ClassPad 101

for ClassPad Version 3.00+

LESSON 14

Introduction to NumSolve and Probability

Welcome

The ClassPad has two forms of memory. One is called *flash memory* and the other is called *MCS* which stands for *memory control system*. In this lesson, you will learn more about each memory area and how variables are stored. You will also learn how to use a simple application called NumSolve to solve equations and another simple application called Probability.

Lesson Goals

- To understand the meaning of global variables
- To understand the meaning of local variables
- To be able to access a variable using a path

In Lesson 14, you will learn how to:

- Store variables
- Delete variables
- Access variables from within other applications
- Input an equation with several variables
- Place lower and upper limits on variables

Upon completion of this lesson, you will be able to answer the following questions:

1. What application uses flash memory?
2. Name two applications that can use a variable defined in the Main application.
3. What happens when we define a variable in Main and then use the same variable name in NumSolve?
4. How many unknowns can NumSolve solve for at one time?
5. What do the lower and upper limits do in NumSolve?

Time required

About 50 minutes.

Getting Started

Before talking too much about memory, we will work with variables and try to develop a general understanding. So, let's get started.

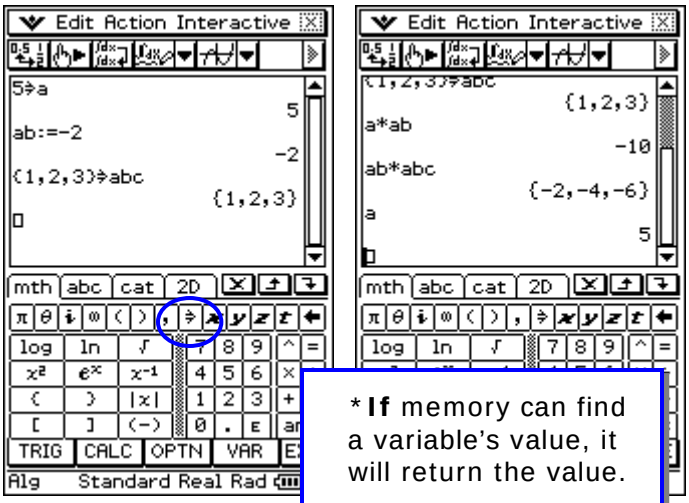
PART I

In this part, we will store a few values in variables and see what happens.

1. Storing and Accessing Variables

We have two ways to store values in variables on the ClassPad.

a. Open M and clear the window (if needed)
b. Store **5** in **a** using **S**
c. Store **-2** in **ab** using **:=**
d. Store **{1,2,3}** in **abc** using either **S** or :=
e. Type in **a*ab** and press **EXE**
f. Type in **ab*abc** and press **EXE**
g. Type in just **a** and press **EXE**

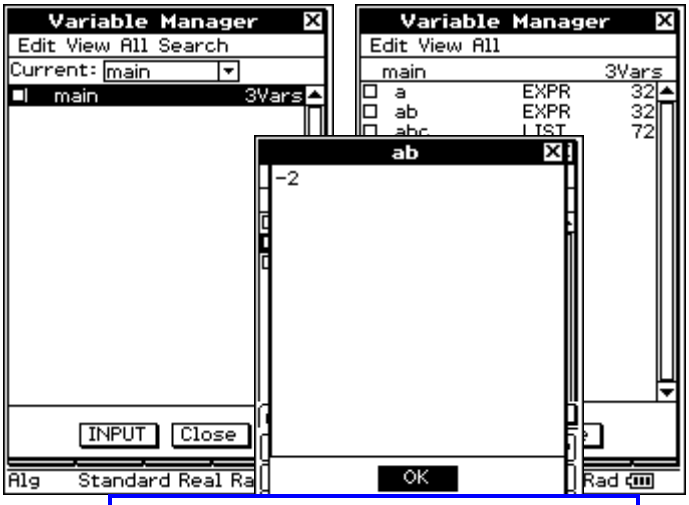


*If memory can find a variable's value, it will return the value.

2. Viewing Variables in the Variable Manager

The ClassPad has a very useful dialog called the *Variable Manager*. This dialog lets you see which variables you have defined.

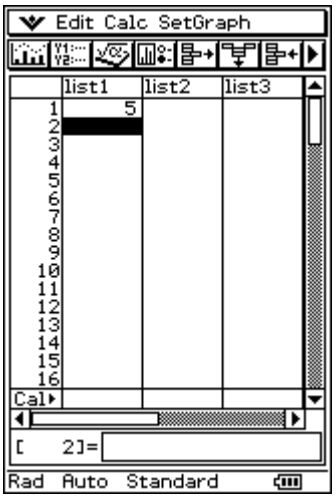
a. To open the ⮟ **menu** and select **Variable Manager**
b. When we define a variable, it is stored in the **current folder** (unless we tell it otherwise)
c. To see the variables defined in the ***main folder*** **double click** on **main**
d. To see what is **stored** inside a variable, **double click** on it's **name**
e. To **delete a variable**, **check** its box and select **Edit / Delete**

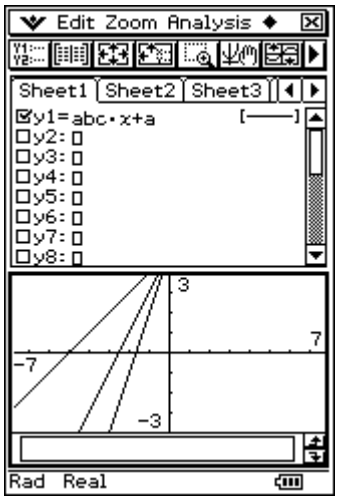


From *any* application, you can open the Variable Manager by selecting: ⮟ **menu / Variable Manager**
"⮟" is called the *System menu*

3. Accessing Variables from Other Applications

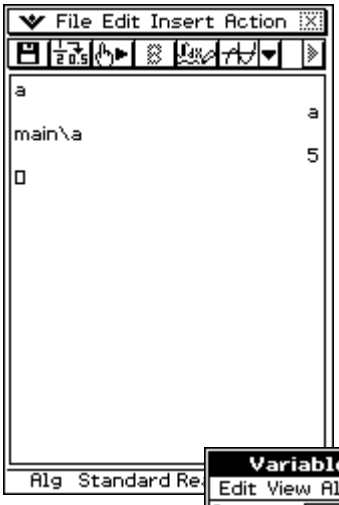
a. Return to the **main launcher** and open **Statistics**
b. Input **a** and press **EXE**
c. Return to the **main launcher** and open **Graph&Table**
d. Input **y1=abc*x+a** and press **EXE**
e. Graph **y1**
f. This is great! **Memory knows** the variables we defined in the **Main** app

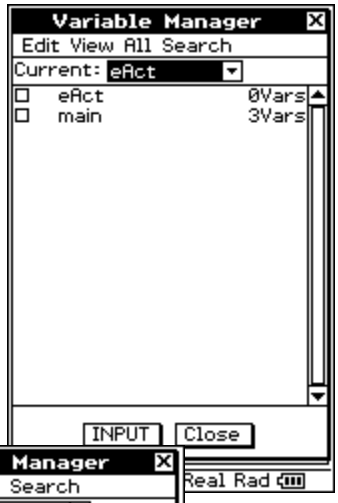


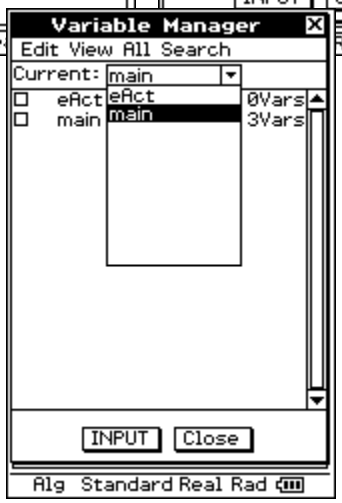


4. Accessing Variables from within the Unique eActivity

a. Return to the **main launcher** and open **eActivity**
b. Clear the window
c. **Change** to a **math line** and input **a**
d. Memory does not know what **a** is!
e. Input **main\a** to let memory know where to look and press **EXE**
f. Open the **menu** and select **Variable Manager**
g. eActivity is unique; it's **current folder** is **eAct** instead of main
h. We could change this eActivities current folder to main if we wanted to (but we do not want to)

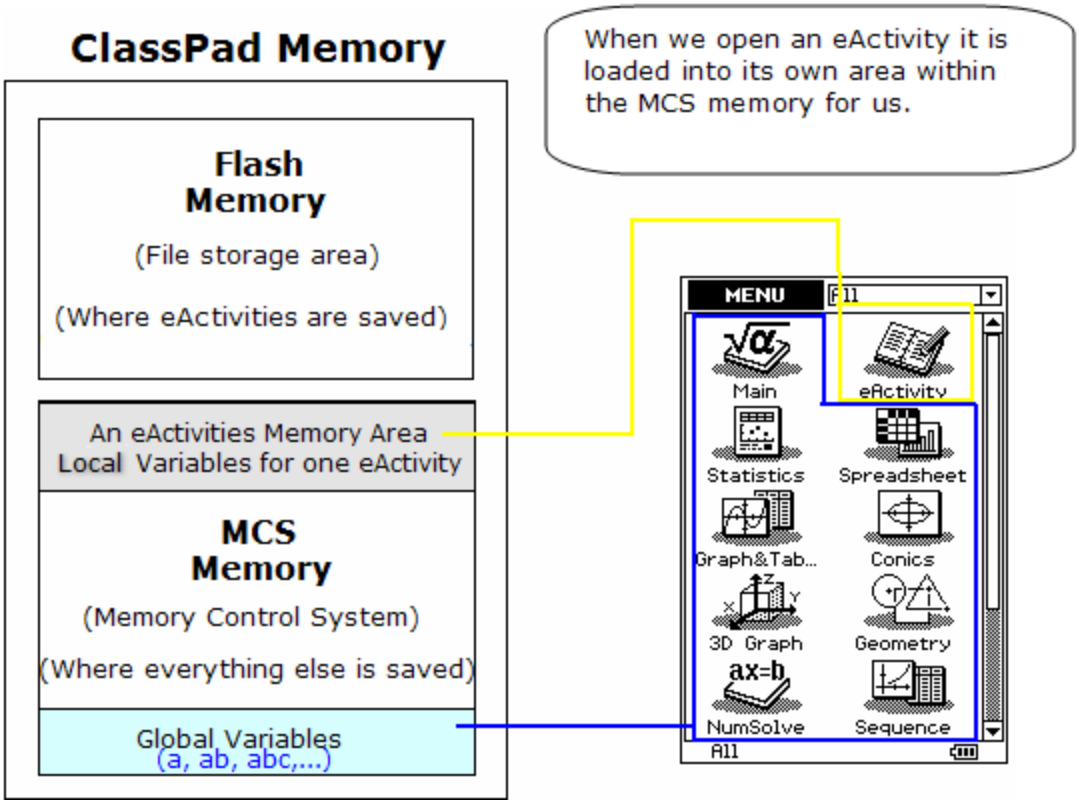






Very Helpful Warning:
Do not delete the variables you have defined (yet). We will use them in the exercises for Part I.

My hope is that this diagram will give you a general understanding of the ClassPad's memory management.



What I am trying to say is:

- All applications EXCEPT eActivity share variables. The variables are called "**global**" because everyone can see them.

- Each eActivity you open has its own memory space for storing variables. When you define a variable in eActivity, only that eActivity can see it. This is why we call variables in an eActivity "**local variables**".

- We can use global variables in an eActivity by changing the **current folder** or inputting something like **main\a**. The "**main**" part is called a path to the variable.

- As you know, within a vcp file eActivities are saved in the eActivities folder. All other application data is stored in the Other Data folder.

- One more interesting note. When we open an eActivity it is loaded into its own area of mcs memory so that we can work with it. When we save an eActivity it is saved back into the flash memory area.

PART I
Practice Exercises

Before beginning the practice exercises, open a word document, type in the following information and then *save it as Lesson14 in your CASIO folder within My Documents*:

- Date: (enter today's date)
- To: (put your instructor's name here)
- From: (put your name here)
- Re: Lesson 14

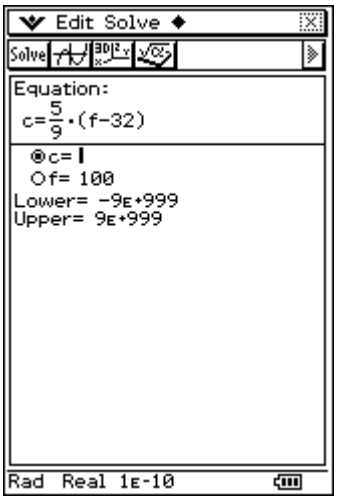
1. Open the **Main** application and **store** a **2x2 matrix** in the letter **M**. Hint: Open the soft keyboard and look in the 2D pages.
2. Open **Geometry** and draw a figure (anything).
3. **Save** the Geometry file with a name for **Drawing**.
4. Open **Spreadsheet** and input some data (anything).
5. **Save** the Spreadsheet file with the name **Data**.
6. **Open** the **Variable Manager** and double click on the **main folder**.
7. With the **Variable Manager** open and **the variables you saved showing**, get a **screen capture**. Paste it into your Lesson14 document (under a title of PART I).
8. Notice the different types of data. This is because you saved different types of data!
9. Check the ab, abc and Data variables and then delete them. Hint: Edit/Delete.
10. With the other variables showing, get a **screen capture.** Add two blank spaces following the first screen capture and then paste this one.
11. Close the **Variable Manager** dialog.
12. Open the **eActivity** application and clear the window.
13. Display the contents of variable **M** by inputting **main\M**. Remember to change to a Math line first!
14. With the contents of variable **M** showing, get a **screen capture.** Add two blank spaces following the last screen capture and then paste this one.
15. There is an easy way to clear the contents of all variables. Open either the Main or eActivity application and select **Edit/Clear All Variables** whenever you want to clear all variables!

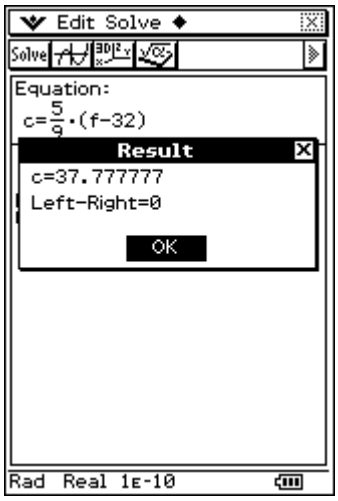
PART II

In this part, you will learn how to use the NumSolve application. NumSolve is a very simple application that can be used to solve most literal equations for one unknown.

1. Converting from Fahrenheit to Celsius

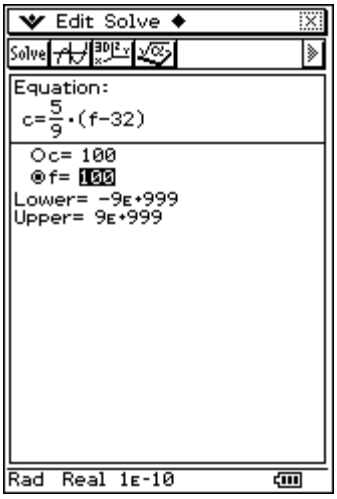
a. Click m and then N
b. **Type** in **c=5/9(f-32)**
c. Press **EXE**
d. Type in **100** for **f**
e. **Click** the 1 button
f. Click **OK**
g. **Note: NumSolve** solves for the variable with the selected radio button

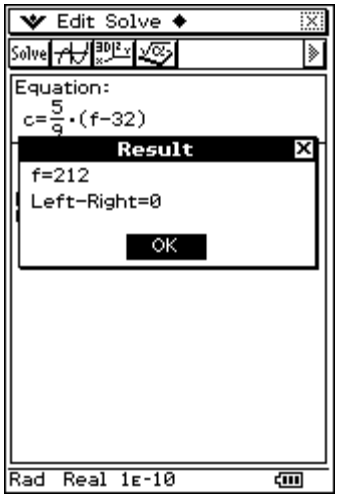




2. Converting from Celsius to Fahrenheit

a. **Change c** to **c=100**
b. **Select** the **radio button** in front of **f**
c. **Click** the 1 button
d. Click **Ok**
e. So, 100 degrees Celsius is the same as 212 degrees Fahrenheit



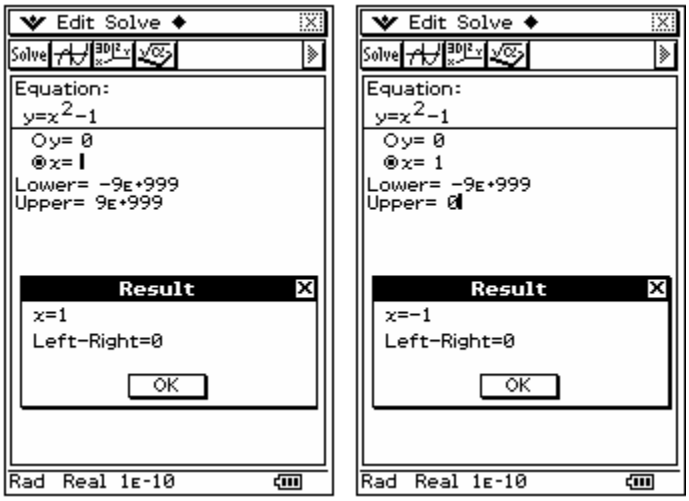


Simple, isn't it? Well, there is one more feature to discuss: The use of the **Lower** and **Upper** values.

NumSolve returns **only one solution** each time you click **Solve**. What if there are two solutions? For example, y = x^2-1 has two solutions when y=0. Namely, x=1 and x=-1.

3. Using NumSolve to Find More Than One Solution

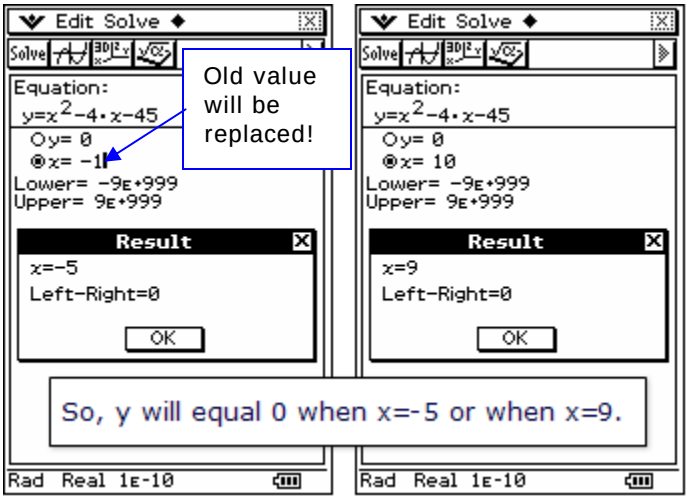
a. Select **Edit/Clear All**
b. Type in **y=x^2-1** and press **EXE**
c. Type in **0** for **y**
d. **Select** the **radio button** in front of ***x***
e. **Click** the 1 button
f. Click **OK**
g. Click on the **Upper** limit value and change it to **0**
h. **Click** the 1 button
i. Click **OK**



4. Another Way to Find More Than One Solution

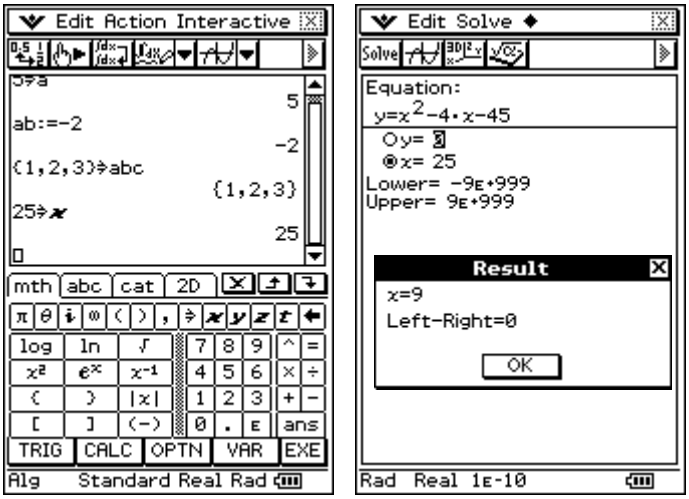
When we guess a solution, NumSolve will return the solution that is closest to our guess.

a. Select **Edit/Clear All**
b. Type in **y=x^2-4x-45** and press **EXE**
c. Set **y=0** (if needed)
d. **Select** the **radio button** in front of **x**
e. **Click** the 1 button
f. Click **OK**
g. Change **x** to **10** (we are "guessing" another solution)
h. **Click** 1 and then **OK**



5. Global Variables Can Be Overwritten

a. Open **Main** and **store 25 in x**
b. Open **NumSolve** (notice our **x-value** was changed to **25**)
c. **Select** the **radio button** in front of **x**
d. **Click** 1 and then **OK**
e. Open **Main** again
f. Input **x** and press **EXE**
g. Notice **x** is now **9** in Main; **x** is a global variable!



PART II
Practice Exercises

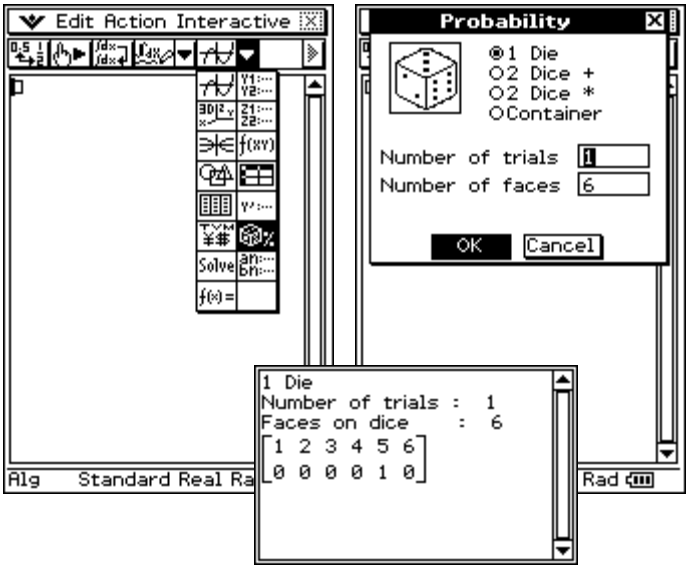
1. Please open the NumSolve application.
2. One of the most useful formulas in Physics is *Force=Mass* **x** *Acceleration*, or **F=MA**.
3. Enter the equation **F=M*A** into NumSolve and press **EXE**.
4. Input a value of **9.8** for **A**, **45.9** for **M** and solve for **F**.
5. After clicking **Solve**, get a **screen capture**. Paste it into your Lesson14 document (under a title of PART II).
6. Change **M** to **your weight or a friend's weight divided 2.2**. For example, M=137/2.2. **Solve** for **F** again. F is your weight in Newtons, or the force you or your friend are exerting on the earth!
7. With your new force showing, get a **screen capture.** Add two blank spaces following the first screen capture and then paste this one.
8. This time, assume we know the force being exerted is 350 Newtons. What is the mass of the object exerting this force?
9. With the new mass (**M**) showing, get a **screen capture.** Add two blank spaces following the second screen capture and then paste this one.

PART III

In this part, you will learn how to use the Probability application. Probability is another very simple application that can be used to roll dice in multiple ways and generate data quickly.

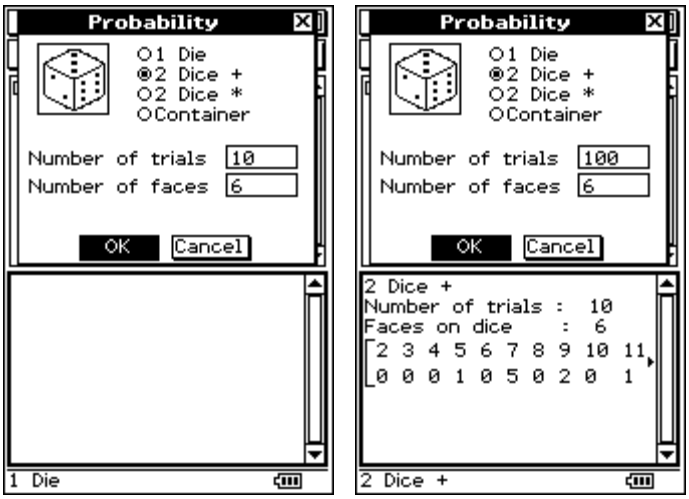
1. Finding Probability

a. Click m and then M
b. Clear Main (if needed)
c. Click on the 2nd n
d. Select
e. Click **OK**
f. The Probability application is only available from within Main or eActivity.



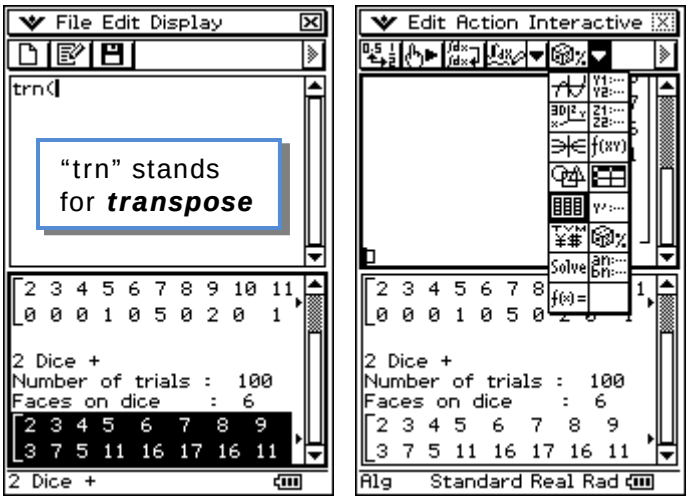
2. Exploring Probability

a. **Click** to begin a new roll **and** clear the old one
b. Click **Ok** to Clear All
c. Select **2 Dice +**
d. **Set** Number of trials to **10**
e. Click **Ok**
f. **Click** to begin a new roll **without clearing** the previous roll
g. Select **2 Dice +**
h. **Set** Number of trials to **100**
i. Click **Ok**



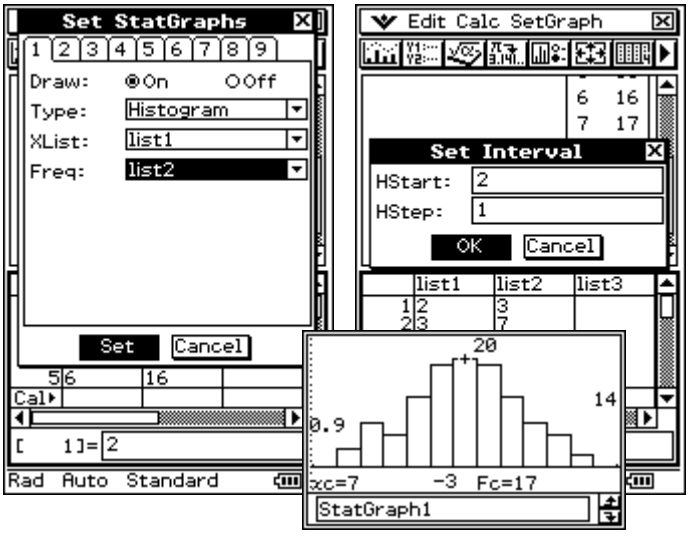
3. Viewing the Data Generated by Rolling Dice Graphically

a. Click in Main and type in **trn(**
b. **Select** the matrix resulting from rolling the dice 100 times and let go
c. Press on selection, and then drag and drop following **trn(**
d. Press **EXE**
e. We need the List Editor window!
f. Click the 2nd n
g. Select (



4. Step 3 Continued…

a. **Select** the output matrix in Main and let go
b. **Drag and drop** into the List Editor window
c. **Click** the G button
d. Set **Type** to **Histogram**
e. Set **XList** to **list1**
f. Set **Freq** to **list2**
g. Click **Set**
h. Click y to graph
i. Set **HStep** to **1**
j. Click **OK**
k. **Trace** to the highest bar



PART III
Practice Exercises

1. Please begin by opening the Main application and clearing the window. Thank you!
2. Open the Probability application.
3. Turn the radio button on for **2 Dice *.**
4. Set the **Number of trials** to **10** and **Number of faces** to **3**.
5. Click **OK**.
6. Without clearing the window, roll the dice again using type **2 Dice *** and **3 faces** again but change **Number of trials** to **100**.
7. **Resize** the Probability window so that both rolls show.
8. With both rolls showing, get a **screen capture**. Paste it into your Lesson14 document (under a title of PART III).
9. **Resize** the window again so that the Main window shows.
10. In Main, type in **trn(** and then drag the matrix from the second roll up (with 100 trials).
11. Press **EXE**.
12. From within Main, open the List Editor.
13. Select your turned matrix and drag it into the List Editor.
14. With Main and the List Editor windows showing, get a **screen capture.** Add two blank spaces following the first screen capture and then paste this one.
15. Draw a histogram for your data using an **HStep** of **1**.
16. With the histogram showing, get a **screen capture.** Add two blank spaces following the last screen capture and then paste this one.

PART IV

Reflection Exercises

You have just completed the fourteenth lesson in ClassPad 101. In the next lesson we will begin programming and will use MCS memory again. Please take a few moments to copy and paste the following four questions at the end of your Lesson14 document and answer them.

1. Approximately how long did it take you to complete this lesson?
2. Which activity did you find particularly useful?
3. Did you find any part of this activity difficult to follow? If so, which part? Also, how did you overcome the difficulty?

Assessment 14: Introduction to NumSolve and Probability

- **Checkpoint**: Your word processed document, titled "Lesson14", should contain the following activities:
  1. Three screen captures from PART I.
  2. Three screen captures from PART II.
  3. Three screen captures from PART III.
  4. Three reflection questions with answers from PART III.

- **Submit** your **Lesson14 document** to your instructor for grading. Once your lesson is submitted, your lesson for ClassPad 101 “Intro to NumSolve and Probability” is complete.

