Science, Technology, Engineering & Maths (STEM) Calculator Guide

Texas Instruments TI-Nspire CX Handheld (Operating System 4.4)

This short guide is designed to instruct you on how to set up your handheld to perform calculations that you will typically do in Science, Technology, Engineering and Maths. This guide will <u>not</u> attempt to explain the underlying Numerical or Mathematical concepts.

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Page 1 - Layout of the keypad, highlighting keys used in this guide.



Page 2 - The Document Settings Menu

The Document Settings Menu controls how the TI-Nspire displays answers to calculations.



You can **either** press **enter**, **or** you can click on the centre of the touchpad **(**, to make your setting choice.

This guide will demonstrate how several of these menu settings can be used to control how answers to calculations are displayed.

You can also access the Document Settings menu from within any Document or Scratchpad, <u>without</u> having to go back to the Home screen.

Simply use the touchpad to move the cursor arrow over the cog/battery icon in the top right corner.

Then click on the centre of the touchpad to select the icon, which will then open up the first pop-up menu.

Page 3 - Restoring the Document Settings to Factory Default Settings

It is often helpful to reset the general settings to avoid unexpected behaviour when starting a new calculation task.

This resetting action is called 'Restoring settings to factory default settings'.

Go to the Home screen by pressing 🚮 on	Document Settings
Press 5 to select Settings	Display Digits: Float 6
Press 2 to select Document Settings	Angle: Radian
Restan	Exponential Format: Normal
Select	Calculation Mode: Auto
	Vector Format: Rectangular
	? Restore Make Default OK Cancel
Salast or restore the acttings	Document Settings
Select is to restore the settings.	Display Digits: Float 6
	Restore Defaults
	Ex Restore settings to factory defaults?
	OK Cancel
	Vector Format: Rectangular
	? Restore Make Default OK Cancel
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Select Make Default Select to apply the restored settings.	Document Settings Display Digits: Float 6 Angle: Radian Exponential Format: Normal Real or Complex: Real Calculation Mode: Auto Vector Format: Rectangular Vector Format: Rectangular ? Restore Make Default OK Cancel Document Settings Display Digits: Float 6 Apply and Save as Default Apply your settings to open document and save them as default for new documents and
Select Make Default Select to apply the restored settings.	Document Settings Display Digits: Float 6 Angle: Radian Exponential Format: Normal Real or Complex: Real Calculation Mode: Auto Vector Format: Rectangular Vector Format: Rectangular ? Restore Make Default OK Cancel Ocument Settings Display Digits: Float 6 Apply and Save as Default Apply your settings to open document and save them as default for new documents and Scratchpad?
Select Make Default Select to apply the restored settings.	Document Settings Display Digits: Float 6 Angle: Radian Exponential Format: Normal Real or Complex: Real Calculation Mode: Auto Vector Format: Rectangular ? Restore Make Default OK Cancel OK Cancel

Page 4 - Using the TI-Nspire for Calculations with Factory Default Settings

Restore Factory Default Settings by first going to the Home screen by pressing from. Press 5 to select Settings Press 2 to select Document Settings

Select Restore and then it to Restore factory default settings.

ſ	Document Settings	
1	Display Digits:	Float 6
	Angle:	Radian
	Exponential Format:	Normal
	Real or Complex:	Real
	Calculation Mode:	Auto
	Vector Format:	Rectangular 🗅 💆
	? Restore Ma	ke Default

Notice that Calculation Mode is set to Auto

This means that the TI-Nspire will try and give answers exactly, without writing them as decimals.

Select Make Default and then OK.

Access the Scratchpad Calculator by pressing When you type 2 ÷ 3 and then press enter, the display should look like that shown ⇔ Notice that the answer is displayed as an exact fraction.	Image: Prode of the second	
Press ctri then enter. This selects ≈ and displays the last calculation's answer as a decimal approximation.	April Scratchpad ▼ RAD 1 2/3 2/3 3 3 3 3 3 3 1	
You can force the TI-Nspire to give a decimal answer straight away by simply including a decimal point somewhere in your calculation - even at the end of a number will do. For example, you could EITHER type in 2 . \div 3 which will display $\frac{2}{3}$ OR type in 2 \div 3. which will display $\frac{2}{3}$	All Scratchpad RAD 2 0.000007 3 0.666667 2 0.666667 3 0.666667	

Page 5 - Using the TI-Nspire in Normal Calculation Mode

We are taking 'Normal Calculation Mode' to mean here that the TI-Nspire will give answers to all calculations as decimal approximations, rather than exact values.

Go to the Home screen by pressing 🖓 👦	
Press 5 to select Settings	
Press 2 to select Document Settings	
Select Restore and then K to Restore factory default settings.	
For Display Digits select Float	
For Calculation Mode select Approximate	

Document Settings	<u>1</u>
Display Digits:	Float 🖻
Angle:	Radian 下
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Real or Complex:	Real
Calculation Mode:	Approximate
Vector Format:	Rectandular 📄 🖳
? Restore Ma	ke Default

Select Make Default and then OK.

These settings will display all answers as decimals, with up to 12 decimal places on show.

Access the Scratchpad Calculator by pressing 🔳.	//////////////////	RAD 🚛 🗙
When you type 2 ÷ 3 and then press enter, the display should look like that shown ⇔	2 3	0.666666666667
Notice that the displayed answer has been rounded to 12 decimal places.	I	
The TI-Nspire actually knows the answer to 14 digit accuracy, and it uses these extra known digits to round the answer correctly.		

Page 6 - Using the TI-Nspire in Fixed Decimal Place Mode



For Display Digits select Fix 3 (scroll down the list to below all the Float settings) For Calculation Mode select Approximate

Select Refault and then .

		Scratchpad 🗢	RAD 🚺 🗙
Access the Scratchpad Calculator by pressing 🔳.	1.2345		1.235
When you type 1.2345 and then press enter, the display should look like that shown ⇔			
Notice that the number has been rounded to 3 decimal places.			

Page 7 & 8 - Using the TI-Nspire in Scientific Notation Mode

Go to the Home screen by pressing and.	Document Settings
Press 5 to select Settings	Display Digits: Float
Press 2 to select Document Settings	Angle: Radian
	Real or Complex: Real
settings	Calculation Mode: Approximate
For Display Digits select Float	Vector Format: Rectangular
For Exponential Format select Scientific	? Restore Make Default OK Cancel
For Calculation Mode select Approximate	
Select \square and then \square .	
	🕼 👭 Scratchpad 🤝 🛛 RAD 🕼
Access the Scratchpad Calculator by pressing	12345 1.2345E4
When you type 12345 and then press enter, the display should look like that shown \Rightarrow	
Notice that the number has <u>not</u> been rounded, as the	
Float setting was chosen.	
If you wanted Scientific Notation to 3 decimal places,	1 Document Settings
press 🚮 on 5 2	Display Digits: Fix 3
For Display Digits select Fix 3	Angle: Radian
Select Make Default and then OK	Exponential Format: Scientific
	Calculation Mode: Approximate
	Vector Format: Rectangular
	? Restore Make Default OK Cancel
Access the Scratchpad Calculator by pressing	
When you type 12345 and then press enter the	12345 1.235E4
display should look like that shown ⇔	
Nation that the displayed requilt has been rounded to 2	
decimal places.	

If you wanted Scientific Notation to 3 <u>significant figures</u> places, press from 5 2 For Display Digits select Float 3 Select Make Default and then K.	Document Settings Display Digits: Angle: Radian Exponential Format: Scientific Real or Complex: Real Calculation Mode: Approximate Vector Format: Rectangular ? Restore Make Default OK	
Access the Scratchpad Calculator by pressing . When you type 12345 and then press enter, the display should look like that shown ⇒ Notice that the displayed result has been rounded to 3 significant figures.	Image: Scratchpad Control of the science RAD Image: Science RAD Image: Science Image: Science <th image:="" science<="" t<="" td=""></th>	
If you wanted to do the calculation (1.23 × 10 ⁴) ÷ (5.67 × 10 ⁻⁸) You would type: 1.23 EE 4 ÷ 5.67 EE (Image: scratchpad I	
Alternatively, you could enter the calculation using the fraction template. Type: ctrl ÷ 1.23 E 4 tab 5.67 E ← 8 to give a screen like that shown ⇒ and then press enter.	Image: Scratchpad RAD 1.23E4 5.67E-8	
The above results are displayed with 3 significant figures (Float 3) in Scientific mode. The same result in just Float mode would look like ⇔	Image: Scratchpad RAD 12300. 2.16931216931E11 5.67E-8	

Page 9 - Using the TI-Nspire in Engineering mode

Go to the Home screen by pressing diam.	Document Settings
Press 5 to select Settings	Display Digits: Float
Press 2 to select Document Settings	Angle: Radia
Select Restore and then to Restore factory default settings.	Exponential Format: Engin Real or Complex: Real Calculation Mode: Appro Vector Format: Recta
For Display Digits select Float	? Restore Make Defa
For Exponential Format select Engineering	
For Calculation Mode select Approximate	
Select Areautt and then .	
	 ☐
Access the Scratchpad Calculator by pressing 🔳.	12345
When you type 12345 and then press enter, the display should look like that shown ⇔	I
Notice that the number has <u>not</u> been rounded, as the Float setting was chosen.	



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12.345E3

Page 10 - Using the TI-Nspire in Degree Mode for Calculations



Page 10 - Using the TI-Nspire in Degree Mode for Drawing Graphs



Page 11 - Calculating Reciprocals

The 'reciprocal of a number' is a fraction formed by putting the number in the denominator of a fraction.

Go to the Home screen by pressing and on.	Document Settings
Press 5 to select Settings	Display Digits: Float
Press 2 to select Document Settings	Angle: Radian
Restore OK	Exponential Format: Normal
Select and then to Restore factory default	Calculation Mode: Auto
settings.	Vector Format: Rectangular
For Display Digits select Float	? Restore Make Default OK Cancel
Select Make Default and then .	
Access the Scratchpad Calculator by pressing	🕼 👭 Scratchpad 🤝 🛛 RAD 🕼 🔊
To calculate the reciprocal of 123	_11
FITHER type in the filter of the second seco	123 123
123	123 ⁻¹
OR type in 123 $(-)$ 1 to display 123^{-1}	123
OR type in 1 ÷ 123 to display 1/123	1/123
and then press enter.	
You can convert the answer from a fraction to a decimal, by doing the following	1 0.008130081301
EITHER press [ctrl] then [enter]	
This selects ≈ and displays a decimal approximation.	
	¶x 1: Actions ►
	[¶] x 1: Actions ¹ z* ⁵ 2: Number ¹ z - Si: Algebra 2: Approximate to Fraction
OR Press menu	I: Actions I: Convert to Decimal 1/2+5 2: Number 1: Convert to Decimal 1/2=3: Algebra 2: Approximate to Fraction 1/6) 4: Calculus 3: Factor
OR Press menu Press 2 to select Number	¹ / ₂ ×5 ¹ / ₂ : S ¹ / ₂ ×5 ¹ / ₂ : Convert to Decimal ¹ / ₂ ×5 ¹ / ₂ : Convert to Decimal ¹ / ₂ ×5 ² / ₂ : Number ¹ / ₂ : Convert to Decimal ¹ / ₂ ×5 ² / ₂ : Algebra ² / ₂ : Approximate to Fraction ¹ / ₂ ×5 ² / ₂ : Algebra ² / ₂ : Approximate to Fraction ¹ / ₂ ×5 ² / ₂ : Convert to Decimal ¹ / ₂ ×5 ² / ₂ : Algebra ² / ₂ : Approximate to Fraction ¹ / ₂ ×5 ² / ₂ : Convert to Decimal ¹ / ₂ ×5 ¹ / ₂ ×5 ¹ / ₂ ×5 ¹ / ₂ ×5 ¹ / ₂ ×5
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OR Press menu Press 2 to select Number Press 1 to select Convert to Decimal	[¶] x 1: Actions [№] x 5: 2: Number [№] x 6: Calculus [№] x 6: Statistics [∞] x 7: Fraction Tools <t< td=""></t<>
OR Press menu Press 2 to select Number Press 1 to select Convert to Decimal	I: Actions I: Convert to Decimal I: Source I: Source I: Source<
OR Press menu Press ⊇ to select Number Press 1 to select Convert to Decimal This should give a screen as shown ⇔	1: Actions Image: Convert to Decimal 1: Source to Decimal 1: Convert to Decimal 1: X= 3: Algebra 2: Approximate to Fraction 1: K 3: Factor 1: Source to Decimal 3: Factor 1: K 3: Factor 1: Source to Decimal 3: Factor 1: Source to Dec
OR Press menu Press 2 to select Number Press 1 to select Convert to Decimal This should give a screen as shown ⇔	1: Actions Image: Convert to Decimal 1: S 2: Approximate to Fraction 1: Convert to Decimal 3: Factor 1: Calculus 3: Factor 5: Probability 4: Least Common Multiple 5: Geatest Common Divisor 5: Greatest Common Divisor 1: 7: Matrix & V 6: Remainder 5: 8: Finance 7: Fraction Tools 1: 123 9: Complex Number Tools 1: 123 1: 123
OR Press menu Press ⊇ to select Number Press 1 to select Convert to Decimal This should give a screen as shown ⇔ Press enter to convert the fraction to its decimal.	1: Actions Image: Convert to Decimal 1: Solution 2: Approximate to Fraction 1: Convert to Decimal 3: Factor 1: Actions 2: Approximate to Fraction 1: Actions 3: Factor 1: Convert to Decimal 3: Factor 1: Actions 3: Factor 1: Solution 3: Factor 1: Solution 3: Factor 1: Solution 5: Greatest Common Multiple 1: Convert to Decimal 5: Greatest Common Divisor 1: 7: Matrix & V 6: Remainder 1: 23 7: Fraction Tools 1: 23 9: Complex Number Tools 1: 123 1: 123 1: 123 1: 123 1: 123 1: 123 1: 123 1: 123 1: 123 1: 123
OR Press menu Press 2 to select Number Press 1 to select Convert to Decimal This should give a screen as shown ⇒ Press enter to convert the fraction to its decimal.	1: Actions Image: Convert to Decimal 2×5 2: Number 1: Convert to Decimal x= 3: Algebra 2: Approximate to Fraction f(A 4: Calculus 3: Factor Image: S : Probability 4: Least Common Multiple Image: S : Probability 5: Greatest Common Divisor f(B) 7: Matrix & V 6: Remainder Image: S : Finance 7: Fraction Tools 123 9: Complex Number Tools 9: Complex Number Tools 1 123 123 Image: S : Decimal Image: S : S : S : S : S : S : S : S : S : S
OR Press menu Press 2 to select Number Press 1 to select Convert to Decimal This should give a screen as shown ⇒ Press enter to convert the fraction to its decimal. Notice that the number has not been rounded, as the Eloat setting is currently chosen	1: Actions It Convert to Decimal 1: Source 2: Approximate to Fraction 1: Algebra 2: Approximate to Fraction 1: Actions 3: Factor 1: Convert to Decimal 3: Factor 1: Convert to Convert to Decimal 5: Greatest Common Multiple 1: Convert to Convert to Cols 5: Greatest Common Divisor 1: Convert to Cols 6: Remainder 1: Convert to Cols 8: Number Tools 1: Convert to Complex Number Tools 9: Complex Number Tools 1: Convert to Decimal 1 1: Convert to Decimal 1 1: Convert to Decimal 1 1: Convert to Decimal 0: 008130081301 1: Convert to Decimal 0: 008130081301

Page 12 - Converting numbers between Decimal and Binary.

Go to the Home screen by pressing and.	Document Settings
Press 5 to select Settings	Apply and Save as Default
Press 2 to select Document Settings	Apply your settings to open document and save
Select Restore and K to restore the settings. Select Make Default and then K.	them as default for new documents and Scratchpad?
To convert the decimal number 123 to binary, first access the Scratchpad Calculator by pressing	1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1
Select Base2 by pressing enter	Integer ▶Base2
Press enter again to complete the conversion. Notice the binary number is prefixed by 0b	Base2 Ob1111011
[the number zero and the letter b]	
To convert the binary number 11011 to decimal, type: OB11011enter As the handheld is already in decimal mode, it will display the decimal equivalent to binary 11011.	Image: Scratchpad RAD Image: Oblight of the second seco