	✓	✓



SCIENTIFIC CALCULATOR (CONTINUED)

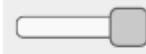
Button	Keyboard Shortcut	Function	Availability on 1 st Screen	Availability on 2 nd Screen
CLEAR	Alt and Delete	Resets calculator and clears memory	✓	✓
ANS		Enters final result of previous calculation; done automatically if an operator is entered before a number	✓	✓
1 st		Moves to first screen of buttons		✓
2 nd		Moves to second screen of buttons	✓	
(Shift and 9	Enters left or open parenthesis	✓	
)	Shift and 0	Enters right or closed parenthesis	✓	
π		Enters value for pi	✓	✓
\wedge	\wedge or Shift and 6	Raises a value to a power; to enter 3^4 , type $3\wedge 4$ and click Enter to get "81"	✓	
x^2	@ or Shift and 2	Squares the value entered; to enter 5^2 , type $5x^2$ and click Enter to get "25"	✓	
1/x		Calculates the multiplicative inverse or converts fraction 1/x to a decimal; to enter 1/8, type 8 1/x and click Enter to get "0.125"		✓
LOG		Enters the common logarithm notation	✓	
LN		Enters the natural logarithm notation	✓	
Degrees \leftrightarrow Radians		Switches mode from degrees to radians or vice versa; default setting is degrees; current mode setting of calculator is listed below lower-right corner of calculator screen	✓	✓
SIN		Enters the sine notation	✓	
COS		Enters the cosine notation	✓	
TAN		Enters the tangent notation	✓	
EE		Enters a value in scientific notation	✓	
$\sqrt{\quad}$		Enters the square root notation		✓
$\sqrt[x]{\quad}$		Enters the x root notation; to enter, $\sqrt[3]{125}$, type 3, click 2 nd , click $\sqrt[x]{\quad}$, type 125 and click Enter to get "5"		✓
x!	! or Shift and 1	Sets up a factorial expression		✓
e^x		Enters a base e exponential expression		✓
10^x		Enters a base 10 exponential expression		✓
SIN^{-1}		Enters the inverse of sine notation		✓
COS^{-1}		Enters the inverse of cosine notation		✓
TAN^{-1}		Enters the inverse of tangent notation		✓

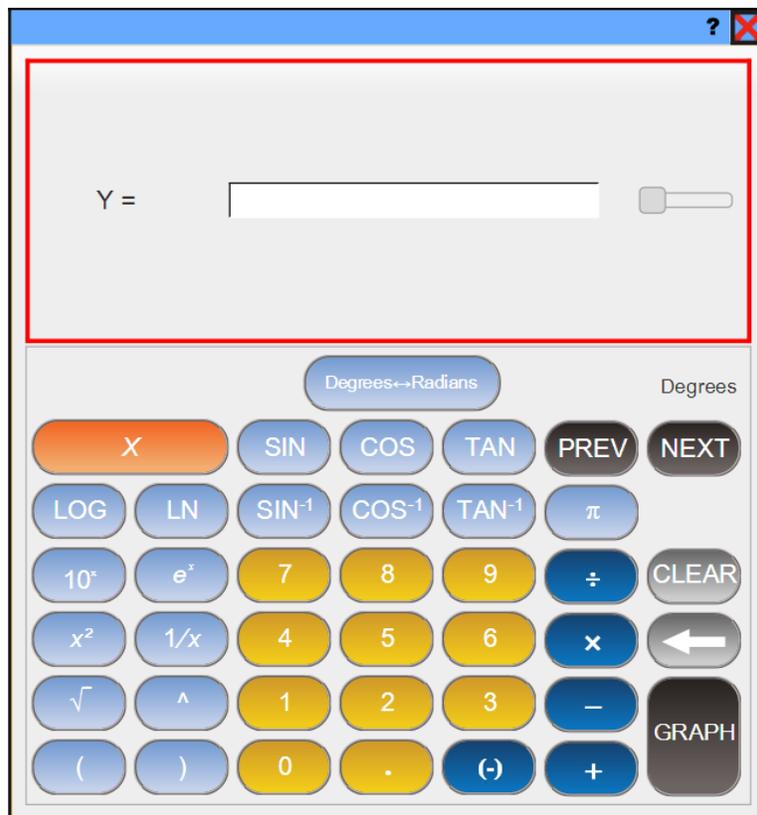


GRAPHING TOOL

Students can access the Graphing Tool by clicking the graph icon, , located in the toolbar at the top of the screen. The Graphing Tool is designed to graph equations where y is equal to a function of x . The Graphing Tool can be clicked and dragged around the screen. The Graphing Tool can also be removed from the screen by clicking the red X located in the upper right corner of the Graphing Tool. This will close the pop-up window for the Graphing Tool.

BUTTON FUNCTIONS

Mathematical functions can be entered in the box after "Y =". If a function with more than 25 characters is entered, the slider, , on the right will become active. Grab the square on the slider and drag it to move the entered text left or right on the screen. Each of these functions will be graphed on the second screen when clicking the GRAPH button. The buttons available on the first screen of the Graphing Tool are shown below.





BUTTON FUNCTIONS (CONTINUED)

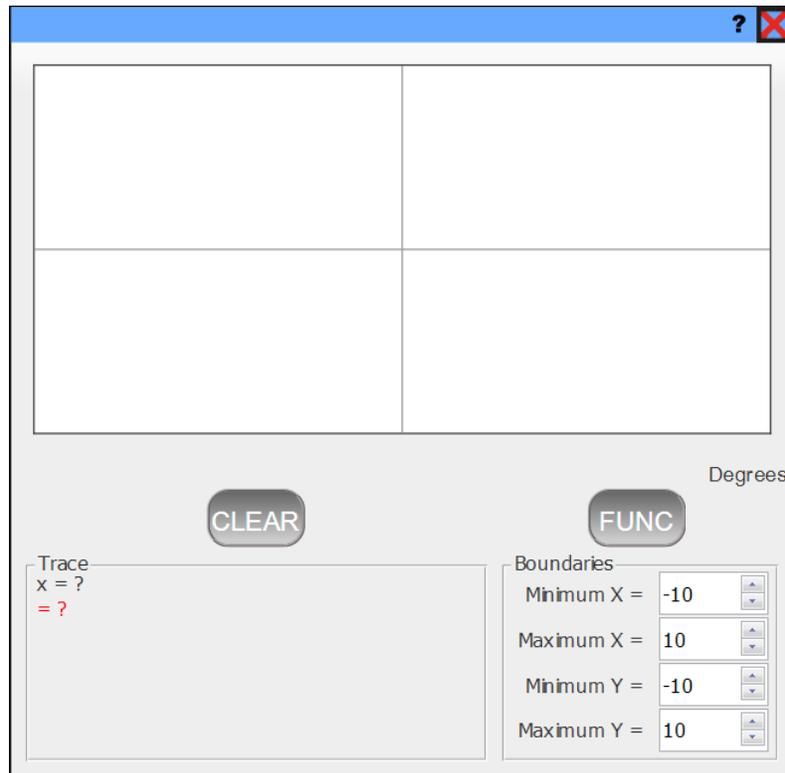
The table below gives the functions and keyboard shortcuts for the buttons on the Graphing Tool.

Button	Keyboard Shortcut	Function
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Enters digits 0 through 9
+	+	Adds
-	-	Subtracts
×	*	Multiplies
÷	/	Divides
.	.	Inserts decimal point
(-)	-	Inserts negative sign
X	x	Enters the independent variable, x
GRAPH		Changes to second window with graph of mathematical function(s)
↵	Delete or Backspace	Deletes last digit, button, or keystroke entered
CLEAR	Alt and Delete	Resets calculator and clears memory
PREV		Moves to previously entered math functions to be edited
NEXT		Allows new mathematical function to be entered or moves to mathematical function below to be edited; up to 6 mathematical functions can be entered at a time
π		Enters value for pi
(Shift and 9	Enters left or open parenthesis
)	Shift and 0	Enters right or closed parenthesis
√		Enters the square root notation
^	^ or Shift and 6	Raises a value to a power; to enter 3 ⁴ , type 3^4 and click Enter to get "81"
x ²	@ or Shift and 2	Squares the value entered; to enter 5 ² , type 5 x ² and click Enter to get "25"
1/x		Calculates the multiplicative inverse or converts fraction 1/x to a decimal; to enter 1/8, type 8 1/x and click Enter to get "0.125"
10 ^x		Enters a base 10 exponential expression
e ^x		Enters a base e exponential expression
LOG		Enters the common logarithm notation
LN		Enters the natural logarithm notation
SIN		Enters the sine notation
COS		Enters the cosine notation
TAN		Enters the tangent notation
SIN ⁻¹		Enters the inverse of sine notation
COS ⁻¹		Enters the inverse of cosine notation
TAN ⁻¹		Enters the inverse of tangent notation
Degrees↔Radians		Switches mode from degrees to radians or vice versa; default setting is degrees; current mode setting of calculator is listed below lower-right corner of equation screen and graph screen



GRAPHS

The graph screen of the Graphing Tool can be accessed by clicking the GRAPH button from the first screen. The second screen of the Graphing Tool has the default settings shown below.



The table below gives the functions for the buttons on the second screen of the Graphing Tool.

Button	Function
CLEAR	Returns to the first screen and clears the entry
FUNC	Returns to the first screen retaining the typed mathematical function(s)

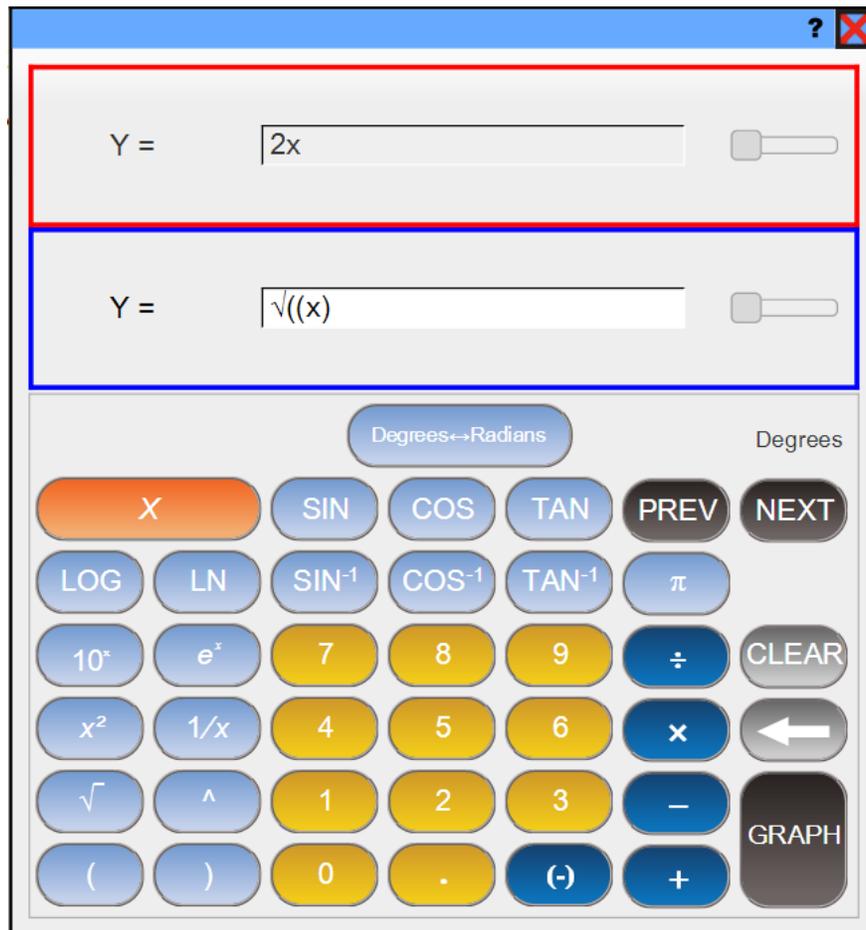
The size of the graph window can be adjusted by entering new values in the white boxes in the Boundaries column. Students can type or use the arrow buttons to change the values for the minimum x value, maximum x value, minimum y value, and maximum y value of the graph window.

A vertical dashed line will represent the location of the x value when dragging the arrow across the graph window. The x-coordinate for the vertical dashed line will appear to the right of "x =" in the Trace column. The corresponding y-coordinate of where the dashed line and the graphed line intersect will appear to the right of the "=" sign in the mathematical function typed below "x =".



GRAPHING MULTIPLE FUNCTIONS

Multiple mathematical functions can be entered on the first screen of the Graphing Tool by clicking on the NEXT button. Up to six mathematical separate functions can be graphed at once. Each new function will have an unique colored border as shown below.





GRAPHING MULTIPLE FUNCTIONS (CONTINUED)

The same color used for the border of the mathematical function entered on the first screen will be used for graphing the function on the second screen. Therefore, the multiple mathematical functions entered on the first screen will all appear each in a different color on the second screen in the graph window.

Also, the different values of the x variable and corresponding y values, noted in the Trace column, will be color coordinated with the mathematical functions entered on the first screen and graphed on the second screen. The picture below shows the second screen when multiple mathematical functions are graphed.

