

Opening Activity

Concepts

- Introduction to TI Navigator™
- Basic functionality of the NavNet App on the calculator

Materials

- TI-84 Plus
- TI-Navigator system

Overview

Participants will experience TI-Navigator™ from a student's perspective.

Using the Calculator

1. Press the **[ON]** button located on the bottom left of the calculator.
2. Press the **[APPS]** button.
3. Move down to NavNet (or **[ALPHA]** N). See Figure 1.
4. Press **[ENTER]** to open NavNet. See Figure 2.
5. Sign in using the user name and password given you by the instructor. You will now be at the TI-Navigator Home screen. See Figure 3.
 - The name may be as few as 3 characters but cannot exceed 32 characters.
 - By default, the calculator is in ALPHA mode. The letters are in green above the keys.

Introduction to Quick Poll

1. Your instructor will ask you a series of questions. Answer each question by moving your cursor to your choice and pressing the **[Y=]** button. (“SEND” soft key)
2. Sample questions:
 - Have you ever seen the TI-Navigator before? (Yes/No)
 - I'm excited about seeing what TI-Navigator has to offer for my classroom. (Agree/Disagree) {verbal}
 - The use of technology is welcomed in my classroom. (True/False)
 - I use technology in the classroom (Always/Sometimes/Never)
 - On a scale of 1-5, with 1 being the lowest, indicate your comfort level with using the computer. Use A for 1, up to E for 5. (Multiple Choice A through E) {verbal}



Figure 1



Figure 2



Figure 3

- How many years have you been teaching? (Open Response)

Introduction to Screen Capture

1. Exit NavNet by pressing the “QUIT” soft key (**GRAPH** button).
2. Clear the Home screen by pressing the **CLEAR** button.
3. Your instructor will ask you a series of questions. Answer each question by typing your answer on the Home screen. Clear the Home screen after each answer.
4. Sample questions:
 - Simplify the expression: $(x-5)^2$.
 - Graph your favorite equation.
 - Display the window settings for your graph.
 - Press the following key sequence on your calculator. **2nd** **+** **2**.

Introduction to Activity Center

1. Go back to NavNet (**APPS**), select NavNet). Notice that you don't have to log in again. During any class session, you only have to log in once.
2. Select 1:Activity Center from the TI-Navigator Home screen. See Figure 3.
3. Play “Catch Me If You Can”.
 - The instructor will have a green cursor while each student will have a white cursor.
 - Chase the instructor's cursor until you “catch” it.
 - After a while, the instructor will change each cursor to a unique shape and color. Can you identify yourself?
4. Play “Guess My Rule”.
 - The instructor will ask you to contribute 3 points that follow a mathematical rule.
 - To contribute each point, press the “MARK” soft key.
 - After the instructor re-configures the activity, you will be asked to contribute an equation to fit the points on the screen.
 - To submit your equation, type it after the “y=” prompt and press the “SEND” soft key.

Launch Pad Question

Quick Poll: I'm ready to begin setting up my own Navigator Classroom. (Agree/Disagree)

Setting Up The Navigator Classroom

Concepts

- Setting up a TI-Navigator™ classroom

Materials

- TI-Navigator software.

Overview

Participants will add a class and populate that class with a sample student roster. They will also use other tools for managing a class.

Adding Classes

1. Begin the TI-Navigator software on the computer by double-clicking the TI-Navigator icon on the desktop. See Figure 1.
2. Select the Add Class icon from the tool bar (see Figure 2) or select Add Class from the File menu.
3. For each class enter the name of the class and press the Add Class button. When you have entered your last class, press the Finish button. We will create one class for this institute which we will call “Practice Class”.

Adding Students

1. Choose the student’s class from the pull down menu under Current Class. See Figure 3.
2. Select the Add Student icon from the Classroom Tab or select Add Student from the Class menu. See Figure 4.
3. For each student enter the student’s first name, last name, and user name. The user name must be globally unique for the entire TI-Navigator software.
4. For this institute, we will use the following students:
 - Jon, Smith, Jon
 - Deb, Jones, Deb
 - Marco, Polo, Marco
 - Sonja, Perez, Sonja
 - Raymone, Tyson, Raymone



Figure 1

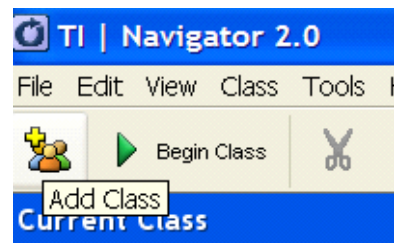


Figure 2



Figure 3

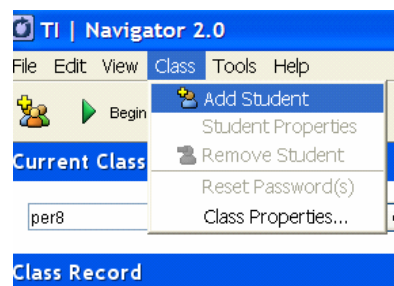


Figure 4

5. You may choose a password for each student, or each student may choose their own when they log in to NavNet for the first time. This will then be the student's password unless the teacher chooses to reset it.
6. The display name is seen only by the teacher in the Seating Chart view of the classroom. By default it is the student's first name. You may choose to give any student a different display name.
7. The Student ID is optional.
8. The Assign Classes button allows the teacher to add the student to other Navigator classrooms.

Viewing Classes in Seating Chart View Versus Student List View

1. There are two ways to view the students in a classroom: Seating Chart and Student List.
2. You may toggle between these two views by selecting the appropriate view under the View button. See Figure 5.
3. Under the Seating Chart view you can rearrange the students to reflect their seating arrangement in the classroom.
4. Under the Student List view, you can organize the students alphabetically by any attribute by clicking the title cell of a column.

Teacher Preferences

1. Teacher preferences are used to set the user name and password for the teacher to log in using a calculator.
2. Logging in as the teacher allows access to key features of TI-Navigator from the calculator, such as Quick Poll, File Transfer, and Activity Center.
3. To set up teacher preferences, select the Teacher Preferences icon from the tool bar or Teacher Preferences under the Tools menu. See Figure 6.
4. Specify a username and password. For this institute use Teacher for the Username and AAA for the Password. See Figure 7.
5. Click OK.

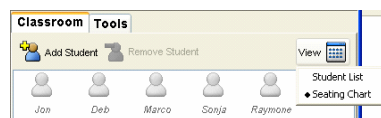


Figure 5



Figure 6

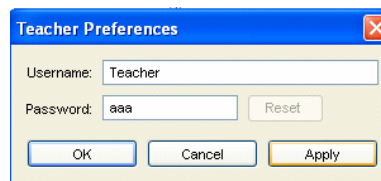


Figure 7

Resetting Passwords

- For any reason a teacher may choose to reset passwords for any number of students. You may not change the password of any student who is currently logged on to the network.
- Select any students whose passwords you want to reset. You may hold down the “Ctrl” button on the keyboard to select any number of nonconsecutive students or the “Shift” button to select any number of consecutive students.
- Select Reset Password(s) from the Class menu. See Figure 8.
- The students will choose their new password the next time they log on to the network.
- If you want to specify passwords for the students, you must do so when you first add a student, or you may specify passwords one at a time after the class has been set up. Double-click a student or select a student and choose Properties from the Edit menu to set the password.
- Click the Reset button.
- Either allow the student to choose their password the next time they log in or specify a password. See Figure 9.

Removing a Class or Student

- Removing a class:
 - From the pull down menu under Current Class select the class you want to remove.
 - Choose Remove Class from the File menu.
 - Confirm that the correct class is going to be removed and click the Remove button. See Figure 10.
- Removing a student:
 - From either the Seating Chart view or the Student List view, select the student you want to remove.
 - Click on the Remove Student icon or select Remove Student from the class menu. See Figure 11.
 - The student is removed from the class. The icon will be removed when you change classes and come back to this class or when you restart TI-Navigator.



Figure 8

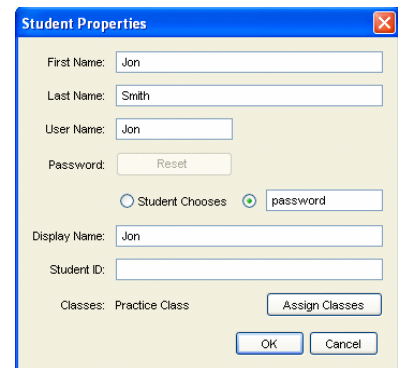


Figure 9

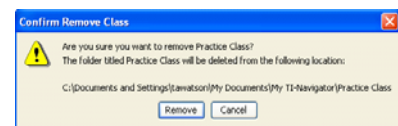


Figure 10

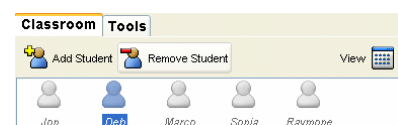


Figure 11

Dual-Enrollment or Moving a Student to a Different Class

1. Double-click the student you wish to move or dual-enroll (or you may select the student and choose Properties from the Edit menu.)
2. Select the Assign Classes button. See Figure 12.
3. Use the check boxes to mark the class or classes you want the student to be assigned to. Uncheck any class you do not want the student to be enrolled in.

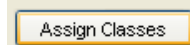


Figure 12

Importing a Class Roster To a New Class (optional)

1. An alternative to adding a class and adding students individually within the TI-Navigator software is creating a text file containing at least the following necessary fields: First Name, Last Name, and User Name.
Notes:
-students must be imported when the class is first created.
-you cannot import students to an existing class.
2. Open Notepad or any other text editor. The file must be set up as follows:
 - At minimum line 1 of the file must have all of the following text typed exactly: First Name, Last Name, User Name (spaces after commas are optional.)
 - All other student property fields are optional, but if used, they must be typed on Line 1 separated by commas.
 - On each successive line, type the student properties chosen in the steps above separated by commas (e.g. Jack, Smith, Jack). Each student must be in a new line. See Figure 13.
 - Save the file as a text file (txt file extension).
3. Begin the TI-Navigator software on the computer by double-clicking the TI-Navigator icon on the desktop. See Figure 1.
4. Select the Add Class icon from the tool bar or select Add Class from the File menu. See Figure 2
5. For each class enter the name of the class and click on the Add Class icon. See Figure 14.
6. Select the class you just entered.
7. Click on the Import Students button in the dialog box. Browse until you find the file that you saved in step 2.

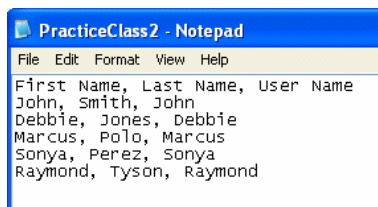


Figure 13



Figure 14

8. Click on the name of the file, and select Open.
 - When the import is successful, you will receive a confirmation message indicating the number of students added to the class.
9. After you have added your last class, press the Finish button.
10. Note: This process can be done using a spreadsheet program by using the cells to separate the data fields rather than commas. The file must be saved as a comma delimited file (csv file extension).
11. You may also import all of your students to one master class list and then reassign them to their appropriate class after they have been created.

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Using Screen Capture

Concepts

- Using Screen Capture to assess student understanding

Materials

- TI-84 Plus
- TI-Navigator system

Overview

Participants will use Screen Capture to view the screen of any or all students.

Creating Screen Captures

- Double click on the TI-Navigator icon from the desktop.
- Choose Practice Class from the pull-down menu under Current Class and click the Begin Class button.
- Log in two calculators as two students from the Practice Class. (e.g. Jon and Deb)
- Select the Screen Capture icon from the tool bar or the Tasks section of the Tools tab (or select Screen Capture from the Tools menu). See Figure 1.
- Select the Class icon to take a screen capture of the entire class or select the Students icon to take a screen capture of individual students. See Figure 2.
 - When using the Students option, hold down the “Ctrl” key to select any number of nonconsecutive students or hold down the “Shift” key to select any number of consecutive students.
- Click OK.
- The student calculator screens will be tiled alphabetically according to Last Name. See Figure 3.
- The teacher has the option of choosing whether the students names are displayed with the screen captures.
 - If a screen capture is viewed by the class, student names should not be displayed.
 - While the student calculators are on the Navigator Home screen, the screen capture will display student names.

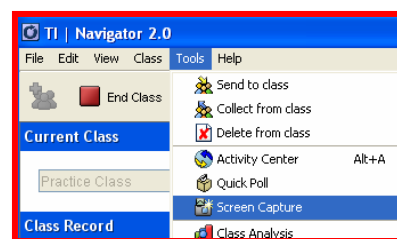


Figure 1



Figure 2

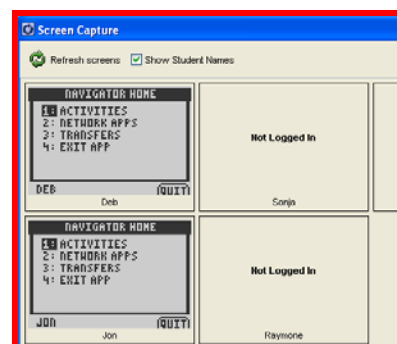


Figure 3

- If a screen capture is performed when the student calculators are outside of the NavNet application, the student names will not display on the computer unless the Show Student Names is selected.
9. On the student calculators, exit the NavNet application by selecting 4:Exit App from the TI-Navigator Home screen or the “QUIT” soft key.
 10. Type a message on each student calculator.
 11. On the computer, select the Refresh Screens icon on the Screen Capture window. See Figure 4.
 12. Toggle the Show Student Names option on and off to view the difference in the Screen Capture window.
 13. Experiment with the screen capture.
 14. To end the class session, on the computer, click the End Class button.

Discussion on Usages in the Classroom

1. What are the different usages of screen capture in a classroom?
2. What are the educational advantages of using screen capture during a class?
3. Think of a concept that was recently taught in your classroom, and write 5 different screen capture prompts.

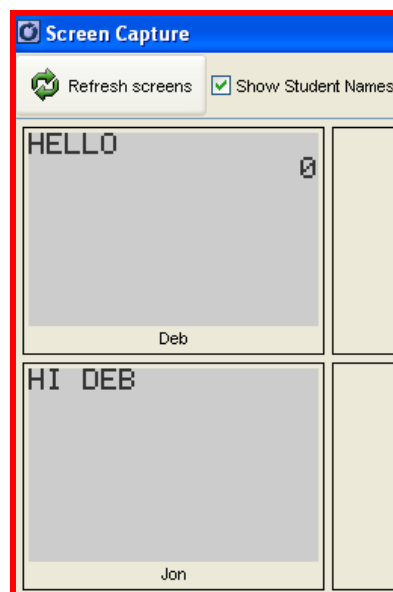


Figure 4

Using Quick Poll

Concepts

- Using Quick Poll to assess student understanding

Materials

- TI-84 Plus
- TI-Navigator system

Overview

Participants will use Quick Poll from both the computer and calculator to take a student poll.

Quick Poll from the Computer

- Double click on the TI-Navigator icon from the desktop.
- Choose Practice Class from the pull down menu under Current Class and click the Begin Class button.
- Use the USB graph link cables to connect two calculators to the computer. Log in one calculator as a student in the Practice Class (e.g. Jon).
 - Press **[APPS]** button.
 - Use the down arrow, **[↓]**, to move the cursor to NavNet.
 - Press **[ENTER]** button.
 - Enter a Username and Password.
- Conducting the poll:
 - Select the Quick Poll icon from the tool bar or the Tasks section of the Tools tab (or select Quick Poll from the Tools menu). See Figure 1.
 - Check the Resubmit check box to allow students to change their answer.
 - Choose Agree Disagree 3 from the pull down format.
 - In the entry box next to Poll Prompt type “I’m learning a lot about TI-Navigator.” See Figure 2.
 - Click on the Start Poll button to send the poll to the class. See Figure 3.
- Answering the quick poll as a student:
 - The question appears on the calculator.
 - The student scrolls to their answer choice using the arrow keys **[↑]** **[↓]** and pressing the “SEND” soft key to record their choice.

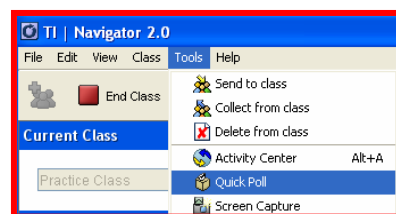


Figure 1

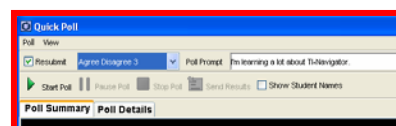


Figure 2



Figure 3

- Since the teacher selected the Resubmit option, the student has the option of resubmitting their choice. Try it.
6. Viewing poll results: (See Figure 4)
 - Click on the Stop Poll button to end the poll. (See Figure 5) You may pause and resume the poll if you choose.
 - Poll results are constantly updated on the computer.
 - Click on the Send Results button (Figure 6) to allow the students to view the poll results on their calculators.
 - The default view on the computer is Poll Details. You may also view individual student submissions under Poll Summary.
 - Student names are hidden by default and may be shown by marking the check box next to Show Student Names. See Figure 7.
 7. Try a few quick poll questions on your own.

Discussion on Usages in the Classroom

1. What are the different usages of quick poll in a classroom?
2. What are the educational advantages of using quick poll during a class?
3. Think of a concept that was recently taught in your classroom, and write five quick poll questions which could have been used to assess student understanding. Try to use various questions formats.
4. What are the advantages of allowing students to resubmit their quick poll answers?

Quick Poll From The Teacher Calculator

1. Log into another calculator as the teacher.
(e.g. Teacher, AAA)
2. From the TI-Navigator Home screen on this calculator, choose 4:Quick Poll by pressing 4 and **[ENTER]**.
3. Select the appropriate format.
4. Ask the class a question verbally.
5. Press the “SEND” soft key.
6. On the student calculator, answer the question. Make sure you press the “SEND” soft key to record the answer.

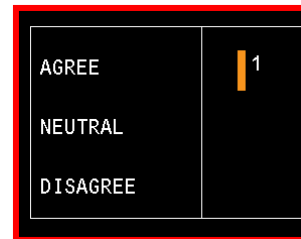


Figure 4



Figure 5



Figure 6

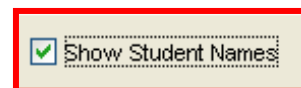


Figure 7

7. Notice that the student results are recorded on the teacher calculator and the computer screen.
8. To ask another question, use the “EDIT” soft key on the teacher calculator and go back to step 3.
9. You may view the results on the computer screen or use the computer to send the results to the student calculators. Try it.
10. Note: The resubmit option is not available when the quick poll is generated from the teacher calculator.

Quick Poll History

1. You may review the results of all quick poll questions from a current class session by clicking the History icon. See Figure 8.
2. If you use the computer to conduct the quick poll and type the question in the Poll Question box, the question will also be saved in the History.
3. Take a look at the quick poll history of your current Practice Class session. See Figure 9.

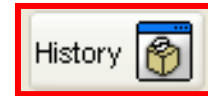


Figure 8

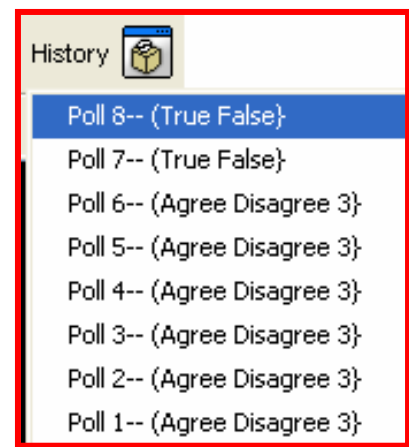


Figure 9

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Introduction to LearningCheck™

Concepts

- Basic functionality of LearningCheck™ Creator

Materials

- TI-84 Plus
- TI-Navigator system
- NavOpening.edc file

Overview

In this activity, participants will review the LearningCheck™ App from a student's perspective.

Using the Calculator (Participant Instruction)

1. Press the **[ON]** button located on the bottom left of the TI-84 Plus. Press the **[APPS]** button.
2. Use the down arrow **[↓]** to move the cursor to NavNet. See Figure 1.
3. Press **[ENTER]** to open the NavNet application.
4. Enter your USERNAME as directed by your instructor and press **[ENTER]**.
5. Enter your PASSWORD and press **[ENTER]**.
6. At this point, the instructor will “force-send” you a file. Once the assignment has been received on your calculator, press **[ZOOM]** (“BACK” soft key). See Figure 2
7. Move the cursor to NETWORK APPS and press **[ENTER]**. See Figure 3.
8. Scroll to LearnChk and hit **[ENTER]** to open the app. See Figure 4.
9. Press **[ENTER]** on the App Introduction screen.

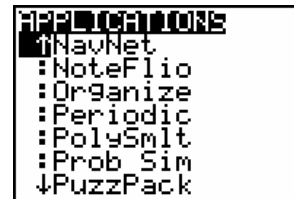


Figure 1



Figure 2



Figure 3



Figure 4

10. Move the cursor in the Assignment LIST to highlight the assignment called NavOpening.
See Figure 5.
11. Press **[ENTER]** on the calculator to open the NavOpening Assignment.
12. Press **[ENTER]** on the first item in the list to view the first question. See Figure 6.
13. Now you are ready to begin your journey exploring the Navigator functionality of LearningCheck.
14. Begin the LearningCheck assignment called NavOpening and refer to the helpful hints below.

Helpful Hints

1. To move to the next question in a document, press the **[GRAPH]** key, which is below the softkey “NEXT”.
2. To move to a previous question, press **[2nd] [GRAPH]** which will move the question sequence in reverse.
3. To read text which extends beyond the text box on the screen, press **[▲]** or **[▼]**.
4. To move between answers to a multiple choice question, press the **[▲]** or **[▼]** keys.
5. To select an answer to a multiple-choice question, press **[ENTER]** on your selection to fill in the bubble. If the bubble is not filled in, your answer was NOT recorded.
6. To select other options, press the **[Y=]** key which is below the softkey “MENU” on the calculator screen.
7. Note: You can be certain that you have an answer that has been recorded for a question if there is a box in front of the title of the question. On the given student screen, Question 8 Grammar does not have an answer recorded. See Figure 7.

Retrieve Class Data (Instructor Demonstration)

1. The instructor will perform the sequence of steps for this section. The process is given here for you to follow along.
 - To retrieve class data, the instructor moves to the Class Analysis program by clicking the Class Analysis icon on the toolbar. See Figure 8.
 - Click on the Choose an Assignment for Analysis icon. See Figure 9.

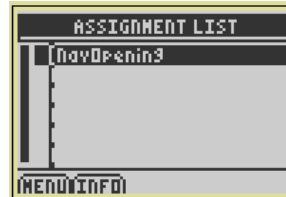


Figure 5



Figure 6



Figure 7

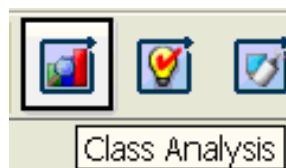


Figure 8



Figure 9

- Browse for the NavOpening LearningCheck document and double click on it. See Figure 10.
2. Click on the Collect Answer Files From Classroom Devices icon to retrieve the data from student calculators. See Figure 11.
 3. The pop-up window Collect Answer Files from Class appears and the following options are selected:
 - Delete Answer File from Device after Collect.
 - Delete Assignment File from Device after Collect.
 - This allows the teacher to manage the memory of the student calculators. Click the white boxes if the check marks are not present.
 4. Click the Start Transfer button from the resulting Collect Answer Files From Class at the bottom center of the pop-up window.
 - The data collected from the student calculators is displayed in a spreadsheet. See Figure 12.
 - Each student's data is coming in as a separate file called a user file with a file extension .usf.
 - Class Analysis calls on these files and displays them as a spreadsheet. The data will not be lost unless you delete the user files.
 5. From this point, the data can be printed, saved, and viewed in a slide show.
 6. A valuable tool in TI-Navigator is the Class Results Slide Show option. Access this from the icon on the top task bar. See Figure 13.
 7. The beginning of the slide show will show the title of the activity. See Figure 14.
 - The menu bar at the top will allow you to move between questions and display a bar graph of answers among the class.
 - The first question frame in the NavOpening activity appears as shown in Figure 15.
 8. A bar graph of student responses is shown to the right. Note that if a teacher registers a response as the correct answer the bar will be green instead of blue. See Figure 16.



Figure 10



Figure 11

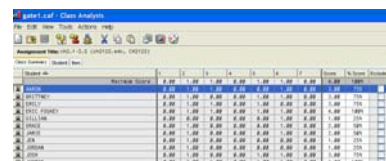


Figure 12

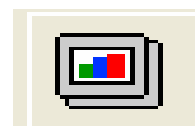


Figure 13



Figure 14

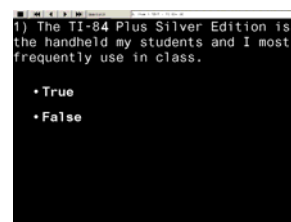


Figure 15

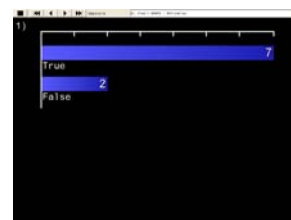


Figure 16

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LearningCheck™

Entering Information

Concepts

- Entering information in a LearningCheck™ file

Materials

- TI-Navigator system™
- HUB.jpg file

Overview

In this activity, you will enter one information item that includes both text and an image.

Introduction

1. Double click on the TI LearningCheck™ Creator icon from the desktop. See Figure 1.
2. Click OK on User Profile Selection – guest pop-up window.



Figure 1

Entering Information

1. Single click on the Text and Image button under the Information heading. See Figure 2.
 - In the Item 1 Template (Text and Image), clear out the existing title and enter “Hubs” in the white text box beside the Title.
2. In the Hubs Template (Text and Image) enter the following information in the white box in the Text section:
 - “Hubs allow communication between student calculators and the access point in the Navigator system.”
3. Click on the Browse button in the Image section of the pop-up window.
4. Use the pull down menu next to “Look in:” to find the file location that contains the jpeg image called HUB as directed by your instructor.
5. Select the HUB.jpg image and double click on the file name.

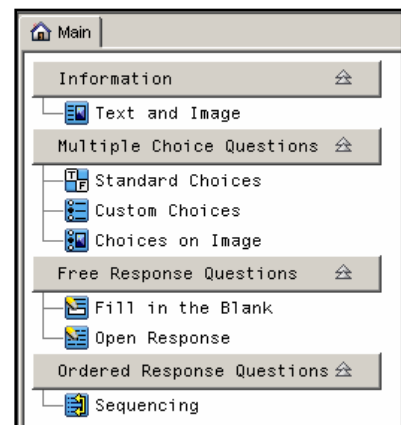


Figure 2

6. Use the Device Type Pull-Down Menu to choose the view to the TI-83 Plus Family. See Figure 3.
7. Click on the Scale/Crop Tool. See Figure 4.
 - Note: For some images (bitmap, jpeg) that are not created on the calculator, using the Scale/Crop Tool causes a portion of the original image to be shown. See Figure 5. Its use is not recommended for this application.
 - Click on the Scale/Crop Tool to get the image back to normal.
8. Why does the tool exist?
 - The Scale/Crop Tool is useful when using a captured device screen (PIC file) as an image. When viewing a PIC, the scale/cropped image will be the exact size of the viewable area on the calculator screen.
9. Click OK to register the information and return to the main screen.

Previewing Questions on the Computer

1. Click on the Tools in the top menu. Move the cursor to Preview and then select Preview All. See Figure 6.
2. In the Select a Device pop-up window click OK to select the TI-83 Plus Family.
 - Note that the preview can be changed to the TI-84 Plus family by clicking the down arrow.
3. Watch the upper left corner of the computer screen to preview the screens viewed by the students.
 - Note all the calculator keystrokes (rectangles around certain words, ex. WINDOW) indicated for the remainder of the steps are not pushed on the calculator. Instead, use the mouse to move the computer's mouse pointer over the appropriate button on the image of the calculator that will pop-up. See Figure 7.
4. Click on the ZOOM key to view the image after you have read the information.
5. Click on the GRAPH key to go to the next screen. Since all the information has been viewed you will see a summary of the information.
6. Close the pop-up window.

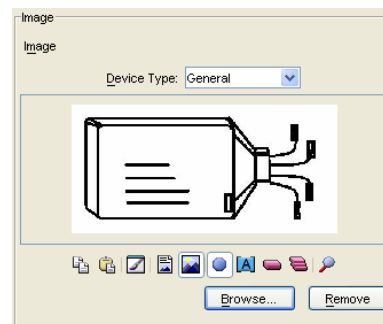


Figure 3

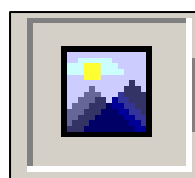


Figure 4

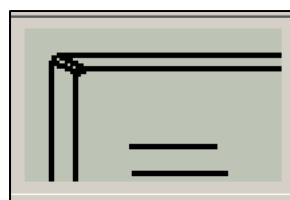


Figure 5

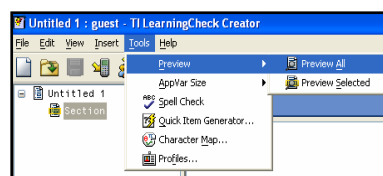


Figure 6

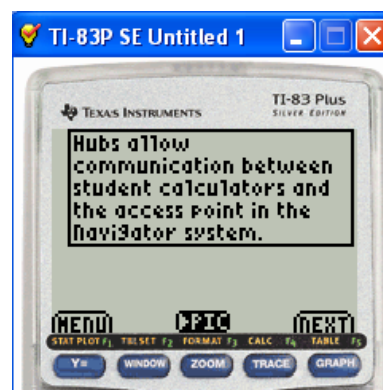


Figure 7

Saving the Education Document (edc file)

1. Click on File in the top menu.
2. Select Save.
3. To change the file name from the default name type “Info Example”.
4. Double click on the folder directed by the instructor, which will be your personal folder to save all other files during the institute.
5. Click on the Save button.
6. Close the TI-LearningCheck Creator software.

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LearningCheck™ Entering Multiple Choice Questions

Concepts

- Types of multiple choice questions
- Creation of multiple choice questions
- Graphics in multiple choice questions

Materials

- TI-84 Plus™
- TI-Navigator system™
- Reference sheet from instructor for multiple choice questions

Overview

In this activity, you will enter three multiple choice questions (Standard Choices, Custom Choices, Choices on Image) and send the created education document to the class using the TI-Navigator™ system.

Introduction

1. Double click on the TI LearningCheck Creator icon from the desktop.
2. Click OK on User Profile Selection – guest pop-up window.

Entering Standard Choices Multiple Choice Question

1. Single click on Standard Choices button under Multiple Choice Questions heading. See Figure 1.
2. In the Item 1 Template (Multiple Choice – Standard Choices) pop-up window, click the pull-down arrow under Response in the Response section.
 - Cursor to the appropriate answer choice option for the Multiple Choice – Standard Choices on the Reference Sheet and click the left mouse button.
3. To identify a choice as correct click on the circle beside the desired response. The correct answer for this question is underlined on your Reference Sheet.
 - In situations where there is no correct answer, such as opinion polling, no circle should be selected.
4. Click inside the white Text field under the Question section and enter:
 - The text from the Multiple Choice – Standard Choices on the Reference Sheet.

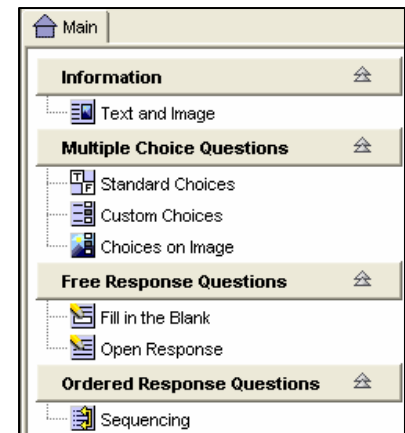


Figure 1

- This will become the title of the question by default. But, if you want a different title in the title box, you can click on the white box beside Title in the pop-up window.
5. Click OK at the bottom right corner of the window.

Entering Custom Choices Multiple Choice Question

1. Single click on the Custom Choices button under the Multiple Choice Questions heading. See Figure 1.
2. In the Item 2 Template (Multiple Choice – Custom Choices), click inside the white Text field under the Question section and enter:
 - The text from the Multiple Choice – Custom Choices on the Reference Sheet.
 - If you need special symbols, use the character map. Click on Tool in the menu bar and select Character Map. See Figure 2.
 - The Character Map can be used to create various symbols in LearningCheck documents as needed.
3. Click inside the white Text field under the Response section and enter:
 - The first answer choice listed from the Multiple Choice – Custom Choices on the Reference Sheet.
4. Click on New at the bottom right of the text box and enter:
 - The second answer choice listed from the Multiple Choice – Custom Choices on the Reference Sheet.
5. Click on New at the bottom right of the text box and enter:
 - The third answer choice listed from the Multiple Choice – Custom Choices on the Reference Sheet.
6. Click on New at the bottom right of the text box and enter:
 - The fourth answer choice listed from the Multiple Choice – Custom Choices on the Reference Sheet.
7. Click in the circle to the left of the correct answer choice which is underlined on the Reference Sheet, marking this as the correct response.
8. Click OK at the bottom right hand corner of the window.

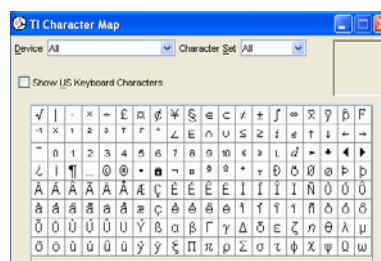


Figure 2

Entering Choice On Image Multiple Choice Question

- Single click on the Choices on Image button under the Multiple Choice Questions heading. See Figure 1.
- In the Item 3 Template (Multiple Choice – Choices on Image), click inside the white Text field under the Question section and enter:
 - The text from the Multiple Choice – Choices on Image on the Reference Sheet.
- Click on Browse in the Response section of the pop-up window.
 - Use the pull-down menu next to “Look in:” to find the file location that contains the bitmap image as directed by your instructor.
- Select the appropriate image file listed on the Reference Sheet and double click on the file name.
- Select the TI-84 family in the Device Type pull-down menu. See Figure 3.
- Click on the Scale/Crop Tool, if necessary. See Figure 4.
- Click Correct Point Tool. See Figure 5.
- Move the cursor to the location of the filled-in bubble on the image on the Reference Sheet and left click. This marks the correct answer to the question.
- Click on the Incorrect Point Tool. See Figure 6.
- Place the cursor on the location of the open bubbles on the image on the Reference Sheet and left click each time to insert a point. This marks the incorrect answers to the question.
- If a point or points are outside the viewable region on the calculator, you will see the message, “One or more points is partially or completely outside the image”.
 - To move points within the image, use the Erase Tool to erase a single point or the Clear Tool to erase all points. See Figure 7.
- Click on the Label Points tool. See Figure 8.
- Click on each of the points you created in any order. Letters will be assigned to the points starting at A.
- To change a label, left click on it and type the desired label.

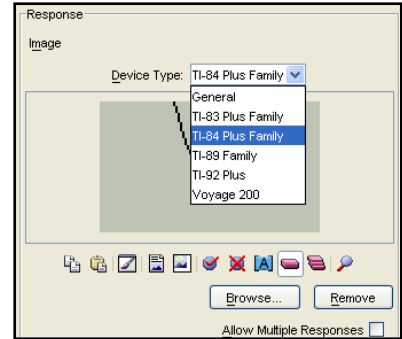


Figure 3

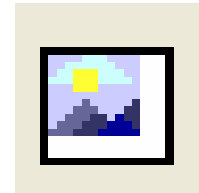


Figure 4



Figure 5

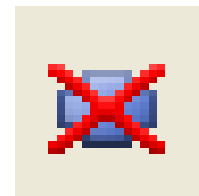


Figure 6



Figure 7

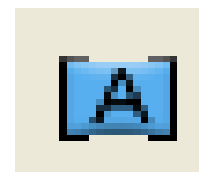


Figure 8

- Labels must be uppercase letters or numbers and are one character in length.

15. Click OK at the bottom right hand corner of the window.

Creating Titles For Questions

- As you create a question, its title will be the first few words of the question, as the default set-up. See Figure 9.
 - Once a question is complete, you can rename it.
 - Change the title of at least one of the questions by: moving the mouse pointer over a blue question bar and double click
or
left click to highlight the question bar and right click and select Edit.
- In the white Text box next to Title, delete the current title and then type in the desired title.
- Click OK in the bottom right hand corner.

Previewing Questions On The Computer

- Click on Tools in the top menu, move cursor to Preview and then select Preview All. See Figure 10.
- In the Select a Device pop-up window, change the device to the TI-84 Plus Family and click OK.
- Watch the upper left corner of your computer screen to preview the screens viewed by students.
 - Note all the handheld keystrokes (rectangles around certain words, for example, **WINDOW**) indicated for the remainder of the steps are not pushed on the calculator.
 - Instead you will use the mouse to move the computer's mouse pointer over the appropriate button on the image of the calculator that will pop-up. See Figure 11.
- For the first question, click on the **WINDOW** button to move between the possible responses.
 - Since there are no arrows on the preview, you must use the **WINDOW** key (TAB soft key) to move between responses.
- When you have the desired response selected press ENTER on the computer keyboard.

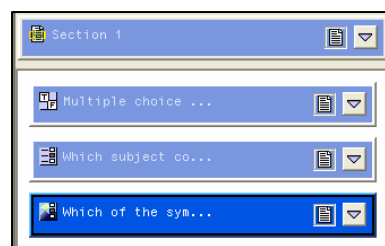


Figure 9

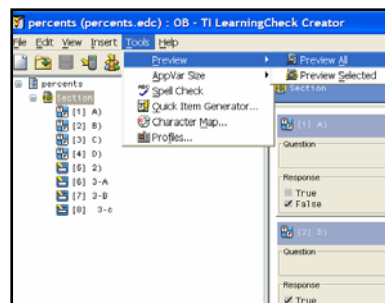


Figure 10

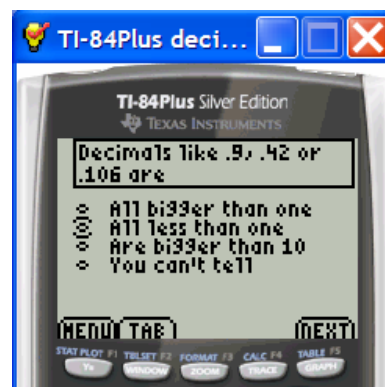


Figure 11

6. Use the **[GRAPH]** key to move to the next question.
7. For the second question, click on the **[WINDOW]** button to move between possible responses.
8. When you have the desired response selected press ENTER on the computer keyboard.
9. Use the **[GRAPH]** key to move to the next question.
10. For the third question, click on the **[ZOOM]** key to view the image after you have read the question.
11. Use the **[WINDOW]** key to tab between the selections on the image. Press ENTER on the computer keyboard to select the desired point on the image.
12. Use the **[GRAPH]** key to go to the next screen. Since all the questions have been viewed, you will see a summary of the questions answered.
13. Close the pop-up window.

Renaming The Education Document (.edc file)

1. Double click on the default name of the document called Untitled 1, in order to rename your file. See Figure 12.
2. Enter “MC Examples” in the white text box under Document Title. See Figure 13.
3. Move the mouse pointer to the bottom right hand corner of the pop-up window and click OK.

Saving The Education Document (.edc file)

1. Click File in the top menu and select Save. See Figure 14.
2. To change the file name from the default name, type “Multiple Choice Examples”.
3. Click on the Save button.

Simulating a Transfer with a Single Calculator From LearningCheck

1. Make sure that the USB unit-to-unit cable is connecting the PC and the calculator together.
2. Make sure the calculator is logged into NavNet.
3. Click on the Send to Class icon. See Figure 15.

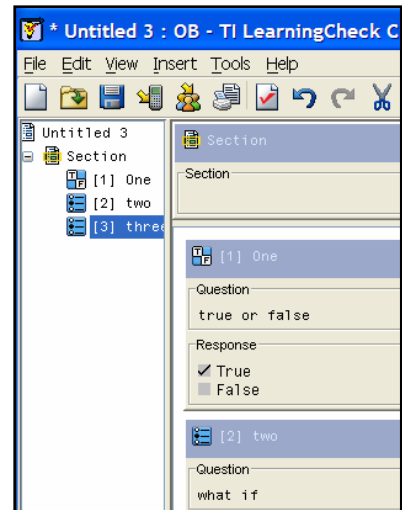


Figure 12

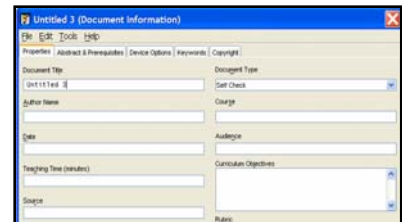


Figure 13

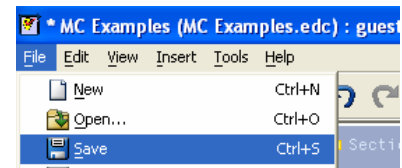
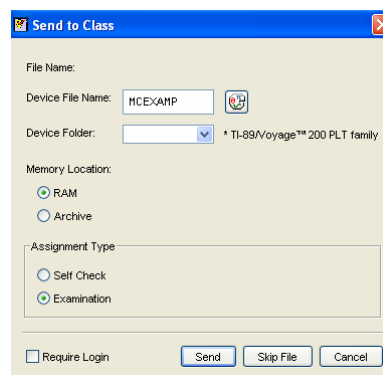
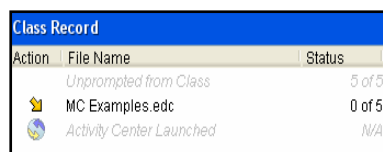


Figure 14



Figure 15

4. Change the Memory Location Selection to Archive.
5. Click Send in the “Send to Class” window. See Figure 16.
6. You will see the sent file listed in the Class Record List on the TI-Navigator Home Screen. This line will also show how many students have received the assignment. See Figure 17.
7. The USB unit-to-unit cable simulates transfer of files to one calculator while the Access Point allows the transfer of files to many calculators in a wireless way. If the Access Point is not connected to your computer, the files to be transferred will automatically be sent down the USB cable even though the Class Icon has been selected.
 - If sending to class from the LearningCheck application, students must be logged into NavNet to receive the assignment.
 - If sending to class from the Navigator home screen, teachers have the option to “force send” to all connected students.
8. At this point, the class has received the “Multiple Choice Examples” assignment on their calculator.

**Figure 16**

Action	File Name	Status
	Unprompted from Class	5 of 5
	MC Examples.edc	0 of 5
	Activity Center Launched	N/A

Figure 17

Sending Files

Concepts

- Sending files

Materials

- TI-84 Plus
- TI-Navigator system
- Days.edc file

Overview

Participants will work on sending files using TI-Navigator.

Sending All Types of Calculator Files

1. Open the TI-Navigator software.
2. Begin Class and log in two student calculators.
3. Click on the “Send to Class” icon. See Figure 1.
4. Select file to send (e.g. Days.edc) and click Next. See Figure 2.
5. Select Class or select Individual Student(s) using the “Ctrl” key to select non-consecutive students.
6. If “Force send” is desired, click in white box to the left of “Force send to students now”.
7. Click on Finish. See Figure 3.
8. You will see the sent file listed in the Class Record List on the Navigator Home Screen. This line will also show how many of the students have received the file. See Figure 4.



Figure 1



Figure 2



Figure 3

Class Record		
Action	File Name	Status
	<i>Unprompted from Class</i>	20 of 20
📁	practice (1).edc	1 of 20
📁	NavOpening(1).edc	1 of 1
📁	NavOpening.edc	1 of 1
📁	Math Opening.edc	1 of 1
📁	sequences.edc	0 of 1
📁	Untitled 1.edc	0 of 20
📁	answers2.edc	1 of 20

Figure 4

Sending Education Document (Alternative Method)

1. Open the TI-Navigator software.
2. Begin Class and log in two student calculators.
3. Open the Learning Check software by clicking the Learning Check icon. See Figure 5.
4. Click OK on the User Profile Section window.
5. Open the education document which is to be sent by clicking the Open File icon or by choosing Open under the File menu.
6. Choose the file to be sent (e.g. Days.edc).
7. Click on the Send to Class icon. See Figure 6.
8. Select the appropriate properties and click the “Send” button. See Figure 7.
9. You will be returned to the TI-Navigator software screen and the file will be listed under the Class Record listing. See Figure 8.
10. Notes:
 - When sending an education document through LearningCheck, it will be sent to the entire class.
 - The USB cable simulates the transfer of files to one handheld while the Access Point allows the transfer of files to many handhelds in a wireless way. If the Access Point is not connected to your computer, the files to be transferred will automatically be sent down the USB cable even though the Class icon has been selected.
 - If sending to class from within the LearningCheck software (see Figure 9), students must be logged into NavNet to receive the assignment. This is a “Force Send” option.
 - If sending to class from the Navigator home screen (see Figure 10), teachers have the option to “Force Send” to all connected students or allow students to retrieve the transfer at their request.

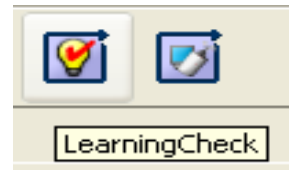


Figure 5



Figure 6

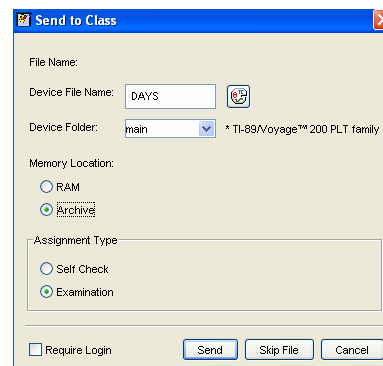


Figure 7

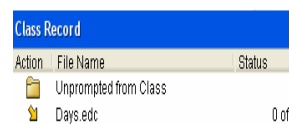


Figure 8

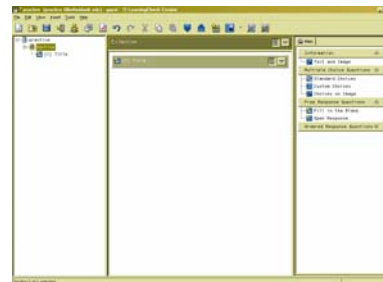


Figure 9

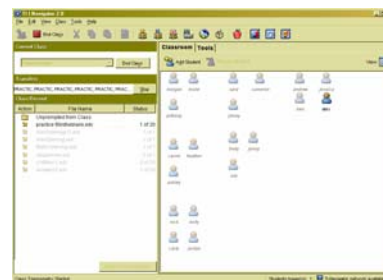


Figure 10

Collecting Files

Concepts

- Collecting files from student calculators

Materials

- TI-84 Plus
- TI-Navigator system

Overview

Participants will use TI-Navigator to collect files located on student calculators. The files can be collected from an individual student, a subset of students, or an entire class.

Introduction

- In order to have a file to collect from the student calculators, enter numbers into list L1 of two calculators.
- Open the TI-Navigator software.
- Begin class and log in two student calculators.
- Click on the “collect from class” icon. See Figure 1.
- Select file to be collected (e.g. L1 under Lists) and click Next. See Figure 2.
If you would like to collect more than one file from the student calculators, then highlight all desired files by using the “Ctrl” key.
- Select Class or select Individual Student(s) using the “Ctrl” key to select non-consecutive students.
- If “Force collect” is desired, click in the white box to the left of “Force collect from students now”. See Figure 3.
- If “Delete after collecting” is checked, after the collection both the assignment and answer file will be deleted from the calculators.
- Click on Next.
- Choose location where you would like the collected file(s) to be saved. See Figure 4.
- Click Finish.

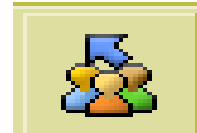


Figure 1

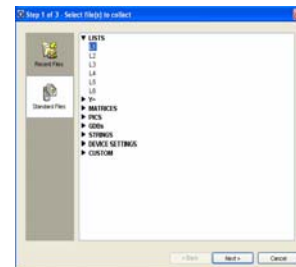


Figure 2

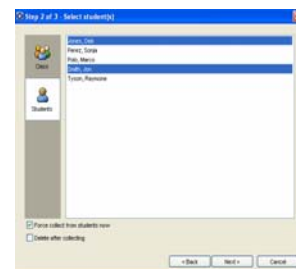
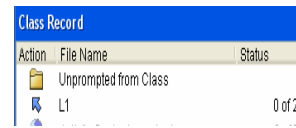


Figure 3



Figure 4

12. You will see the collected file listed in the Class Record List on the Navigator Home Screen. This line will also show how many of the students' files have been received. See Figure 5.
13. Discussion: How might this be a useful feature for your classroom?




Action	File Name	Status
	Unprompted from Class	0 of 2

Figure 5

Using and Sending GDBs

Concepts

- Function graphing
- Transformations

Materials

- TI-84 Plus
- TI-Navigator™ software

Overview

This activity will explore transformation graphing using GDBs. Participants will create a Graph Database on the teacher calculator and send it to students using TI-Navigator. Graph data bases (GDBs) are designed to store the equations, window settings and graphing modes on a handheld to be recalled at a later time.

Creating A Graph Data Base (GDB)

1. Press $\boxed{Y=}$. Be sure to clear all the $\boxed{Y=}$ locations and turn off all Stat Plots as shown in Figure 1.
2. Type the following functions in the $\boxed{Y=}$ register as in figure 2:
 - $Y_1 = x^2$, which is the parent function.
 - $Y_2 = x^2 + 3$, shifts the graph up three.
 - $Y_3 = \{1, -1\} \sqrt{X}$, to graph $y = \pm \sqrt{X}$.
 - $Y_4 = \{2, 0.5, -1\} x^2$, to graph 3 parabolas.
3. Press \boxed{WINDOW} . Make the settings match those seen in Figure 3.
4. Press $\boxed{2nd} \boxed{ZOOM}$ to access FORMAT. Make sure all items are selected along the left side of screen as shown in Figure 4.

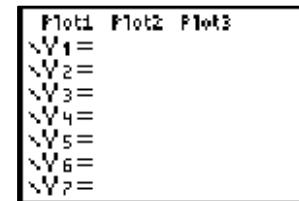


Figure 1

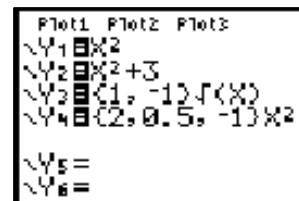


Figure 2

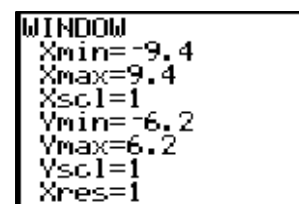


Figure 3

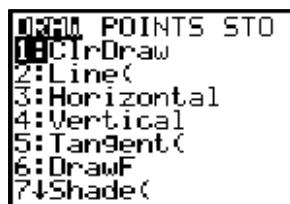


Figure 4

- Graphical databases (GDBs) are designed to store the equations, window settings, and graphing modes on a handheld. To create a GDB begin by pressing $\boxed{2\text{nd}} \boxed{\text{PRGM}}$ to access DRAW as shown in Figure 5.
- Scroll to $\boxed{\text{STO}}$ and choose 3:StoreGDB as seen in Figure 6.
- Press $\boxed{\text{ENTER}}$ to paste the command in the home screen of the handheld. Press 1 and $\boxed{\text{ENTER}}$ to store the information as GDB1 on the handheld as shown in Figure 7.

Recalling A GDB

- Press $\boxed{\text{Y=}}$ and erase all the equations from above. Press $\boxed{\text{ZOOM}}$ and choose 6:ZStandard.
- Press $\boxed{2\text{nd}} \boxed{\text{PRGM}} \boxed{\blacktriangleright} \boxed{\blacktriangleright} \boxed{4} \boxed{1} \boxed{\text{ENTER}}$ to return to the STO menu, paste the command to recall GDB 1 in the Home Screen, and execute it as seen in Figure 8.
- All the equations, window settings, and formats will return, as they were when the GDB was designed.

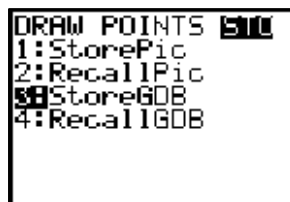


```

DRAW POINTS STO
1:ClrDraw
2:Line(
3:Horizontal
4:Vertical
5:Tangent(
6:DrawF
7:Shade(

```

Figure 5

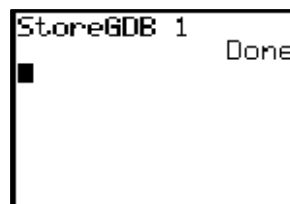


```

DRAW POINTS STO
1:StorePic
2:RecallPic
3:StoreGDB
4:RecallGDB

```

Figure 6

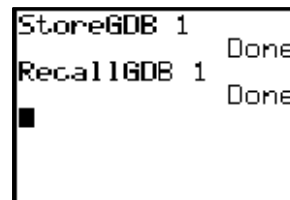


```

StoreGDB 1 Done

```

Figure 7



```

StoreGDB 1 Done
RecallGDB 1 Done

```

Figure 8

Downloading A GDB Using TI Connect™

1. Note: TI-Connect and TI-Navigator can not run at the same time.
2. Connect the calculator to a TI Connectivity Cable USB. Open the TI Connect software as shown in Figure 9. Click on TIDeviceExplorer.
3. The TI Connect software will open a window with an outline view of the contents of the calculator. Click on the plus to the left of Graph Database to see the GDBs stored on the calculator as seen in Figure 10.
4. Click on GDB 1 to select it as in Figure 10. Then choose File – Copy to PC. Save the file in a location as directed by the instructor. The file may also be saved by using “drag and drop” to the desired location.
5. Note: TI-Connect and TI-Navigator can not run at the same time.

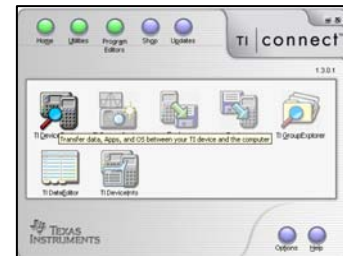


Figure 9

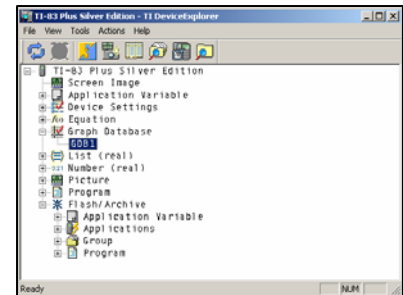


Figure 10

Sending A GDB Using TI-Navigator

1. Open the TI-Navigator software. Click Begin Class. Click the Send to Class icon on the menu bar. See Figure 11.
2. Step 1 of 2:
Select the file(s) to send. Browse to the file location and select GDB1. Click Next. See Figure 12.
3. Step 2 of 2:
Select student(s). Click Class to send to all students logged on or click Students and select particular students.
Note: Check the “Force send to students now” box if desired. See Figure 13.
4. Click Finish.
5. All students may now recall GDB1 and have the same equations, window settings and formatting options.

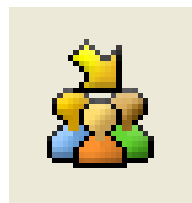


Figure 11

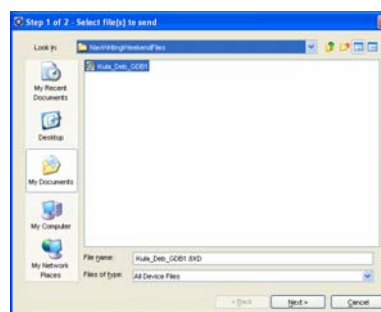


Figure 12

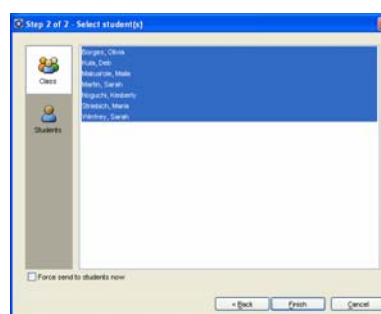


Figure 13

Using and Sending Programs

Concepts

- Graphing functions and scatter plots
- Setting **WINDOW**

Materials

- TI-84 Plus
- TI-Navigator™ software
- GolfDrive.edc and Golfdrive.8xp files

Overview

Programs can be used to control settings on the student handhelds and to set up functions or scatter plots. This activity will give the steps for aiding students with scatter plots.

Setting Up The Activity

1. The instructor will open the TI-Navigator software and send the following two files to the class:
Golfdrive.8xp and GolfDrive.edc
2. Print a hardcopy of the LearningCheck questions for students.

Class Activity

1. Run the program GOLFDRIVE. To do this press **PRGM** and move the cursor to GOLFDRIVE in the list of programs. Press **ENTER** to paste it on the Home Screen and **ENTER** again to execute the program.
2. The program will set the lists, the formats, the StatPlot, and the window for students. Everyone should be looking at the same plot in the same window as in Figure 1.
3. The plots represent the average driving distances (in yards) for players on the men's and women's professional golf tours from 1992 to 2003. The boxes represent the men and the plusses represent the women.
4. Answer the LearningCheck questions on the worksheet. Then enter the NavNet APP and select LearningChk, then select GolfDrive from the list of assignments. Enter your answers to the questions.
5. The instructor will collect and demonstrate the combined results.

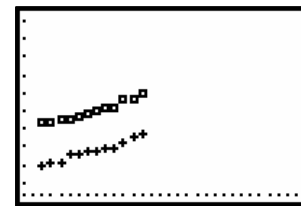


Figure 1



Hard Copy of Assignment
GolfDrive

- Info Your teacher has sent you the data for the average driving distances for men and women golfers on the professional tour from 1992 to 2003. In L1 are the years. In L2 are the average male distances. In L3 are the average female distances.
- 1 List your best fit equation for the men below.
- 2 List your best fit equation for the women below.
- 3 Are linear models appropriate for these sets of data? If they are not, explain why you think so.
- 4a According to the line of best fit models estimate average driving distances for men in 2005 ? . Next estimate the average driving distances for women in 2005 .
- 4b According to the line of best fit models estimate average driving distances for men in 2005 . Next estimate the average driving distances for women in 2005 ? .
- 5a Again using the line of best fit, when will the average driving distance for the men's tour be 300 yards? ?
- 6a According to the female model, when will the average driving distance for the women's tour be 260 yards? ?

Activity Center

Concepts

- Using Activity Center to conduct various activities

Materials

- TI-84 Plus™
- TI-Navigator system™

Overview

Participants will use Activity Center to set up sample activities and experience them from both a student's and teacher's perspective. They will adjust the settings of different views and contribute points, equations and lists.

Graph View Tab

- Begin the Practice Class and log in one of the calculators as the teacher and the other as a student.
- Select 1: Activity Center from the TI-Navigator Home. See Figure 1.
 - The calculator will display a message "WAITING FOR TEACHER". See Figure 2.
- Select the Activity Center icon from the tool bar or the Tasks section of the Tools tab (or select Activity Center from the Tools menu). See Figure 3.
- There are five viewing tabs: List, List-Graph, Graph, Graph-Equation, Equation.
- Select the Graph tab.
- Change the basic window settings to $[-20, 20]$ by $[-5, 5]$ by entering the appropriate values in the boxes at the end of the axes.
 - Note the resulting changes to the viewing screen.
- Click on the Edit Window Settings icon or select Edit Window Settings from the Edit Menu. See Figure 4.



Figure 1

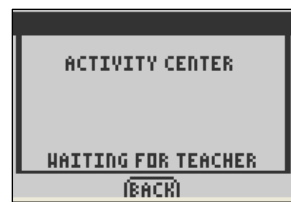


Figure 2

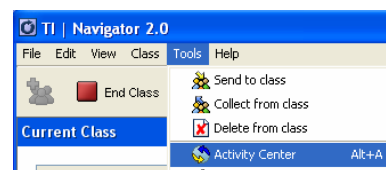


Figure 3

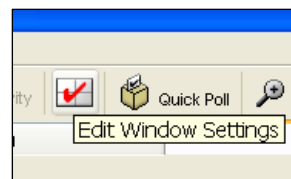


Figure 4

8. Adjust the settings to reflect the following: (See Figure 5)
 - X scale of 2
 - Y scale of 2
 - Axis Labels turned on
 - X for X Label
 - Y for Y Label
9. Click OK.
10. From the Graph tab window the Axes, Axis Label and Grid options can be toggled on and off. Try it.
11. To return to the Zoom Standard window settings quickly, click the Zoom Standard icon in the toolbar. See Figure 6.
12. The Zoom In, Zoom Out and Zoom Square icons are used to quickly change the window settings. Try it.
 - The Zoom Stat icon is used to match window settings to lists. This will be discussed later.

Contribute Points, Equations and Lists

1. Setting up “Catch Me If You Can” activity:
 - From the Contribute pull-down menu within the Activity Center, select the Points option. See Figure 7.
 - Select the Configure button and use the following settings: (See Figure 8)
 - Number of points per student: 0
 - Step Size: 1
 - X-List: X
 - Y-List: Y
 - Deselect (uncheck) Display Coordinates and Send Graph Contents as background
 - Select the OK button.
2. Perform the “Catch Me If You Can” activity.
 - Select Start Activity from the toolbar, and “chase yourself” around the grid.
 - Select Stop Activity from the toolbar to end the activity.

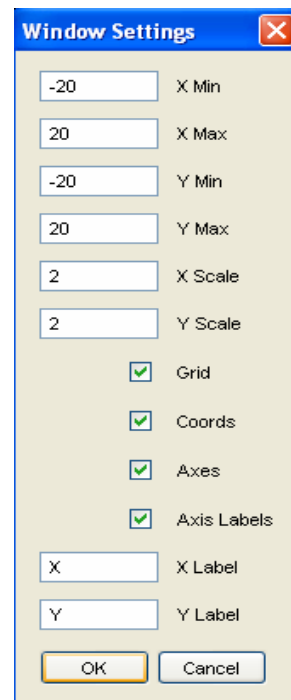


Figure 5

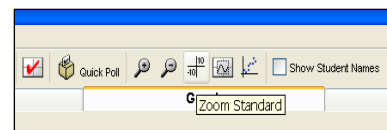


Figure 6

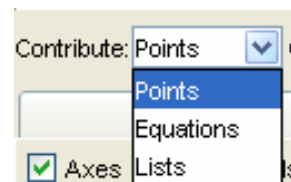


Figure 7

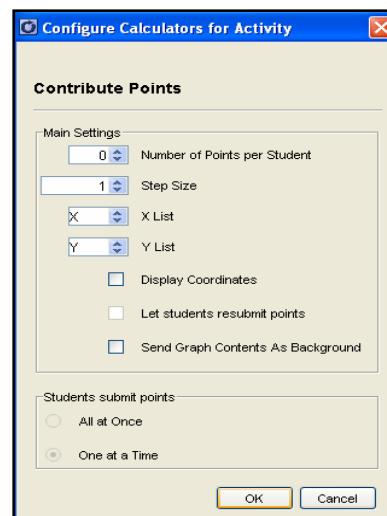


Figure 8

3. Setting up “Guess My Rule” activity:
 - Click on the Zoom Standard icon followed by the Zoom Square icon. See Figure 9. This will give everyone convenient window settings.
 - Click on the Window Settings icon to change the X scale and Y scale to 1.
 - From the Contribute pull-down menu within the Activity Center, select the Points option. See Figure 7.
 - Select the Configure button and use the following settings: (See Figure 10)
 - Number of points per student: 3
 - Step Size: 0.5
 - X-List: X
 - Y-List: Y
 - Select (check) Display Coordinates
 - Select (check) Let Students Resubmit Points
 - Deselect (uncheck) Send Graph Contents as background
 - You can choose to allow students to submit points All At Once or One at a Time
 - Select the OK button
4. Perform the “Guess My Rule” activity.
 - Select Start Activity from the toolbar.
 - On the student calculator mark 3 points according to the following rule:
 - “Make your x-coordinate 1 greater than your y-coordinate.”
 - Select Stop Activity from the toolbar. See Figure 11.
 - Reconfigure Activity Center to contribute Equations, with the following settings: (See Figure 12)
 - Number of equations per student: 1
 - Select Let students view graphs of equations
 - Deselect Let students resubmit equations
 - Deselect Send Current Graph Contents As Background
 - Select Empty Equations
 - (The other options are useful for other activities which you will see used later.)
 - Select the OK button
 - Select Start Activity from the toolbar.
 - On the student calculator enter a “guess” of the math rule that fits these points and [send].

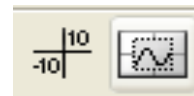


Figure 9

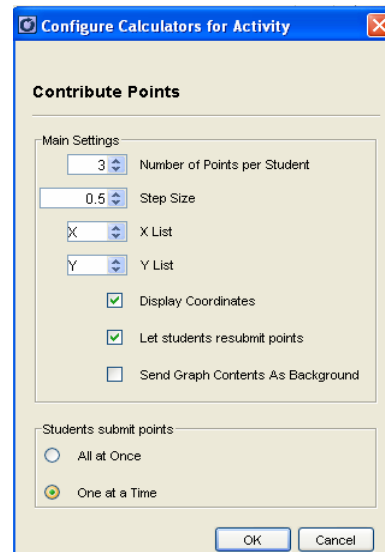


Figure 10

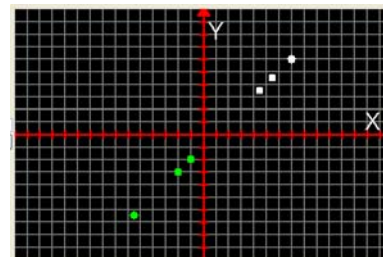


Figure 11

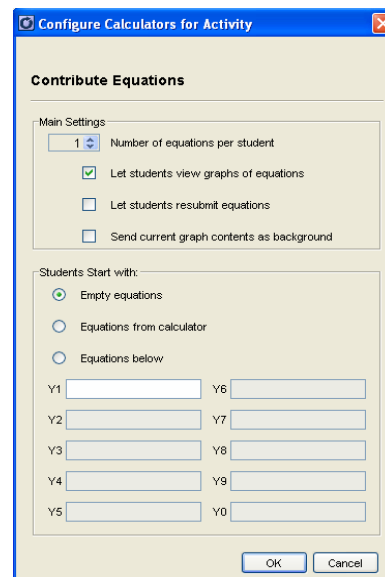


Figure 12

- Select Stop Activity from the toolbar. See Figure 13.
 - To clear the data from the screen, from the Edit menu select Clear Activity Data. See Figure 14.
 - Practice another round using the following rule: “Make the y-coordinate two less than twice the x coordinate.”
 - Clear the data from the screen for the next activity (from the Edit menu select Clear Activity).
5. Setting up “Happy Birthday – Part 1” activity:
- From the Contribute pull-down menu within the Activity Center, select the Lists option. See Figure 15.
 - Select the Configure button and use the following List properties: (See Figure 16)
Select Create independent lists using 1 list named L1.
 - Click the OK button.
 - Deselect Let students view sequence plots.
 - Select Empty lists. See Figure 17. (The other options are useful for other activities which we will use last.)
 - Click the OK button.

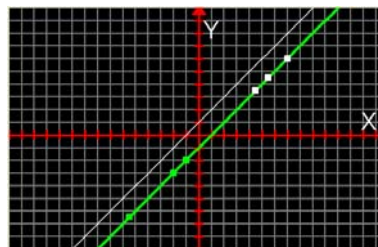


Figure 13

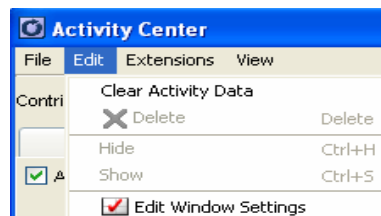


Figure 14

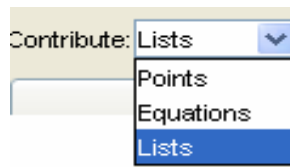


Figure 15

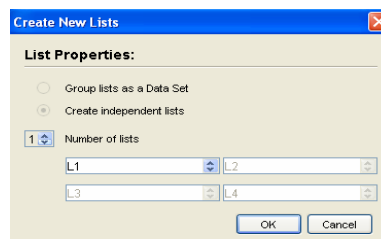


Figure 16

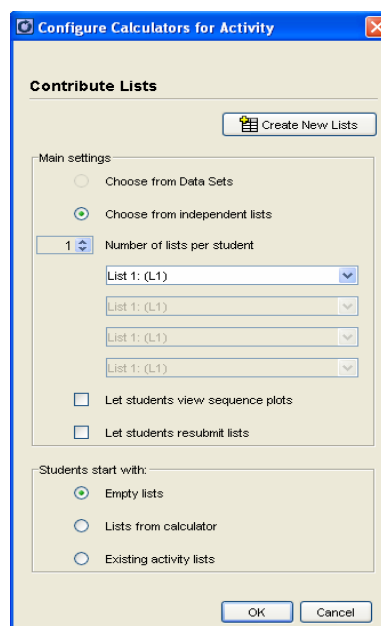


Figure 17

6. Perform the “Happy Birthday – Part 1” activity:
 - Select Start Activity from the toolbar.
 - On the two calculators, enter five days and “Send” (to simulate 10 students’ days of birth).
 - Select the List tab to view the lists. See Figure 18.
 - Click the cell with L1 to order the list in ascending/descending order.
 - Question: “Can it be known from the list if any two students have the same birthday?”
 - Select Stop Activity from the toolbar.
 - Clear the data from the activity center (from the Edit menu select Clear Activity).
 - Select Start Activity from the toolbar.
 - On the two calculators, enter five months and “Send” (to simulate 10 students’ months of birth).
 - Click the cell with L1 to order the list in ascending/descending order.
 - Question: “Can it be known from the list if any two students have the same birthday?”
 - Select Stop Activity from the toolbar.
 - Clear the data from the activity center.
7. Setting up “Happy Birthday – Part 2” activity:
 - Reconfigure the activity to contribute two lists (L1 and L2) of the type “Group Lists as a Data Set”. See Figure 19.
 - Click the OK button.
 - Note: With creating a Data Set, lists are considered pairs whose dimensions must match, while creating Independent Lists may have different dimensions.
 - Use the following settings: (See Figure 20)
 - Select Choose from Data Sets and use the pull-down menu to select the L1-L2 Data Set.
 - Select Let students resubmit lists.
 - Select Empty Lists.
 - Click the OK button.
8. Performing the “Happy Birthday – Part 2” activity:
 - Select the Start Activity from the toolbar.
 - On the two calculators, enter five months (L1) and five days (L2) and “Send” (to simulate 10 students’ birthdays).
 - Select Stop Activity from the toolbar.
 - Question: “Can it be known from the grouped lists if any two students have the same birthday?”

Display Name	L1
Teacher	4
Teacher	12
Teacher	26
Teacher	30
Teacher	20
<Hidden>	16
<Hidden>	2
<Hidden>	4
<Hidden>	30
<Hidden>	15

Figure 18

Figure 19

Figure 20

9. Extension of the “Happy Birthday” activity:
- Using the List-Graph tab, the scatter plot can be created of the collected data.
 - Question: “From the scatter plot, what indicates that students have the same day of birth? What about the same month of birth?”

Reflections

1. Having been introduced to the Activity Center, what are some things that you would like to be able to do with your class?
2. In what ways could you use:
 - Contributing Points?
 - Contributing Equations?
 - Contributing Independent Lists?
 - Contributing Grouped Lists?
3. How might you design lessons using more than one type of data contribution?

Advanced Activity Center

Concepts

- Using advanced features of Activity Center

Materials

- TI-84 Plus™
- TI-Navigator system™

Overview

Participants will investigate some of the advanced features of the Activity Center.

Using Predefined Equations and Lists

Exploring Families of Functions

- Begin a class with two student calculators.
- Set up Activity Center to Contribute Equations.
- Configure the activity with the following settings:
(See Figure 1)
 - Number of equations per Student: 2
 - Mark the check boxes for “Let students view graphs of equations” and “Let students resubmit equations”
 - Uncheck “Send Graph Contents As Background”
 - Under the “Students Start with:” section select the bullet for “Equations below” and enter 2x for [Y1] and [Y2]
 - Select OK
- Start the Activity.
- To explore the relationships between parallel lines, have students add their favorite number to 2X in [Y2] and [Send]. They may preview their graphs before sending. See Figure 2.
- Stop the Activity.
- Try other families of equations.

Activity Center and Other Calculator Features

- When using empty lists and/or equations in Activity Center, TI-Navigator also populates the corresponding memory of the students’ calculators outside of NavNet. Teachers may use this feature to teach a lesson using both

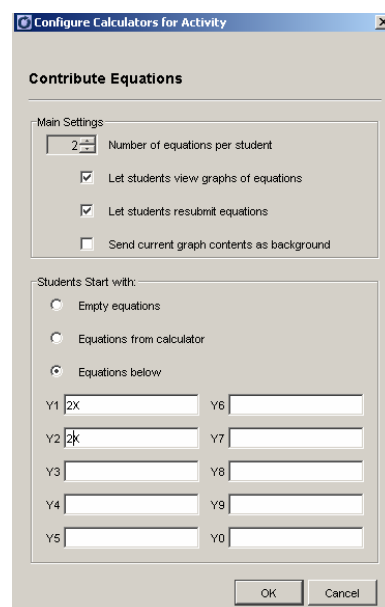


Figure 1

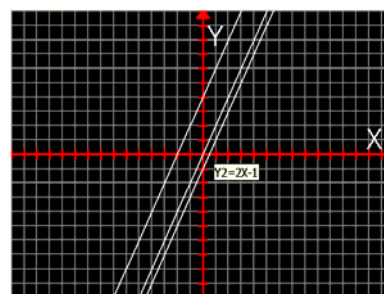


Figure 2

Activity Center and any of the calculator's other capabilities. To see this, on one of the student calculators, exit out of NavNet and hit the $\boxed{Y=}$ button.

Solving Systems of Equations

1. Clear the data from the previous activity. See Figure 3.
2. Set up and configure Activity Center as in the previous example, but this time use $3X-2$ for [Y1] and $-3X+12$ for [Y2]. See Figure 4.
3. Start the Activity. Each student will have these two equations in their calculators both in NavNet and in [Y1] and [Y2] in their calculator memory.
4. Have students [Send] the equations.
5. Stop the activity and reconfigure to Contribute Points. Use 0 points with a step size of 0.5, and check "Display Coordinates" and "Send Graph Contents as Background". See Figure 5.
6. Start the Activity and have the students move their cursor to the intersection point.
7. Ask, "What are the approximate coordinates of the intersection point?".
8. Exit NavNet and press $\boxed{Y=}$.
9. These equations can now be investigated using other capabilities of the calculator.

Regression Analysis Using Aggregated Data

1. Clear the data from the previous activity. See Figure 3.
2. Set up and configure Activity Center to collect a Data Set consisting of two lists, L1 and L2, with empty lists.
3. Start the Activity and ask students to send their height into L1 and shoe size into L2.
4. Once all the data is received in Activity Center, stop the activity.
5. Reconfigure the activity to use "Existing Activity Lists".
6. Start the Activity and the students will receive the aggregated lists on their calculators in L1 and L2.
7. Stop the activity when all students have received the data.

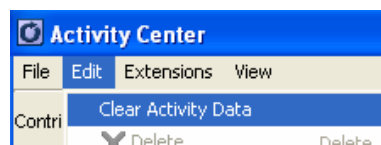


Figure 3

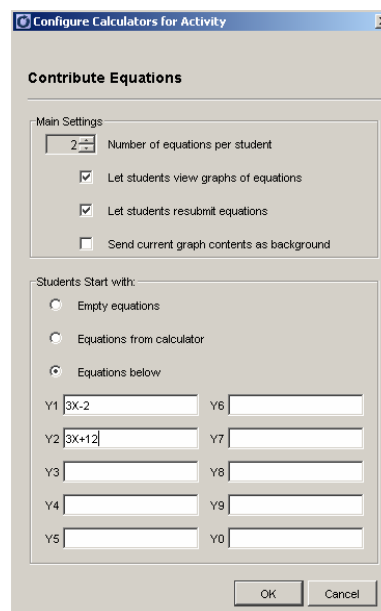


Figure 4

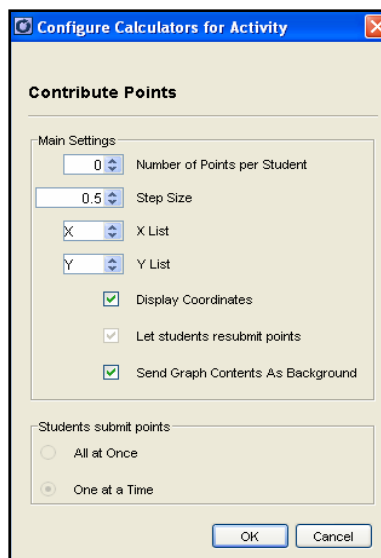


Figure 5

8. Have the students exit the NavNet App.
9. Have the students calculate the regression equation and store it in [Y1].
10. While students are working on the regression equation, the teacher can set up the plot of L1-L2 in the Activity Center.
11. Click on the List-Graph tab and configure the plot to graph L1-L2.
12. Choose the ZoomStat icon to get an appropriate window.
13. Reconfigure the activity to Contribute Equations. Use 1 equation per student and select Equations from the calculator $Y=$ screen.
14. Start Activity.
15. Once students have completed their regression task, have them return to the NavNet App and Activity Center.
16. Students just need to hit [Send] and their regression equation in [Y1] will be sent to the teacher computer.
 - This is an assessment tool.
 - All students should have the same equation.

Using The Equation Tab and “What If” Scenarios

1. Click on the Equation Tab of the Activity Center.
2. Create two equations for participants to explore by typing the equations after the “Y=” and clicking Enter. (Use $3X - 2$ for [Y1] and $-3X + 12$ for [Y2] as in the previous example.) See Figure 6.
3. Use the “Window Settings” under the Graph tab to define the X values in the table to range from -15 through 15. See Figure 7.
4. Select [Y1] and [Y2] from the pull-down choices for the equations. See Figure 8.
5. Scroll through the table to find the X value that causes the two Y values to be as close as possible. See Figure 9.
6. Use the “What If” table (the table below the populated table with no x-values entered) to make better guesses for X. See Figure 10.

Display...	Name	Equation
Teacher	Y	$-3X+12$
Teacher	Y	$3X-2$

Figure 6



Figure 7

x	Y=3X-2	Y=-3X+12
-15	-47	
-14	-44	$Y=3X-2$
-13	-41	$Y=-3X+12$
-12	-38	

Figure 8

x	Y=3X-2	Y=-3X+12
-3	-11	21
-2	-8	18
-1	-5	15
0	-2	12
1	1	9
2	4	6
3	7	3
4	10	0
5	13	-3

Figure 9

X	Y=3X-2	Y=-3X+12
2.4	5.2	4.8
2.3	4.9	5.1
2.3333	4.9999	5.0001

Figure 10

Graphing Vertical Lines and Inverse Functions

1. Clear the data from the previous activity.
2. Under the Graph-Equations tab, the teacher can graph vertical lines and inverse functions using the input equations at the top of the window. See Figure 11.
3. Type the equation for a vertical line such as “ $X = 3$ ” and hit Enter.
4. The graph of the vertical equation will appear on the Activity Center grid.
5. You may graph as many vertical lines on the grid as you like, just enter them individually.
(e.g. “ $X = -5$ ” and “ $X = 0$ ”)
6. To hide an equation which has been graphed, such as “ $X = -5$ ”, select the equation from the list and click the “HIDE” button at the bottom of the equation listing box. The hidden equation will be listed in italic lettering. See Figure 12.
7. Clear the activity data to investigate the inverse equation feature.
8. Enter the equation “ $Y = 4X - 6$ ” in the input box and click Enter.
9. Now, enter the inverse equation for it, “ $X = 4Y - 6$ ”.
10. To distinguish the two graphs, change the color of one of the equations by double-clicking on the color box and select a different color from default green. See Figure 13.
11. This is a good time to have a discussion of the possible connections between the graphs of the equation and its inverse.
12. Set up an activity to allow students to submit a possible “ $Y=$ ” equation for the inverse of “ $Y = 4X - 6$ ” based on the graph of “ $X = 4Y - 6$ ”.
 - Set the activity to “Contribute Equations”
 - Configure it to contribute 1 equation with “Send Graph Contents as Background” selected and no predefined equations.
 - Would you want the student to be able to resubmit equations?
13. Start the Activity.
14. Students will be able to see the graph by hitting the “Plot” soft key.

Figure 11 shows a software interface with two input fields. The top field is labeled 'X=' and has an 'Enter' button to its right. The bottom field is labeled 'Y=' and also has an 'Enter' button to its right.

Figure 11

Displa...	Name	Equation
Teacher	X	0
<i>Teacher</i>	X	-5
Teacher	X	3

Figure 12

Displa...	Name	Equation
Teacher	X	4Y-6
Teacher	Y	4X-6

Figure 13

15. Once the student has identified the possible equation, they can return to the equation screen by hitting the “EQN” soft key. Enter their guess and hit “Send”.
16. All students’ equation guesses and its graph will appear in the Activity Center screen.
17. If the students hit the “Plot” soft key before the activity stops, they will get all the plots from the class Activity Center.
18. Stop the Activity.

Reflections

1. Having been introduced to the Activity Center, what are some things that you would like to be able to do with your class?
2. In what ways could you use:
 - Contributing Points?
 - Contributing Equations?
 - Contributing Independent Lists?
 - Contributing Grouped Lists?
3. How might you design lessons using more than one type of data contribution?

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Sending Internet Data To The Class

Concepts

- Downloading data from the Internet
- Sending data to students
- Saving and Collecting Pictures

Materials

- TI-84 Plus
- TI-Navigator™ System
- Internet access
- TI Connect™ software

Overview

Participants will use data from the Internet to explore the changes in world population over time and to make projections into the future.

Downloading The Data

1. Open TI Connect software.
2. To have a place to store the data, use TI Connect to create a list.
 - Click on TI DataEditor to begin. See Figure 1.
3. Go to File, and then New.
 - Choose TI-83 Plus, List, and L1 from the pop-up window. See Figure 2.
 - This will create a column called L1.
 - Repeat this process to create a second list called L2.
 - Now minimize TI Connect.
4. If you have access to the Internet, open the Internet browser and go to the world population data site for TI-InterActive!, education.ti.com/us/product/software/tii/datasites/worldpop.html. See Figure 3.
 - If you do not have Internet access, then use the Internet explorer file called Data Sites – TI InterActive!
 - The file may be found at the direction of the instructor.
5. Highlight the data for years and population by clicking the mouse on year 0.
 - Hold the mouse button down and drag to the end of the data.

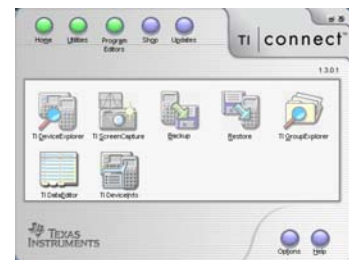


Figure 1



Figure 2

Year	Population (in billions)
1950	2.53
1955	2.63
1960	2.74
1965	2.85
1970	2.97
1975	3.09
1980	3.21
1985	3.33
1990	3.45
1995	3.57
2000	3.69
2005	3.81
2010	3.93
2015	4.05
2020	4.17
2025	4.29

Figure 3

- Choose Edit and then Copy to copy the data to the clipboard. Using Ctrl – C on the computer keyboard will achieve the same goal.
6. Minimize the Internet browser and maximize the TI DataEditor.
 7. Click the first position in L1.
 - Paste the data into L1 and L2 by choosing Edit and then Paste. Use Ctrl – V on the computer keyboard will achieve the same goal. See Figure 4.
 8. To save, click on L1, and then choose File and Save to save the list L1.
 - Repeat the process for L2.
 - Save the lists as directed by the instructor.

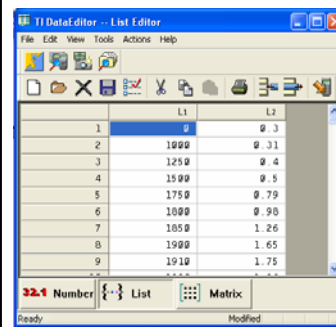


Figure 4

Sending The Data To The Calculator

1. Open the TI-Navigator software. Click Begin Class. Click the Send to Class icon on the menu bar.
2. Step 1 of 2: Select the file(s) to send. Locate L1 and L2 saved above and select both. Click Next.
3. Step 2 of 2: Select student(s). Click Class to send to all students logged on or click Students and select particular students. If desired you can check the Force send to students now box. Click Finish.

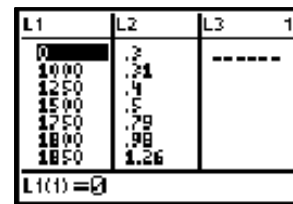


Figure 5

Creating The Scatter Plot On The Handheld

1. Press **CLEAR** to erase the Home Screen.
 - Press the **STAT** key. Choose 1:Edit. Press **ENTER**. This shows the data. See Figure 5.
2. Press **2nd** [STAT PLOT] to access the Stat Plot menu. See Figure 6.
3. Select Plot 1 by pressing **ENTER**. The word ON should be flashing.
 - Press **ENTER** to activate Plot 1. See Figure 7.
4. Press **▼** to go to Type. Beside Type select the first icon, which represents the scatter plot.
5. Press **▼** to go to Xlist. Press **2nd** [1] to get L1.
6. Press **▼** to go to Ylist. Press **2nd** [2] to get L2.
7. Press **▼** to go to Mark. Press **▶** to go to smallest mark, Press **ENTER**. See Figure 8.



Figure 6



Figure 7



Figure 8

- Press **[ZOOM]**. Go to 9: ZoomStat to see the handheld-generated graph of the world population data from year 0 to 2150. See Figure 9.

Saving Pictures

- Press **[2nd]** **[DRAW]** to access the DRAW menu.
 - Scroll to **[STO]** to store the picture in memory.
 - Save by choosing 1:StorePic and then press **[ENTER]** to confirm the save on the Home Screen of the handheld. See Figure 10.
- Enter "1" to give this picture a name. See Figure 11.
 - Press **[ENTER]** to store the picture in the handheld's memory as PIC 1.

Collecting Pictures

- Open TI Navigator software. Click Begin Class. Click the Collect from Class icon on the menu bar.
- Step 1 of 3: Select the file(s) to collect. Select PICS then Pic1. Click Next. See Figure 12.
- Step 2 of 3: Select student(s). Click Class in order to send to all students logged on or click Students and select particular students.
 - If desired check the Force send to students now box.
 - If desired check the Delete after collecting box.
 See Figure 13.



Figure 9



Figure 10



Figure 11

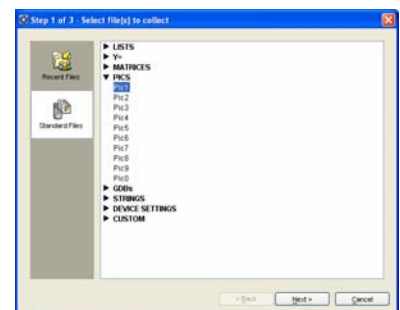


Figure 12



Figure 13

4. Step 3 of 3: Select collect folder. Save as directed by the instructor. Click Finish. See Figure 14.

Notes For Teacher

1. The teacher could also get a screen capture from all students, then display and discuss.
2. To save the screen capture from students, the teacher could press Alt-PrntScr to copy the Screen Capture window to the clipboard and then paste it into a Word (or similar) document.

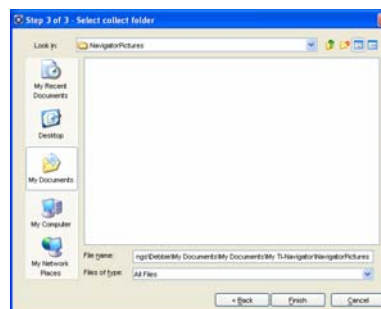


Figure 14

Pass The Ball

Math Concepts

- Scatter plot
- Function
- Proportional relation

Materials

- TI-84 Plus
- TI-Navigator™
- Stopwatch
- Tennis ball

Overview

In this activity, we will collect data of the form (number of people, time it takes to pass a ball), make numerical prediction, build a scatter plot, and model with a proportional relation of the form $y = mx$. Data will be entered in Activity Center and transferred by TI-Navigator to student handhelds.

Description Of The “Pass The Ball” Activity

1. For the ball pass activity, begin by having three people stand in a circle.
 - You will be repeating the activity for six different numbers of teachers.
 - Use different teachers to maximize participation.
2. For each round, the starter will bounce, catch, and pass the ball to the next person. Continue bouncing, catching, and passing the ball until it is back to the starter.
3. Start and stop with the same person. Time how long it takes the ball to get all the way around the circle. Have teachers record the times on the table. See Figure 1.
4. For the last round, have everyone in the room participate. Before timing, have teachers predict how long they think it will take and write it on their handout. Ask teachers to share their predictions. Then time.

Using TI-Navigator For The Activity

1. Launch TI-Navigator and Begin Class.
2. Click the Send to Student icon. Select the two LearningCheck documents to send to the students, Post Test and Rule Answers.
3. Describe the “Pass the Ball” activity to the participants and perform six rounds of the activity (just not the last round where everyone participates).
4. Do a Quick Poll with the following three questions:
 - How long will it take to pass the ball to everyone?
 - How long will it take to pass the ball to 50 people?
 - How many people would be in the circle if it takes 50 seconds to pass the ball?

Sample Table

Number of People	Time in Seconds
4	6
6	9
7	13
9	16
25	46
N	$1.7N$

Figure 1

5. Discuss the results.
6. Click on the Activity Center icon.
 - Click on the List tab.
 - Click on the Create New List button.
 - Select Create Data Set and number of lists equal to 2.
 - Click OK.
 - Click in the data box for L1 and type in value.
 - Tab to L2 and type in value. Press enter and repeat until all data has been entered.
 - Select Contribute Lists and click Configure.
 - Select Existing activity lists then click OK.
7. Click Start Activity to send the lists to the class.
8. Once the class receives the lists, click Stop Activity. They can quit the App and make a scatter plot of the data in L1 and L2 and fit the data with a function rule.
 - Do not use the **STAT** button.
9. Click on List-Graph tab.
 - Configure Plots for L1 and L2.
 - Use the settings icon to create an appropriate viewing window.
 - Select Contribute Equations, click Configure, with number of equations equal to 1.
 - Check Let students view graph of equations, do not check Send Graph Contents as Background.
 - Click on Graph-Equation tab to view graphs and equations as students contribute their equations.
10. Have the participants complete the “Rule Answers” LearningCheck document.
 - This document contains several questions relating to the results.
 - Have participants use a consensus rule, or their own to respond to these questions.
 - Display answers using Slide Show and discuss results.
11. Have the participants open the “Post Test” LearningCheck document and discuss.
 - This is a set of questions similar to the activity.
 - Use the Activity Worksheet for students to record solutions.
 - The results of this worksheet may be used as a summative assessment.

LearningCheck Fill In The Blank Questions

Concepts

- Creation of fill in the blank questions
- Transferring an educational document to the class

Overview

In this activity, you will create fill in the blank questions with alpha and numeric input and retrieve the answer files from a class using the TI-Navigator system.

Materials

- TI-84 Plus
- TI-Navigator™ system
- LearningCheck Creator program

Fill In The Blank Features

1. LearningCheck questions can be composed by the teacher with blanks, allowing the students to enter their answers.
2. The blanks may be constructed to hold alpha or numeric characters.
 - The student will automatically be able to enter alpha characters on the calculator if the teacher selects a text style fill in the blank.
 - If the teacher selects a numeric style fill in the blank question, the student will automatically be able to enter a numeric character on the calculator.
3. For teachers who are concerned with students unable to spell adequately, a pull-down style fill in the blank question style can be selected.
 - It has the “feel” of a multiple choice question.
 - Students will be able to select a word from a pop-up window which will be inserted in the blank.
 - This works well for students with English as a second language.

Composing Fill In The Blank Questions

1. Click on the white page icon on the task bar to begin a new LearningCheck education document.
2. Click OK on the User Profile Selection – Guest pop-up window.
3. To start constructing the question, click the Fill in the Blank icon under Free Response Questions within the Main panel as shown in Figure 1.
 - The Item 1 Template (Fill in the Blank) will be seen as shown in Figure 2.

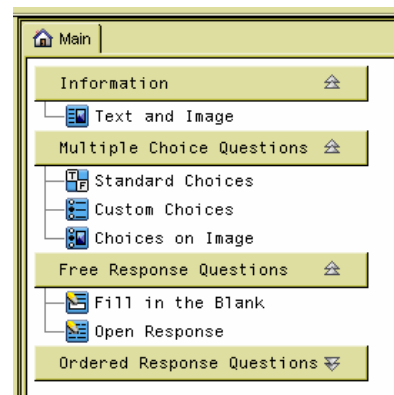


Figure 1

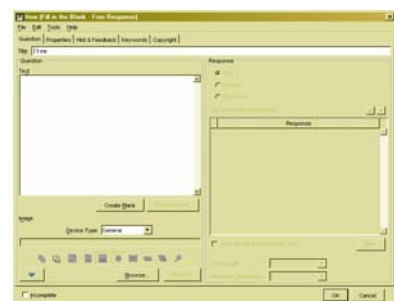


Figure 2

Using Fill In The Blank as a Drop-Down Option

1. Highlight the default title “Item 1” in the white Title field (top left side of template) and enter the title from the Fill In The Blank – Pull-Down part of the Reference Sheet.
2. Click on the white Text field (Question section) and enter the text from the Fill In The Blank – Pull-Down part of the Reference Sheet.
3. To create a blank, highlight the word or number to be filled in by the student.
 - Move the mouse pointer to the word that was underlined in the text statement on the Reference Sheet and highlight it. See Figure 3.
4. Press the Create Blank button below the Text box at the bottom right of the Question section.
 - Note the highlighted word is now a text type of Fill in the Blank recorded in the Response section.
5. To create a pull-down type of Fill in the Blank question, move the cursor to the white circle to the left of the words Pull Down under the Response section title and left click with the mouse.
 - Note that under the List of Possible Responses the appearance of a multiple choice style of question appears. The correct response by default, is associated with the highlighted text.
6. Move the mouse pointer over the New button in the Response section. Click the mouse button.
7. From the Reference Sheet, enter the first choice for the blank in the Text field of the Response section.
8. Move the mouse pointer over the New button in the Response section and click the button.
9. From the Reference Sheet enter the second choice for the blank in the Text field of the Response section.
10. Move the mouse pointer over the New button in the Response section and click the button.
11. From the Reference Sheet enter the third choice for the blank in the Text field of the Response section. See Figure 4.
12. Click OK at the bottom right hand corner of the Fill in the Blank template. This will close the template.

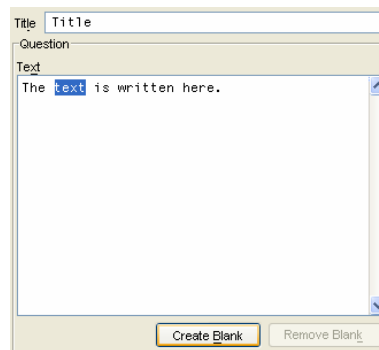


Figure 3

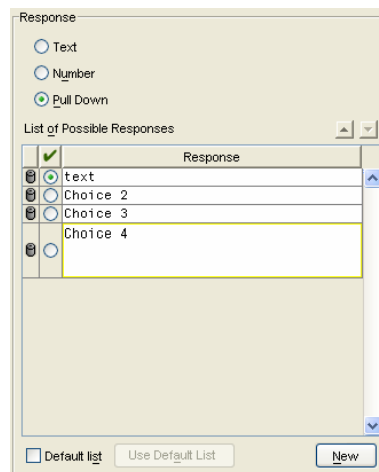


Figure 4

13. Double click on the default document name, Document 1, found on the left side of the Navigator software.
 - Overwrite the default name under Document Title by highlighting it and entering “Fill In The Blank”.
 - Click OK at the bottom right corner.

Using Fill In The Blank - Text/Numeric Option

1. Highlight the default title Item in the white Title field, (top left side of template) and enter the title given on your reference sheet.
2. Click on the white Text field (Question Section) and enter the text from the Fill In The Blank – Text/Numeric part of the Reference Sheet.
3. To create a blank, highlight the word or number to be filled in by the student.
 - Move the mouse pointer to the word that was underlined in the text statement on your reference sheet and highlight it. See Figure 5.
4. Press the Create Blank button below the Text box at the bottom right of the Question section.
 - Note the highlighted word is now a text type of Fill in the Blank recorded in the Response section. See Figure 6.
5. To create a second blank, highlight the word or number to be filled in by the student.
 - Move the mouse pointer to the number that was underlined in the text statement on your reference sheet and highlight it.
6. Press the Create Blank button below the Text box at the bottom right of the Question section.
 - Note the highlighted word is now a text type of Fill in the Blank recorded in the Response section.
 - Under the type of response in the Response section, move your cursor to the circle on the left side of the word Number and left click with the mouse.
 - The program automatically copies your number and allows options for creating a range of values of the tolerance for a specific value. See Figure 7.
7. Click OK at the bottom right hand corner of the Fill in the Blank template. This will close the template.
8. Double click the default document name, Document 1, found on the left hand side of the TI-Navigator software.

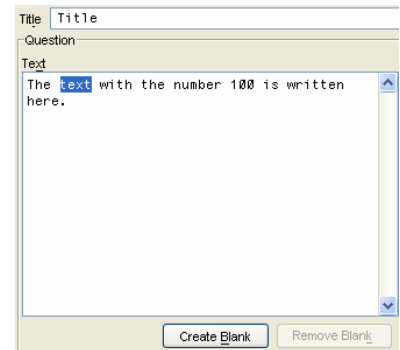


Figure 5

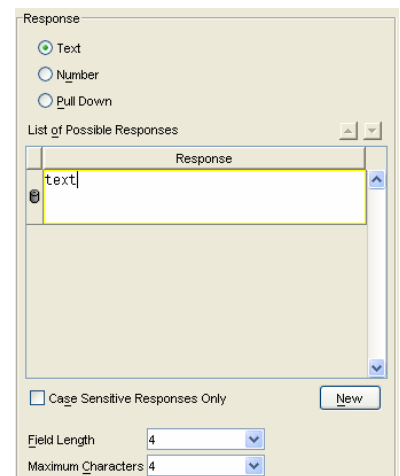


Figure 6

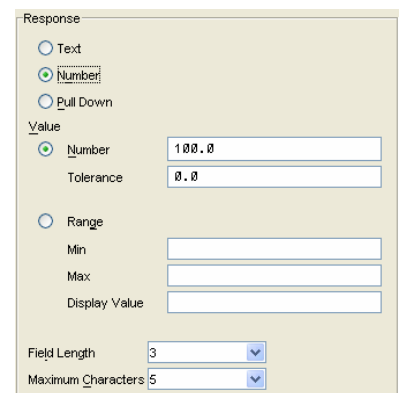


Figure 7

- Overwrite the default name under Document Title by highlighting it and entering “Fill in the Blank”.
- Click OK at the bottom right corner.

Simulating a Transfer with a Single Calculator

1. Save the educational document by clicking the Save icon or use the File, Save menu. See Figure 8.
2. Make sure that the USB unit-to-unit cable is connecting the PC and the calculator together.
3. Make sure the calculator is logged into NavNet.
4. Send the Fill in the Blank education document to the class using the Send to Class icon.

Answering a Fill In the Blank Question

1. Access and begin the assignment on the calculator.
2. The first blank is surrounded by a rectangle as shown in Figure 9.
3. If a blank was set up as a:
 - PULL DOWN, any key will access the words that can be inserted into the blank. See Figure 10. Press the number of the word desired or use the \uparrow or \downarrow arrow keys to highlight the number next to the word. Press ENTER to select the word.
 - TEXT RESPONSE, the calculator keypad is locked in alpha mode (A appears in the top right hand corner of the calculator screen). See Figure 11. Find the green letters on the calculator keypad (or use the TI-keyboard) and enter the correct answer.
 - MULTIPLE BLANK QUESTION, press the WINDOW key to move to the next blank. This key is below the word TAB on the calculator screen. See Figure 12.
 - NUMERIC RESPONSE, press the numbers on the calculator keypad that corresponds to the desired answer. See Figure 13.
4. Press the GRAPH key to move to the NEXT question.
5. When the last question is answered, the App returns to the item list. The presence of a square to the left of a question’s name indicates that the question has been answered. See Figure 14.
6. To exit the LearnChk App, press the Y= key found under the word MENU from the calculator screen.
7. Select 5 to exit the App.

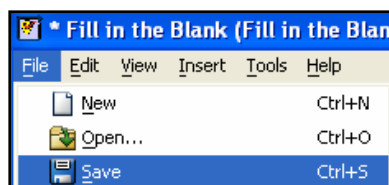


Figure 8



Figure 9

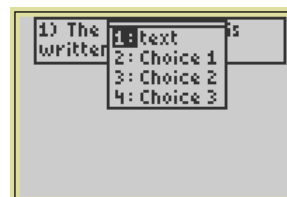


Figure 10

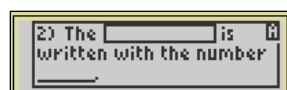


Figure 11

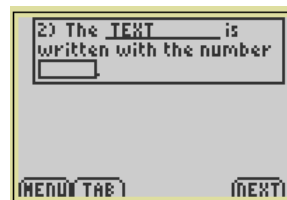


Figure 12

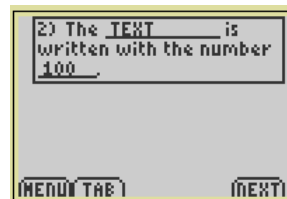


Figure 13

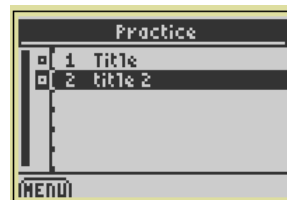


Figure 14

Simulating a Collection from a Single Calculator from Class Analysis

8. Return to the computer and select the sent file listed in the Class Record. If there are students who did not receive the file, you must stop the transfer before you can collect the answers by clicking the STOP button. See Figure 15.
9. The program which collects and grades the answers to an educational document is Class Analysis.
10. Click on the Class Analysis icon from within the TI-Navigator software or from the desktop. See Figure 16.
11. Once Class Analysis is open, click on the Choose an Assignment for Analysis icon. See Figure 17.
12. Browse for the Fill in the Blank educational document (*.edc) that was saved earlier, select the file and click on Open. See Figure 18.
13. Click on the Collect Answer Files From Classroom Devices icon to retrieve the data from student calculators. See Figure 19.
14. The pop-up window Collect Answer Files from Class appears as shown in Figure 20. Ensure that there are checkmarks to the left of the options:
 - Delete Answer File from Device after Collect.
 - Delete Assignment File from Device after Collect.
 - This allows the teacher to manage the memory of the student calculators. Click the white boxes if the checkmarks are not present.
15. Acting in the role of teacher, retrieve the student data from the calculator by pressing the Start Transfer button as shown in Figure 20.
 - Be sure that the calculator and the computer are connected with the USB unit-to-unit cable.
16. Once the transfer is complete, two green file names appear on the pop-up transfer window. See Figure 21.
 - One file is the assignment file (... \FILLINT...) and one is the answer file (... \UFILLINT...)
 - Use the mouse to click on the Close button to stop the transfer.
17. The data is collected from the calculators and displayed in a spreadsheet.

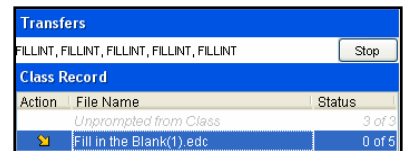


Figure 15

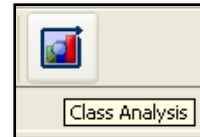


Figure 16



Figure 17

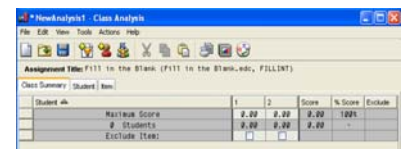


Figure 18



Figure 19

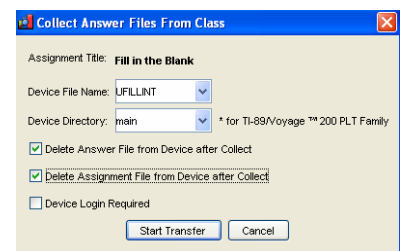


Figure 20

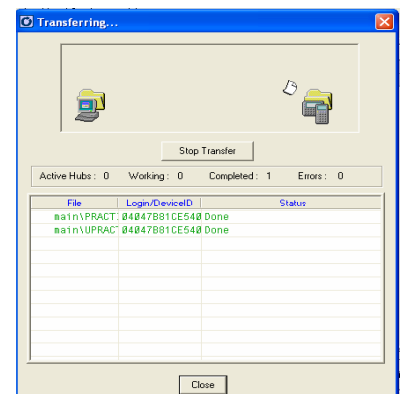


Figure 21

- From this point, the data can be printed, saved and viewed in a slide show.
 - Each student's data is coming with a file extension .usf
 - Class Analysis calls on these files and displays them as a spreadsheet. The data will not be lost unless you delete the user files.
- To save the data, click on File at the top left corner of the software window and select Save to save the file on the desktop of the computer. See Figure 22.
 - The assessment results are saved in a .caf file (Class Analysis file). The LearningCheck document is saved in an .edc file (education document).
 - To print a report, click on File at the top left corner of the software window and select Print Report. See Figure 23.
 - Explore the various printing options.
 - The Class Summary option will give the spreadsheet of grades for all students.
 - Selecting Hard Copy of Assignment will print a copy of the assignment without answers. This utility works well for file copies or makeup work.
 - If Answer Key and Include Item Data are both checked, a hard copy of the assignment with answers is printed for your files.
 - A valuable tool in TI-Navigator is the Class Results Slide Show option.
 - To examine the data from your questions in a slide show, click the Class Results Slide Show icon as shown in Figure 24 on the Class Analysis menu bar.
 - The beginning of the slide show will show the title of the activity.
 - The menu bar at the top will allow you to move between questions and display a bar graph of answers among the class. See Figure 25.
 - To access the bar graph of student responses, press the single right arrow from the menu. This moves you forward through the slide show.
 - Note that if a teacher registers a response as the correct answer, the bar will be green instead of blue.
 - Close the TI-Navigator software.

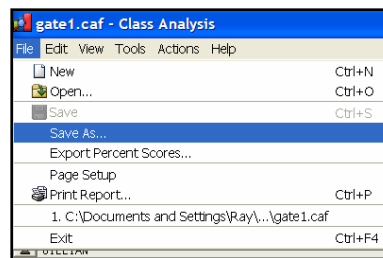


Figure 22

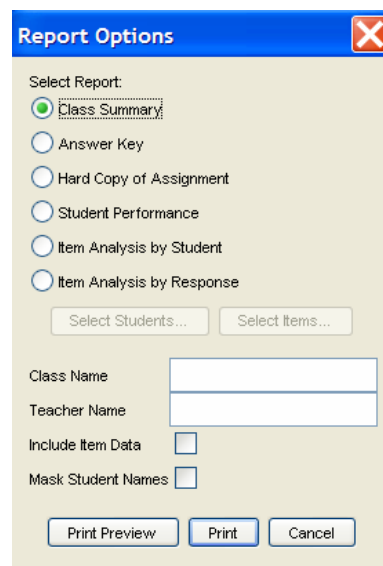


Figure 23

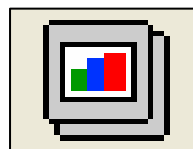


Figure 24



Figure 25

LearningCheck Open Response Questions

Concepts

- Answering Open Response questions with TI-keyboards
- Writing Open Response questions

Materials

- TI-84 Plus
- TI-Navigator™ system
- TI-keyboard

Overview

In this activity, you will use the TI-keyboard to answer questions without having to use the **[ALPHA]** button.

Answering An Open Response Question

1. Press the **[APPS]** button and use the arrow key to scroll down to NavNet. See Figure 1.
2. Press **[ENTER]** to open the NavNet application. See Figure 2.
3. Enter your USERNAME and press **[ENTER]**. Enter your PASSWORD and press the soft key OK.
4. At this point, the instructor will “force send” you a file. Once the assignment has been received on your calculator, hit the BACK soft key. See Figure 3.
5. Move the cursor to Network Apps and press **[ENTER]**. See Figure 4.
6. Scroll to LearnChk and press **[ENTER]** to open the App. See Figure 5.

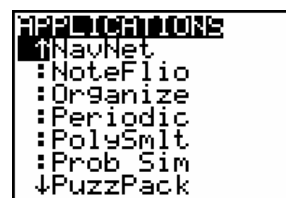


Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

7. Press **[ENTER]** on the App introduction screen. See Figure 6.
8. Move the cursor in the Assignment List to highlight the opening activity called “email addresses”.
9. Press **[ENTER]** on the calculator to open the “email addresses” assignment.
10. Press **[ENTER]** on name to get to the question.
11. Press the MENU soft key and scroll down to 8:Use keyboard. See Figure 7.
12. Use the TI-keyboard to type the text of the answer to the question, as you would use a word processor. When finished, press the NEXT soft key to move to the next question.
13. Enter your e-mail address. To access the @ symbol on the calculator if keyboards are not available, press the **[Y=]** key which corresponds to MENU, scroll down to 7:Special characters and select @. Press **[ENTER]** on the calculator, and the DONE soft key to paste the character on the screen.
14. When finished entering the text, disconnect the calculator from the TI-keyboard. Reconnect the calculator to the hub.
15. The instructor will collect answers from all participants when they are finished.

Writing An Open Response Question

1. To create an Open Response question, open the LearningCheck creator software. Click on Open Response as shown in Figure 8 to open the template for entering the question.
2. Give the question a title. Use “Email Address” for this example. Then in the Text box below Question type the following:
 - If you wish to receive periodic updates on your child’s progress during the year, please enter your name and e-mail address below. See Figure 9.
 - Click OK to finish the question.
3. There is an area for a suggested response, but Class Analysis does not grade Open Response Questions.
4. Change the default document name, Document 1 to “Parent Email”.

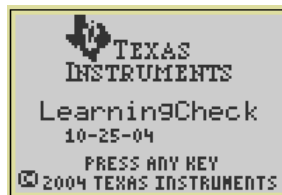


Figure 6



Figure 7

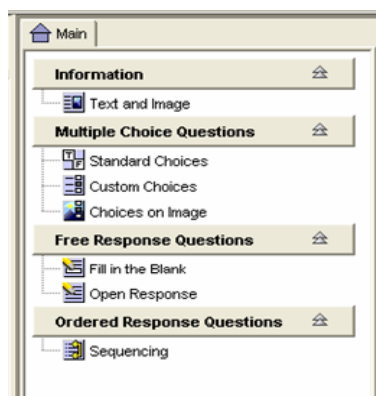


Figure 8

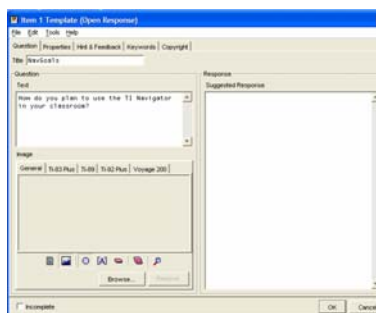


Figure 9

Simulating A Transfer With A Single Calculator

1. Save the educational document by clicking the Save icon or use the File, Save menu.
2. Make sure that the USB unit to unit cable is connecting the PC and calculator together.
3. Make sure the calculator is logged into NavNet.
4. Send the Parent education document to the class using the Send to Class icon in LearningCheck. See Figure 10.
5. As a student, open the question on your calculator and answer it.
6. As the teacher, return to the computer and use Class Analysis to collect the student responses using the Collect Answer Files From Classroom Devices icon. See Figure 11.
7. Examine the data from your question in a slide show by moving the cursor to the Slide Show icon on the Class Analysis menu bar. See Figure 12.

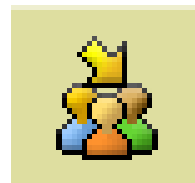


Figure 10

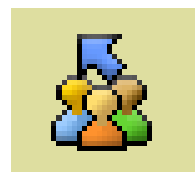


Figure 11

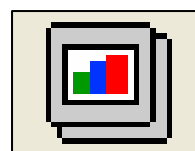


Figure 12

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LearningCheck Sequencing Questions

Concepts

- Answering ordered response or sequencing questions
- Creating ordered response or sequencing questions

Materials

- TI-84 Plus
- TI-Navigator™ system

Overview

In this activity, you will create and answer ordered response/sequencing questions and send the education document to a single calculator using the TI-Navigator system.

Comments About Sequencing Questions

1. A Sequencing question requires the student to sort items. For example, you can give students the steps of the scientific method in the incorrect order and have them rearrange them to the correct order.
2. In this example, you will be given the days of the week in mixed order. Your task is to put them in the correct order.

Answering A Sequencing Question

1. The instructor will send you the “Days” education document.
2. Once you receive the activity, access it through the menus.
3. On the Days assignment, press **[ENTER]** to look at the question. See Figure 1.
4. To move between the options press the **[▲]** and **[▼]** arrows.
5. Notice when you enter the question, there is a new tab above the **[TRACE]** soft key, which allows students to check the answer. See Figure 1.
6. Press this key and LearningCheck will tell you that the answer is incorrect. See Figure 2.
7. To move items in the sequence, move to the desired location and press **[ENTER]** to select the item you want to move. Use the **[▲]** and **[▼]** arrow keys to move the item to the desired place and press **[ENTER]** to relocate the item. Note: If you need to do a calculation, you can pause the application in order to use the calculator.



Figure 1

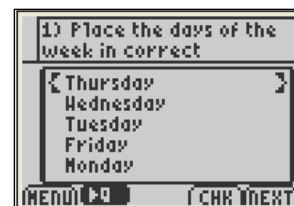


Figure 2

Pausing The App To Answer A Question

1. In order to pause the application, press the MENU soft key and select 5:Pause App. See Figure 3.
2. You can now use the calculator for any necessary calculations. To re-enter Navnet, press the [APPS] key and select Navnet. You will automatically re-enter the App and the network.

Writing An Ordered Response Question

1. Open the LearningCheck Creator software.
2. Click on Sequencing, (see Figure 4), to make the template appear in order to write the question.
3. In the title box, type the title of the question. For this example use “Order”.
4. To enter the text for the question, click on the text field under Question, and then type the text:
”Put the numbers in order from least to greatest”
See Figure 5.
5. To enter the items to sort. Click the Text field under Response.
Now you may enter the first item in the correct sequence. The first item will be “-6”. As you type the number will appear in the Correct item list.
6. To enter the second item, “-3”, click NEW and type the number. See Figure 6. In the same manner, add the numbers “0”, “2” and “12”.
7. To finish the question, click Generate Presentation Sequence. This will jumble the choices as they would appear on the calculator. See Figure 6.

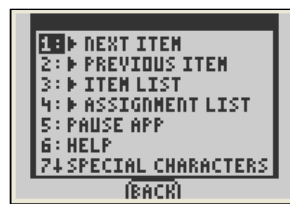


Figure 3

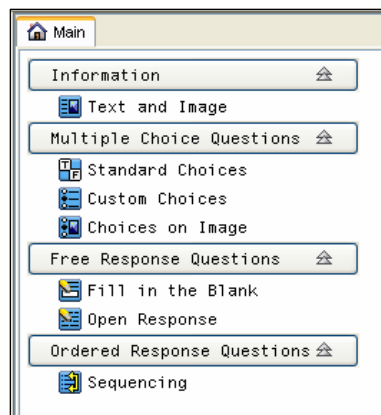


Figure 4

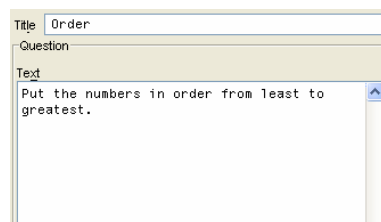


Figure 5

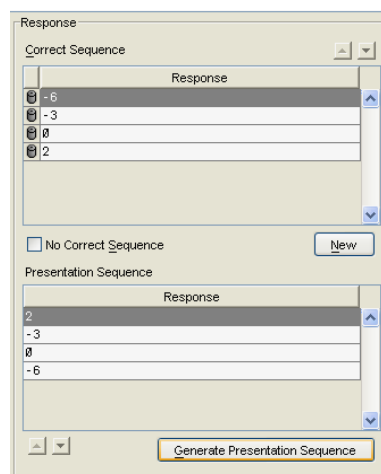


Figure 6

8. Click OK to finish the question.
9. To name the file that you will send to the calculator, double click in Document 1 along the left side of the screen. See Figure 7.

This will open the Document Information window. See Figure 8.

It will allow you to name the file as it will appear on the calculator. Enter the information such as author name, and identify the file as an Examination or Self-Check. In this window enter the name "Ordering". Click OK to finish the changes.

Sending To A Single Calculator

1. Connect your calculator to your computer with the USB silver cable.
2. Send the LearningCheck file "Ordering" to the calculator and practice answering the sequence question on the calculator.

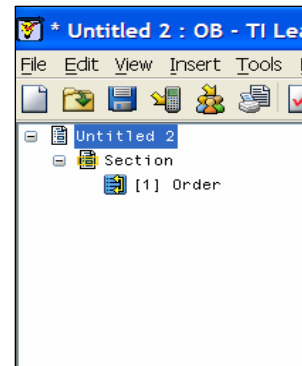


Figure 7

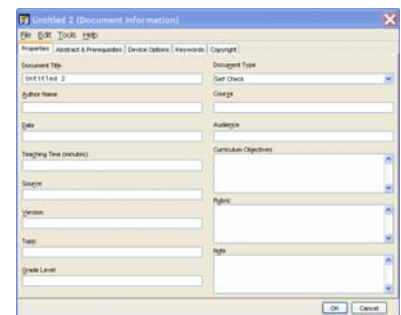


Figure 8

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Writing An Education Document

Concepts

- Practice writing an education document with various types of questions
- Practice sending and answering an education document
- Practice collecting and viewing the answer file for an education document

Overview

In this activity, you will practice writing questions for an education document, send the document to a class, answer the assignment on a student calculator, collect the student responses, and view the class results.

Materials

- TI-84 Plus
- TI-Navigator™ system

Creating A 7-Question Education Document

1. Open the TI-Navigator software.
2. Open the LearningCheck Creator.
3. Click OK in the User Profile Selection-Guest.
4. Using the Assessment information from the Reference Sheet, create the following types of questions:
 - Multiple Choice
 - Fill-In-The-Blank (Drop Down)
 - Fill-In-The-Blank (2 Blanks)
 - Multiple Choice With Image
 - Sequencing
 - Open Response
5. Save the file as “Assessment”.
6. Login a student on a calculator.
7. Using LearnCheck, send Assessment to the class (the single calculator in this case).
8. Complete the assignment on the calculator.
9. Retrieve the data using TI-Navigator.
10. Examine the data from your assignment in a slide show.
11. Save the Class Analysis file as “First Assignment”.
12. Close the TI-Navigator software.

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Homework Questions From The Class

Concepts

- Work with TI-InterActive!™
- Collect data from students using TI-Navigator™

Materials

- TI-84 Plus
- TI-Navigator™ system
- TI-InterActive!™

Overview

This activity will set up a TI-InterActive! document that will allow teachers to determine quickly which homework problems students were having difficulty completing.

Setting Up The Worksheet

1. Open the TI-InterActive! software by double clicking on the icon on the desktop. See Figure 1.
2. Click the List icon. See Figure 2. This will open the Data Editor work area (or go to the Insert menu and choose “List”).
3. Save the Data Editor work area to the worksheet document by clicking the “Save to Document” icon. (or go to the File menu and choose “Save to Document”) See Figures 3 and 4.



TI InterActive!

Figure 1

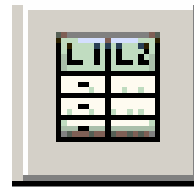


Figure 2

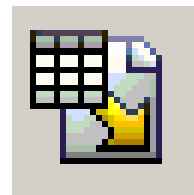


Figure 3

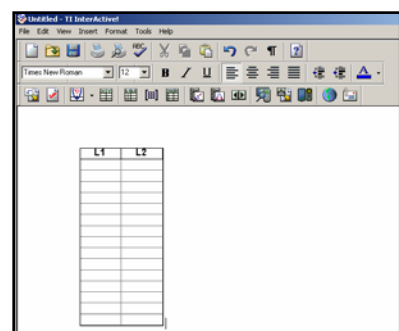


Figure 4

4. Click the arrow to the right of the Graph icon and choose the Scatter Plot icon. See Figures 5 and 6.
5. In the Functions window, see Figure 7, click on the Style icon. See Figure 8.
6. Change the Plot Type to Histogram. See Figure 9.

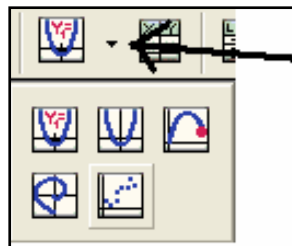


Figure 5

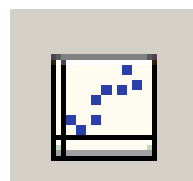


Figure 6

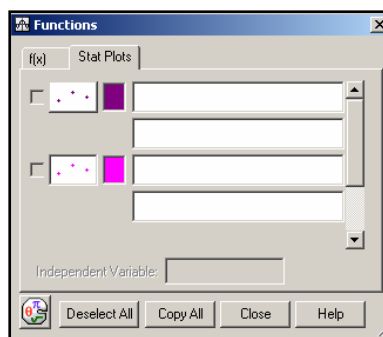


Figure 7



Figure 8

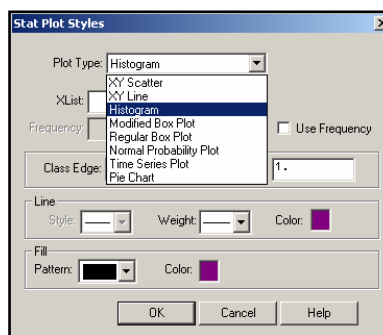


Figure 9

7. Type "L1" in the Xlist box and, if desired, change the color by clicking the Color box. See Figure 10.
8. Click OK.
9. Turn on the Histogram by clicking on the box to the left of the Style icon, See Figure 11.
10. In the Graph window, adjust the settings so that the graph is only showing Quadrant 1.
 - $X_{min} = 0$
 - $X_{max} = \#$ of problems in homework assignment
 - $Y_{min} = 0$
 - $Y_{max} = \#$ of students in class divided by 2
11. Save the Graph work area to the document worksheet by clicking the "Save to Document" icon, or from the File menu selecting "Save to document".
12. Now you are ready to collect the homework questions from your class. See Figure 12.
13. Save the TI-InterActive! document for class by clicking the Save icon or go to the File menu and choose "Save". Make a note as to where you have saved the file.
14. Exit TI-InterActive!.

Collecting Homework Questions From The Class

1. Start the TI-Navigator software and have students log into the Navigator classroom.
2. Start the TI-InterActive! software.
3. Open the TI-InterActive! worksheet you created to collect the homework questions from the class by clicking the Open icon, browsing for the file and click Open.
4. Have the students enter the homework questions in L1 for which they had difficulty.
 - Click the **[STAT]** key.
 - Choose 1:Edit.
 - Type each number of a homework question followed by the **[ENTER]** key.
5. Double click on the Lists in the worksheet to open the Data Editor window.
6. Go to the File menu, choose Import, then from Class. See Figure 13.

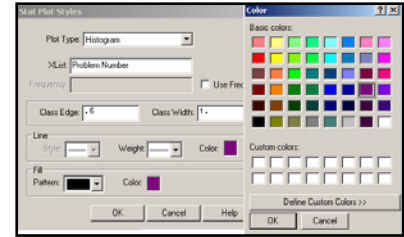


Figure 10

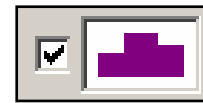


Figure 11

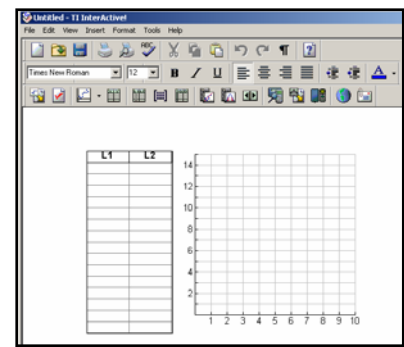


Figure 12

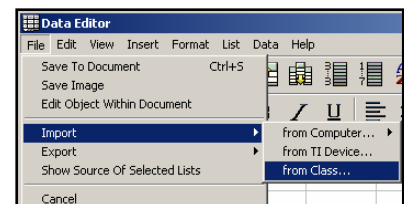


Figure 13

7. Click on the Augmented List(s) tab. See Figure 14.
8. Type L1 in the First row of boxes.
9. Click Import.
10. The students' homework questions will be augmented into the Data Editor window's L1.
11. Click the "Save to Document" icon or go to the File menu and choose "Save to Document".
12. Now you will know what questions your students really need to see in class.
13. For future reference, save the TI-InterActive! document worksheet. (see comments below)

Comments

- Once the "Setting Up The Worksheet" steps are done once, the data list and graph can be copied and pasted for the next class. Or you can have a blank one set up for use each day and do a "Save As" at the end of class for your records (instead of just a "Save").
- Keeping a cumulative record of the question histograms can be useful the next time the course is taught. Modifications can be made to address the most common questions. See Figure 15.

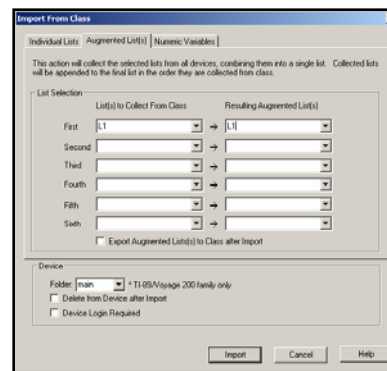


Figure 14

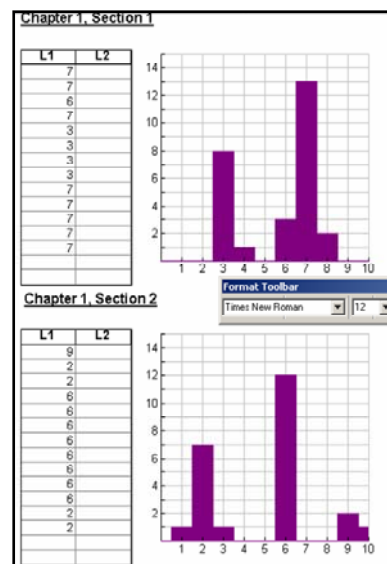


Figure 15

Item Banks

Concepts

- Use Item Bank questions in a LearnCheck file.

Materials

- TI-84 Plus
- TI-Navigator™ system

Overview

Participants will experience TI-Navigator™ from a student's perspective.

Item Banks

- In the LearningCheck software, click File, Open Item Bank. See Figure 1.
- Choose the LearnCheck file called Middle School Math. See Figure 2.
- To transfer a question from the Item Bank into the working document, click and hold on the desired question and drag into the question section. See Figure 3.

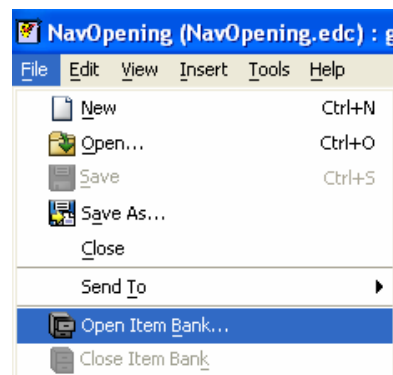


Figure 1

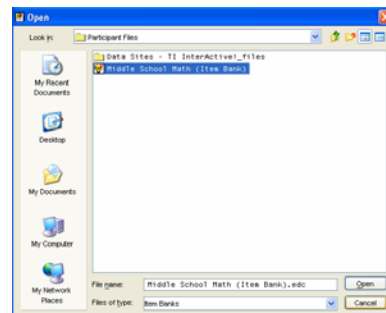


Figure 2

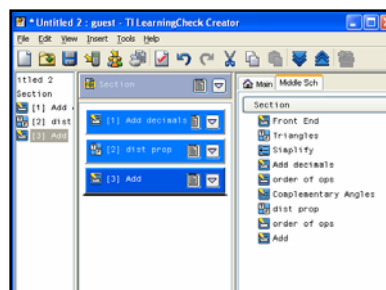


Figure 3

4. In order to close any Item Bank, right click on the Item Bank and choose Close Item Bank. See Figure 4.

Notes

1. To preview a question, double click on question in the Item Bank.
2. You can insert several Item Banks by repeating steps 1 and 2 above.
3. Each Item Bank appears as a separate tab on the far right of the screen. See Figure 5.
4. To switch between Item Banks, click on the desired tab.

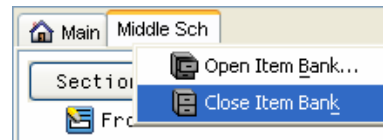


Figure 4

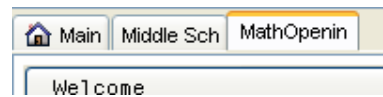


Figure 5

Working With Parabolas

Concepts

- Transformations of the vertex form of the quadratic function
- Connections between algebraic and graphic representations

Materials

- TI-84 Plus
- TI-Navigator™ software
- Program QUADMTCH
- Transformation Graphing App

Overview

Using the TI-84 Plus with the Transformation Graphing Application and the TI-Navigator system, students will explore transformations of the vertex form of the quadratic function. After a class-wide exploration, students will use the Transformation Graphing App to individually assess their knowledge of the vertex of a parabola in vertex form.

Pre-assessment

1. Send the Vertex Pretest Learning Check document to the students to assess their previous knowledge on this topic.
 - While the students are working on the pre-assessment, circulate the room and assign an integer between -10 and 10 to each student for the day's activity.
2. Collect the results from the Vertex Pretest LearningCheck using Class Analysis.
3. Quickly review class results and determine how much knowledge the students possess.
 - Use this knowledge to aide your decision on the instructional flow for the lesson.

Vertex Class Exploration

Students Contributing Lists

1. Click the Activity Center icon on the menu bar. See Figure 1.
2. Select lists from the Contribute pull-down menu. See Figure 2.
3. Click the Configure button. Select Create Data Set, L1, and L2. Click OK.
4. On the Configure Calculators for Activity window, click Configure the Plots button. Select L1 as the X-List, L2 for the Y-List in Plot1. Click OK.

In this activity, students will investigate the effect of changes in the value of h and k only on the graph of the parabola in vertex form.

Changes in a are not studied. The effect of a does appear as a “looking ahead” in the lesson Post Test.



Figure 1

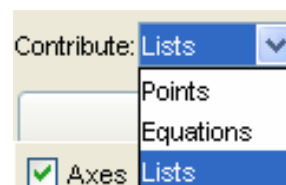


Figure 2

5. Be certain Students start with: empty lists selected.
Click OK.
6. Click Start the Activity.
7. Have students go to the Activity Center. See Figure 3.
8. Write the equation $y = (x - 2)^2 + 3$ on the board.
9. Have students record their individual x-value in L1 and the corresponding y-value in L2.
10. Press the SEND softkey.
11. The aggregated data can be found in the Activity Center in the following places:
 - Click the List tab to view the aggregated lists
 - Click the List-Graph tab to view the lists and the scatter plot
 - Click the Graph tab to view the graph
12. Stop the activity.
13. To send the aggregated lists back to the student calculators, click the Configure button and select Existing activity lists. Click OK.
14. Start the activity and students will receive the aggregated lists.
15. Stop the activity.
16. Students can then exit the APP and investigate the points contributed by class members. Have students create a stat plot on their calculators then enter the equation in y1 to verify the results and note the coordinates of the vertex.
17. Repeat this activity, if desired, with the equations:
 $y = (x + 5)^2 + 3$ and $y = -(x - 1)^2 - 3$

Vertex Class Exploration

Students Contributing Points

1. Click the Equation tab. Enter the equation $y = (x - 2)^2 + 1$ in the Y= box and click Enter.
2. Click the Graph tab to display the graph.
3. From the Contribute pull-down menu, select Points.
4. Click Configure. Select: 1 point per student, step size=1. Make sure the Send Graph Contents as Background box is checked. Click OK.



Figure 3

5. Start the Activity.
6. Ask students to locate the vertex and press the MARK soft key.
7. Stop the activity and discuss the results.
8. Activity Extension:
 - Clear all points from the graph
 - Configure the points so that each student will submit two points, step size=0.5
 - Start the Activity
 - Ask students to mark two points where the graph is increasing
 - Stop the activity and discuss the results

Vertex Class Exploration

Student Contributing Equations

1. Click the Activity Center icon.
2. Click the List-Graph tab.
3. Click File, Load, Load Activity Settings and locate and select Quadratic.
4. Click File, Load, Load Lists and select lists Q1, Q2, Q3, Q4, Q5 and Q6.
5. Select Contribute Equations.
6. Click the Configure Plots button. Check On for lists Q1 and Q2. See Figure 4. Click OK.
7. Click Start Activity.
 - Explain that students can see the plot by pressing the PLOT soft key and can toggle back to the equation by pressing the EQN soft key. See Figures 5 and 6.
 - Students should press the SEND soft key when they are satisfied that their equation fits the plot.
8. When all students have sent their equations, click Stop Activity and discuss the results.
9. To repeat the activity for the next data set, click the Graph-Equation tab, select the student equations and click the Hide button. Click on the white space to actually hide the graphs.
10. Click on the List-Graph tab, uncheck the Plot1 On box, click the right arrow button, check the Plot2 On box. See Figure 7.

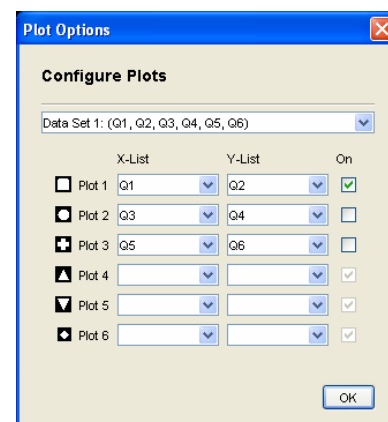


Figure 4



Figure 5

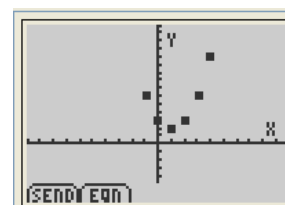


Figure 6

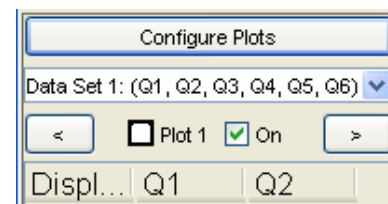


Figure 7

11. Click Start Activity and repeat steps 6 to 9.
12. Repeat the process for the activity with Plot3.

Student Self-check

13. Have the students run the Transformation Graphing application.
14. Transfer the program QUADMTCH using the TI-Navigator system.
15. Have the students run this program.
 - Explain that after finishing the first match they are to turnoff Plot 1, turn on Plot 2 and then press **[GRAPH]** to see another practice problem.
 - Figure 9 shows how the **[Y=]** screen will look before start of the second “game.” You might have to give instructions on how this is accomplished.
 - There are a total of 3 practice problems, Plot 1, Plot 2, and Plot 3.
 - While students are working with this program, circulate through the room aiding those who had difficulty with the function evaluation during the second phase of the lesson.

How Did They Do? Summative Assessment

1. Send the Vertex Post Test LearningCheck document to the students to assess their progress with the lesson.
 - The last three questions on this test involve student predictions of the effect of changes in the value of a on the graph of the parabola when presented in $y = a(x - h)^2 + k$ form.
2. Collect the class results of the Vertex Post Test LearningCheck using Class Analysis and review the results.

QUADMTCH sets all student handhelds so they are the same.

Students are to use the Transformation Graphing App to move one parabola on top of the other.

Figure 8 illustrates the screen when QUADMTCH is initially executed.

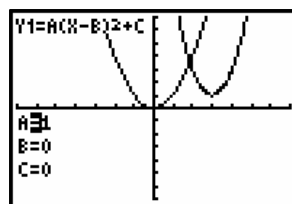


Figure 8

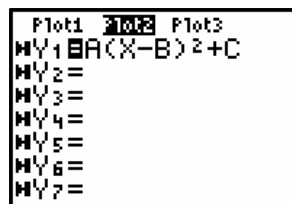


Figure 9

Projectile Motion

Concepts

- Position, velocity, and acceleration
- Collecting files from student handhelds

Materials

- TI-84 Plus
- TI-Navigator™ software
- TI-84 Plus picture PIC1

Overview

Participants will receive a graph of the height of a rocket over time. The instructor will ask participants questions about the rocket involving height, velocity, and acceleration. Participants will respond by moving the free-floating cursor to the appropriate point on their graph. After each question, TI-Navigator will be used to collect participants' results (screen captures) and display them for the class. This display can encourage class discussion of the relation between height, velocity, acceleration, and the graph.

Introduction

1. Students are often hesitant to respond to questions in class because they are afraid of being wrong. TI-Navigator allows students to respond to questions anonymously.
2. This feature encourages more students to participate and become involved in classroom discussions.

Procedure

1. Launch TI-Navigator, Begin Class, then send the picture PIC1 to the class.
 - See the Tip Sheet for sending a picture.
2. Participants should clear their Y= menus.
 - Go to the Y= menu and clear each entry. See Figure 1.
 - Deselect all scatter plots.
 - Set Window: Xmin = -1, Xmax = 15, Xscl = 1, Ymin = 0, Ymax = 500, Yscl = 100. See Figure 2.
3. Participants should turn off their axes.
 - Go to the Graph Format by pressing 2nd ZOOM ([Format]).
 - Highlight AxesOff and press ENTER . See Figure 3.
4. Each participant should open the picture PIC1.
 - Press 2nd PRGM ([Draw]). Scroll to STO, then use the arrow keys, and scroll to 2:RecallPic. See Figure 4.

```
Plot1 Plot2 Plot3
\Y1=
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

Figure 1

```
WINDOW
Xmin=-1
Xmax=15
Xscl=1
Ymin=0
Ymax=500
Yscl=100
Xres=1
```

Figure 2

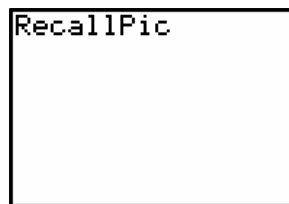
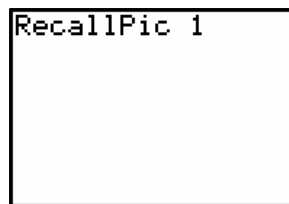
```
RectGC PolarGC
CoordOn CoordOff
GridOff GridOn
AxesOn AxesOff
LabelOff LabelOn
ExprOn ExprOff
```

Figure 3

```
DRAW POINTS STO
1:StorePic
2:RecallPic
3:StoreGDB
4:RecallGDB
```

Figure 4

- Press **[ENTER]** to paste the RecallPic command to the Home Screen. See Figure 5.
 - Select 1. See Figure 6.
 - Press **[ENTER]** to open the picture. See Figure 7.
5. How high did the rocket travel?
 - Use your TI-84 Plus cursor movement keys and the free-floating cursor to mark the point on the graph that corresponds to the highest point in the rocket's trajectory.
 - Wait for your instructor to collect the class results.
 - How high do you think the rocket traveled?
 6. The instructor will capture screen shots of each participant's home screen and display the class results.
 7. The instructor should ask the participants to discuss the reasoning behind various answers (screen shots).
 - The responses should remain anonymous so that participants (students) are more likely to participate in the discussion.
 8. When was the rocket's velocity zero?
 - When your teacher tells you to do so, mark the point on the graph that shows when the rocket's velocity is zero.
 - Wait for your instructor to capture the screen shots and display class results, then choose one of the responses and explain why a student might have marked that point.
 - Tell whether or not you think this is the correct point.
 9. When did the rocket engine finish burning?
 - When your teacher tells you to do so, mark the point on the graph that shows when the rocket engine finished burning. Wait for your instructor to capture the screen shots and display class results. Use the collated results to see what your classmates thought.
 10. When was the rocket's velocity greatest?
 - When your teacher tells you to proceed, use your handheld to mark the point when the rocket's velocity was greatest.
 - After you have seen the collated class results, choose one of the responses, mark it in the and explain why a student might have marked that point.
 - Tell whether or not you think this is the correct point.

**Figure 5****Figure 6****Figure 7**

11. When was the rocket's velocity constant?
 - When your teacher says it is okay to proceed, use your handheld to mark a point on the graph where the velocity is constant, then view the collated class responses.
 - Why would the rocket fall with a constant velocity?
12. When do you think the rocket touched down?
 - Where did it touch down?
 - Explain why you chose these answers.
13. When did the rocket's velocity change from positive to negative?
 - When your teacher tells you to do so, mark the point on your TI-84 Plus graph that shows when the rocket's velocity changed from positive to negative.
 - After you have seen the collated class results, choose one of the responses and explain why a student might have marked that point.
 - Tell whether or not you think this is the correct point.
14. When did the rocket's velocity change from increasing to decreasing?
 - When your teacher tells you to do so, mark the point on your TI-84 Plus graph that shows when the rocket's velocity changed from increasing to decreasing.
 - The instructor should collate the results and ask participants to discuss the reasoning behind various answers (screen shots).
 - The responses should remain anonymous so that participants (students) are more likely to participate in the discussion.
15. During what time interval was the rocket accelerating?
16. During what time period was it decelerating?
 - During either or both of 15 and 16, the instructor may do screen captures of student responses from the home screen or have the students return to the Activity Center and do a Quick Poll.

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Phases Of The Moon

Concepts

- Interpreting Graphs

Materials

- TI-84 Plus
- TI-Navigator™ software
- Images of Moon Phases each day for one month
- Phases of the Moon Student Activity Sheet

Overview

This activity is designed to have students to interpret the graph of the percent of the moon showing over the days of a month. The activity will lead students to relate each phase of the moon to its location on a model of the data for any month.

Introduction

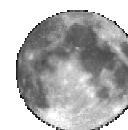
1. There are eight traditionally recognized phases of the moon.
2. The Pre-Moon Learning Check will assess students' prerequisite knowledge of these eight phases.
3. Students will then be given images of the moon for one or more days of the month and will be asked to estimate the percent of the moon that is illuminated on the given day(s).

Assess Student Prerequisite Knowledge

1. Before beginning the classroom activity students should be given the Phases of the Moon Worksheet, estimate the percent of the moon that is illuminated for their assigned day(s), and complete #1-4 on the worksheet.
2. Students should enter their estimate(s) in L1 and L2.
 - The day of the month should be in L1.
 - The estimate of the percent of the moon that is showing should be in L2.
3. While students are working, send the PreMoon.edc file to the class. Do NOT check Force Send Now. Instruct students to start the NavNet App and select 3:Transfers when they have completed their lists.
4. After the transfer is complete, students should select Network Apps from the TI-Navigator Home screen on their calculator, select LearnChk and do the PreMoon assignment.



New Moon
0% illuminated
(Students should enter 0)



Full Moon
100% illuminated
(Students should enter 1)

5. Begin Activity Center and setup to collect L1 and L2 from the student calculators so the class data will be aggregated.
 - Setup the List-Graph to display the scatter plot for later viewing.
6. Collect the student responses to the PreMoon LearningCheck using Class Analysis.
7. Use the Class Results Slide Show to prompt a discussion of student understanding of the eight phases of the moon.

Analyzing The Collected Data

1. After the student data has been collected and aggregated, show the class the scatter plot of their estimates from the List-Graph window in the Activity Center. Answer question #5 on the worksheet.
2. Have each student talk to the student that estimated the percent of the moon illuminated on the day before and the day after their day, and then adjust their estimate(s) in L2 if desired. Answer question #6 and 7 on the worksheet.
3. The teacher should hide the original data in the lists and restart the activity.
4. Students should return to the Activity Center, enter their adjusted value(s) if necessary and resend the lists.
5. Show the revised scatter plot and discuss. Have students complete the worksheet.

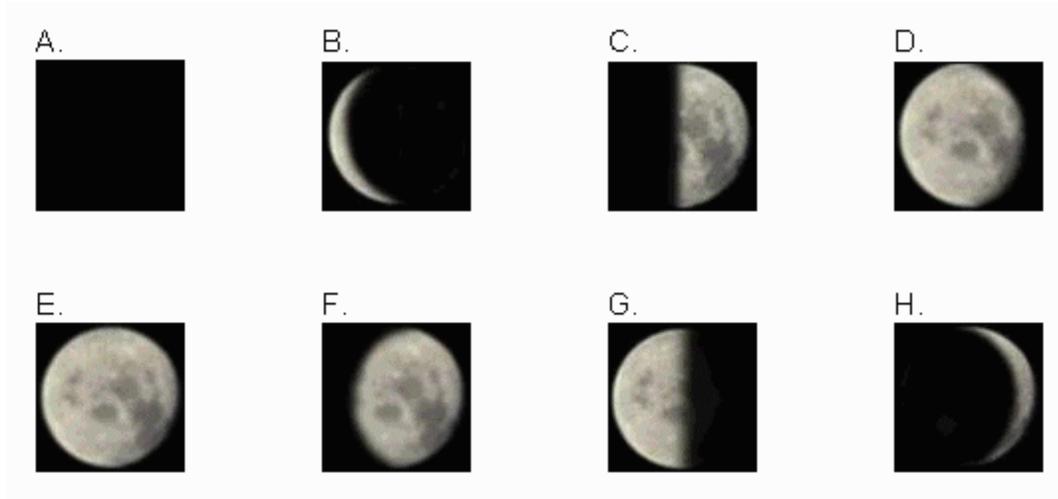
Assess Student Knowledge

1. Exit the Activity Center and send the PostMoon LearningCheck to the class. Check the Force Send to Students Now box.
2. Have students complete the PostMoon activity in LearnChk.
3. Collect the student responses to the PostMoon LearningCheck using Class Analysis.

Phases of the Moon Worksheet

Name _____

Date _____



1. Match the eight traditionally recognized phases of the moon with the correct image shown above.

Phase	Date
First Quarter	
Full Moon	
New Moon	
Third Quarter	
Waning Crescent	
Waxing Crescent	
Waning Gibbous	
Waxing Gibbous	

2. Your teacher has assigned you a day of the month. Record your day and the phase of the moon for your day.

3. Estimate the fraction of the moon showing for your date? _____

4. Record your day in L1 and your estimate in L2.

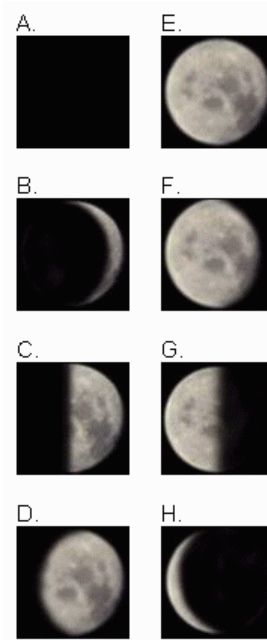
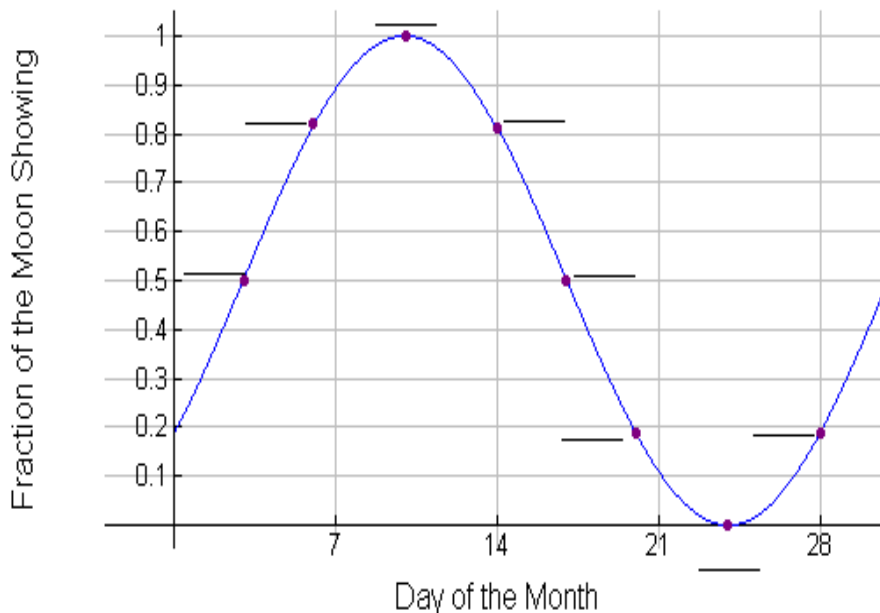
5. What patterns, if any, do you see in the scatter plot produced by your class's estimates? Do any of the estimations need to be revised?

6. Find three other students in your class that have days that are in consecutive order with your day. List their names, days, and moon phases.

Student Name	Day	Estimated Fraction

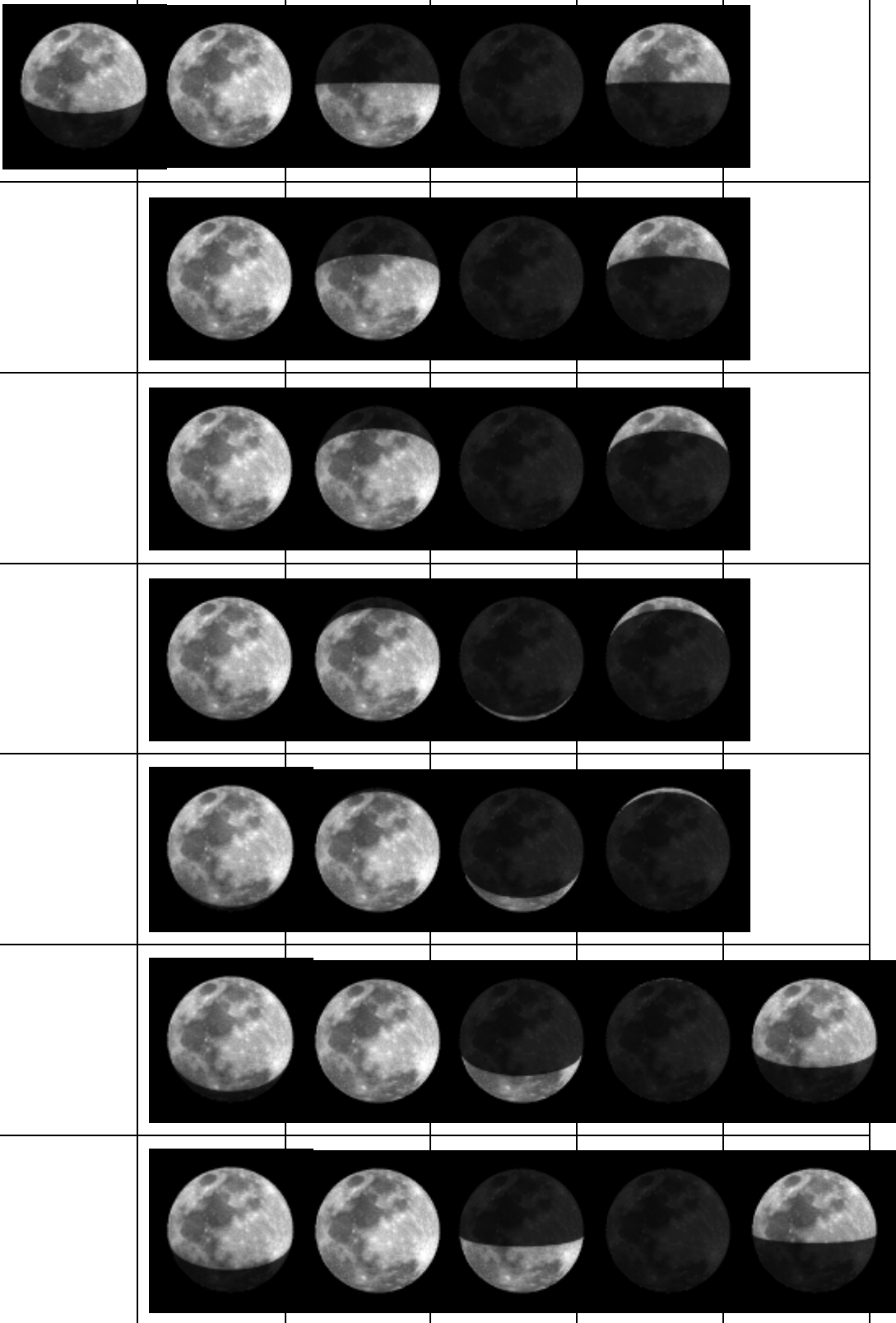
7. Revise your estimation if necessary. Record your day in L1 and your estimate in L2.
 8. Describe how the graph would look if two consecutive months were plotted.

9. On the graph, match the letters from the previous page to the points to identify the phases of the moon.



10. Explain how you can tell from the graph when there is a waxing gibbous moon.

Phases of the Moon for January 2004



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Introduction to Cabri® Jr.

Welcome to the world of Cabri® Jr., the powerful interactive geometry application for the TI-84 Plus handheld. Cabri Jr. is the latest member of the Cabri Geometry software family. Originally published in 1988, Cabri Geometry was the first example of a new genre of mathematics software where geometric figures could be constructed and then dynamically moved on the computer screen while retaining the constructed properties of figures. Cabri Geometry™ II software, an upgrade of the original program, was published by Texas Instruments in 1995 in conjunction with a version of the software resident in the new TI-92 graphing handheld. Cabri Geometry II for the TI-92 was the first interactive geometry software ported to a handheld device. Since that introduction to handhelds, the program has been modified as a flash application to run on the TI-89, TI-92 Plus, and the Voyage 200 handhelds. Cabri Jr. is the next logical step in the family tree, opening the door to interactive geometry on the TI-84 Plus type handheld platforms.

The name Cabri Jr. gives some indication of the functionality of this new application compared to its parent programs. Because of the limitation of the TI-84 Plus type handheld platform, Cabri Jr. does not have all of the functionality of other versions of the program, especially the computer versions. However, this does not mean that the program is trivial or useless. On the contrary, Cabri Jr. is often the perfect solution for students and teachers in the typical secondary mathematics classroom setting. In addition, Cabri Jr. has the ability to interact with the latest computer version of the software, Cabri Geometry II Plus in both directions. The power of Cabri Jr. for the mathematics classroom comes from its ease of operation and that it is ported to a common platform like the TI-84 Plus that is readily accessible to so many secondary students.

Important Issues

When considering the functionality of Cabri Jr., two important issues must be addressed with teachers and students using the software. One of these issues is related to interactive geometry software in general and the other is related more specifically to Cabri Jr.

A General Interactive Geometry Issue

You will receive two Cabri Jr. files from the instructor via the TI-Navigator: SQRDRAW and SQRCONST. The difference between the two files will be discussed below.

A careful distinction must be made between the idea of a drawing and a construction. Figure 1a shows what appears to be a square constructed on the screen using Cabri Jr. Measurement tools have been used to demonstrate numerically that all the sides and angles of the figure are congruent, making the figure a square. Figure 1b shows what happens when one of the vertices of the “construction” is dragged on the screen. While the shape appeared to have all the properties of a square, if these properties do not remain valid when the shape is dragged, then the original shape was a drawing not a construction.

Figure 2a shows another shape that appears to be a square. When the shape in Figure 2a is dragged, the properties that indicate the shape is a square are still valid as shown in Figure 2b. Even when side lengths of the square change, all four are still equal. The shape in Figures 2a and 2b are constructions, not drawings. Drawing a figure on the screen only gives the appearance of specific properties, like equal length sides or right angles. A construction guarantees that the figure will have specific properties no matter how it is dragged around the screen. This crucial difference between a drawing and a construction is one of the basic features that make interactive geometry software so powerful and useful in the mathematics classroom as a visualization and exploration tool.

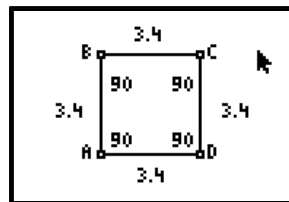


Figure 1a

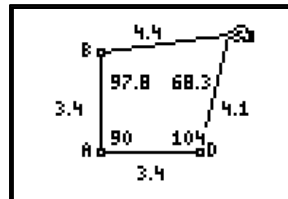


Figure 1b

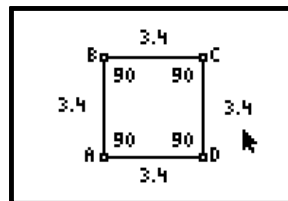


Figure 2a

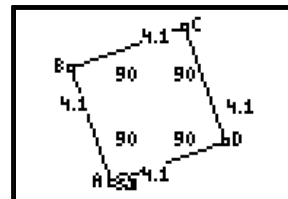


Figure 2b

A Specific Cabri Jr. Issue

You will now receive the file CIRTRI1 from the instructor. This file will illustrate the difference when using Cabri Jr.

One of the things that you will notice about Cabri Jr. on the TI-84 Plus platform is how fast points, figures, and construction drag across the screen. This speed is the result of the way numerical values are calculated and tracked by the application program. In order to achieve the desired speed, the precision of the calculations used in Cabri Jr. has been limited to two decimal places with a displayed precision of one decimal place. This compromise causes certain apparent discrepancies to appear on the screen, especially with angle measurements.

Figure 3a shows an angle inscribed in a semicircle. The Central Angle Theorem guarantees that $\angle ABC = 90^\circ$ since $\angle AOC = 180^\circ$. However, when $\angle ABC$ is measured and dragged, it seems to vary in size from 89.8° to 90.1° . See Figures 3a, 3b, and 3c.

The question is whether this type of variation in the angle measure constitutes a problem or an opportunity. A computer construction using measurements cannot be considered an analytical proof. Since this is true, having a more exact numerical value, no matter how accurate, will never make a measured figure serve as an analytic proof. The variation in the measured values shown in Figures 3a, 3b, and 3c is a strong “suggestion” that there might be an underlying mathematical property. With only a suggestion of a mathematical property, there is a stronger motive to pursue a true analytic proof to explain the truth of the suggestion than if the values were exact in all cases. For example, an analytic proof for that an angle inscribed in a semicircle is a right angle could proceed as follows:

Construct the segment OC (Figure 4). The sum of the angles of $\triangle ABC$ is 180° so we can conclude that $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 180^\circ$. Segments OA, OB, and OC are congruent since they are radii of the same circle. This means that $\triangle ABO$ and $\triangle OBC$ are both isosceles and that $m\angle 1 = m\angle 2$ and $m\angle 3 = m\angle 4$. Combining these results by substitution yields $2 \cdot m\angle 2 + 2 \cdot m\angle 3 = 180^\circ$. Algebraically, this becomes $2 \cdot (m\angle 2 + m\angle 3) = 180^\circ$ or $m\angle 2 + m\angle 3 = 90^\circ$, the result required.

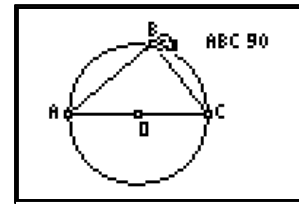


Figure 3a

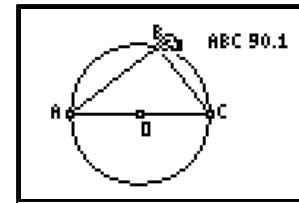


Figure 3b

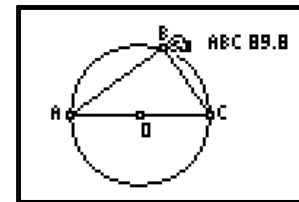


Figure 3c

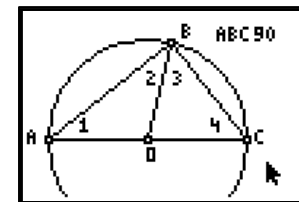


Figure 4

One of the main purposes of interactive geometry software like Cabri Jr. is to promote mathematical thinking and reasoning among students who use it. Cabri Jr. provides an environment that encourages the need to complete the exploration-discovery-proof thinking process. Without the final step, the process is incomplete, lacking the closure that real proof provides.

Eugene Olmstead

Charles Vonder Embse

October 2003

Lines in the Coordinate Plane

Concepts

- Slope
- y-intercept
- Equation of a line in the coordinate plane
- Horizontal and vertical lines
- Parallel and perpendicular lines

Materials

- TI-84 Plus
- TI-Navigator™ software
- Cabri Junior application
- Cabri Geometry II Plus software

Overview

One of the most important topics in algebra is linear functions. This activity approaches this topic from a geometric rather than algebraic point of view. First, lines are geometric objects in the coordinate plane. These geometric objects have properties that we can describe algebraically. The algebraic representations are then driven dynamically by the geometric objects. The final result of the activity is a better understanding of linear functions both algebraically and geometrically.

Introduction

1. How would you describe the steepness of a roof, hill, ramp, or set of stairs?
 - Some hills, for example, are very steep like a challenging (Black Diamond) run at a ski area.
 - Some roofs are nearly flat and some are so steep that no one could walk on them without special equipment.
 - The concept of steepness of a line in the coordinate plane can be explored dynamically using a simple right triangle attached to a line.
2. In the plane, the positive y-axis is considered to be “up” and the negative y-axis is “down.”
 - The x-axis is considered to lie in the horizontal direction, left to right.
 - Imagine the y-axis standing vertically upward so steepness of a line will be represented by how much the line goes “up” or “down” related to the y and x-axes.

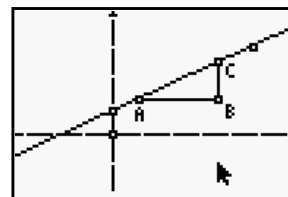


Figure 1

Exploration

1. Sent the Cabri Junior figure called LINES1 using the TI-Navigator system.
 - This Cabri Junior figure contains a construction that originally looks like Figure 1, a line in the coordinate plane with right triangle $\triangle ABC$ attached to the line along its hypotenuse at points A and C.

- The right angle is always located at point B.
 - The point where the line intersects the y-axis is called the y-intercept of the line.
 - The “control point” for the line’s steepness is the unlabeled point on the line in the upper right corner of the screen.
 - **Note:** Be prepared at each step of this investigation to share your reasoning about the question and your Cabri Junior figure with the class via the TI-Navigator system.
2. Drag the control point of the line and explain what happens to the shape of the right triangle. See Figure 2.
 - How is this related to the steepness of the line? Explain.
 3. Drag the y-intercept of the line along the y-axis and explain what happens to $\triangle ABC$ and the position of the line. See Figure 3.
 - Experiment with different rotations of the line to see if there is a pattern.
 - Explain any patterns you find.
 4. Sometimes the line is “uphill” from left to right as in Figure 3 and sometimes it is “downhill” from left to right as in Figure 4.
 - How would you differentiate between an uphill and downhill line of the same steepness?
 - Explain your reasoning.
 5. Measure the length of segments AB and BC.
 - Use the Calculate tool from the F5 menu to compute the value of the ratio:

$$\frac{BC}{AB}$$
 - Make a conjecture about a way that you could use these measurements to quantify the steepness of a line.
 - Test your conjecture and then explain your method and reasoning.
 6. Drag point C (and/or A) along the line to change the lengths of the legs of the right triangle $\triangle ABC$. See Figure 5.
 - Is there any variation in the value of the ratio?
 - Explain what happens and why.

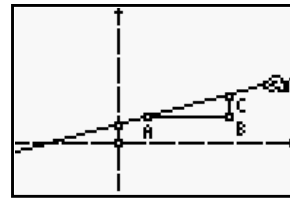


Figure 2

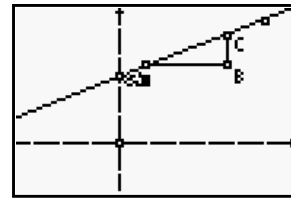


Figure 3

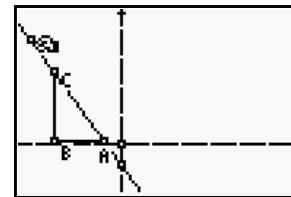


Figure 4

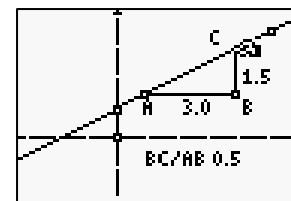


Figure 5

7. The ratio

$$\frac{BC}{AB} \text{ is the ratio of } \frac{\text{Change in } y \text{ coordinates}}{\text{Change in } x \text{ coordinates}}$$

and is called the slope of the line.

- Use the Slope measurement tool from the F5 menu to compute the slope of the line. See Figure 6.
- Explain how the slope of the line compares to the ratio

$$\frac{BC}{AB}$$

as the line rotates around the y-intercept.

- Are these two values always equal? Explain.
- Drag points A and C and explain how the slope is affected and why.

8. Using the Coord & Eq tool from the F5 menu, compute the equation of line AC.

- Explain how this compares to the ratio

$$\frac{BC}{AB}$$

and the slope as you rotate the line around its y-intercept. See Figure 7a.

- How does dragging the y-intercept change the equation as shown in Figure 7b?
- Show the coordinates of the y-intercept of the line.
- Explain the relationship between the equation of the line and the coordinates of the y-intercept, and the slope of the line as the line is rotated and translated.

9. On a new screen with the coordinate axes showing, construct a line through the origin extending through the first quadrant.

- Measure the slope and show the equation of this line.
- Rotate the line around the origin and observe the value of the slope in various positions.
- Sometimes the value of the slope is positive and sometimes it is negative.
- Sometimes the slope has a large absolute value and sometimes it has a small absolute value.
- Sometimes the slope is zero, sometimes it is one, and sometimes it is infinitely large.
- Determine a way to organize the different slope values so you can quickly estimate the slope of any line.

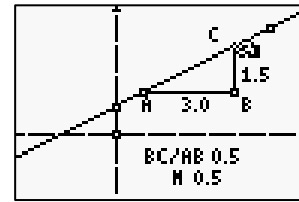


Figure 6

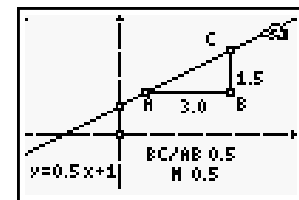


Figure 7a

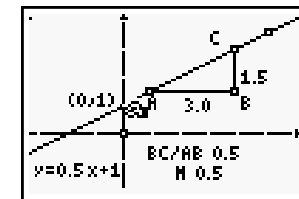


Figure 7b

10. Explore the slopes of parallel and perpendicular lines.

- Open a new screen and show the coordinate axes.
- Draw a line with a y -intercept extending through the first quadrant. See Figure 8.
- Using the Parallel tool, construct another line parallel to the first line with its defining point on the y -axis.
- Note: when using the Parallel tool, select the line first and then place the defining point on the y -axis.
- Use the Slope tool to compute slopes and the Coord. & Eq. tool to compute the equations of both lines.
- Drag the original line and make a conjecture about the slopes of parallel lines.

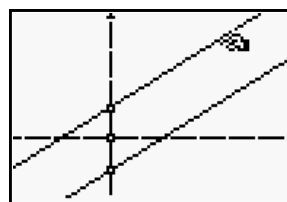


Figure 8

11. Start with a new screen with the coordinate axes showing.

- Draw a line with a y -intercept extending through the first quadrant.
- Use the Perp tool to construct a perpendicular line at any point on the original line. See Figure 9.
- Use the Slope tool to compute the slope and the Coord & Eq tool to compute the equation of both lines.
- Helpful hint: use the Calculate tool to compute the product of the slopes of the two lines.
- Drag the original line and make a conjecture about the slopes of perpendicular lines.

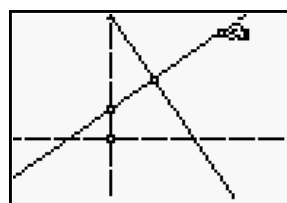


Figure 9

Teaching Notes: Lines in the Plane

Teacher Preparation

- Directions for creation of the Cabri Junior file LINES1 used in this activity if it is not available electronically:
- Use the Hide/Show tool to show coordinate axes.
 - Draw a horizontal segment in the lower portion of the screen.
 - Construct a Point on the y -axis.
 - Use the Compass tool to construct a circle centered at the point on the y -axis with the radius of the first segment drawn.
 - Draw a Line from the center of the circle to a point on the circle such that the line goes off to the upper right of the screen.
 - Drag an endpoint of the segment to enlarge the circle and place the point on the circle further out on the line.
 - Hide the circle and the segment and its endpoints. See Figure 1.
- Construct two points on the line and label them points A and C as shown in Figure 2.
- Do *not* use the points defining the line as either point A or C.
 - Construct a line perpendicular to the x -axis through C by selecting the x -axis first and then the point.
 - Construct a second line perpendicular to the y -axis through A.
 - Label the intersection of these two lines point B.
 - Draw segments AB and BC and hide the perpendicular lines. See Figure 3.
- Save this figure as LINES1 (on the teacher calculator).
- Send the Cabri Junior file LINES1 to student calculators using the TI-Navigator system (from the teacher calculator).

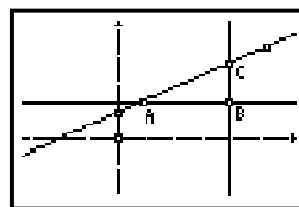


Figure 1

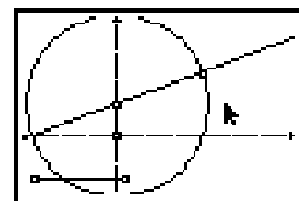


Figure 2

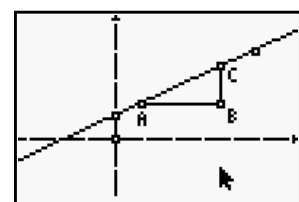


Figure 3

Exploration

- At each step in the Exploration, use the TI-Navigator system to capture student work for display on the projection screen at the front of the room.
 - This display can be done on the TI-84 Plus using Cabri Junior or with Cabri Geometry II Plus software on the TI-Navigator system control computer.
 - As students explain their reasoning, either the teacher or the student can manipulate the sample drawing to illustrate the ideas and reasons used.
- This construction creates a "slope triangle" attached to the line showing the dynamic relationship

$$\frac{\Delta y}{\Delta x}$$

the definition of slope of a line.

- As points A and C are dragged along the line, the right triangle changes size but not shape, producing a sequence of similar triangles.
 - Measuring angles of $\triangle ABC$ will help convince students that no matter where points A and C are located, all versions of the triangle are similar to each other. See Figures 4a and 4b
 - Since similar triangles have proportional sides, the ratio $\frac{BC}{AB}$ will stay constant as long as the line is not rotated.
- As the line is rotated around the y-intercept, the hypotenuse of the right triangle remains the same length but the legs change. See Figure 5.
 - This means that the angles of the slope triangle change producing non-similar triangles.
 - When the line is nearly horizontal, the vertical leg is very short and the horizontal leg is nearly as long as the hypotenuse.
 - The reverse is true when the line is nearly vertical.
 - As the y-intercept is dragged along the y-axis, the slope triangle is translated vertically in a rigid motion. See Figure 6.
 - This means that all of the properties of the triangle remain unchanged.
 - The only way to change the shape of the triangle is to rotate the line to change its steepness.

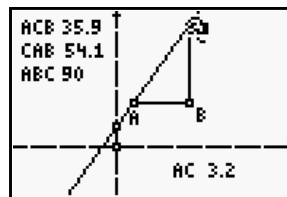


Figure 4a

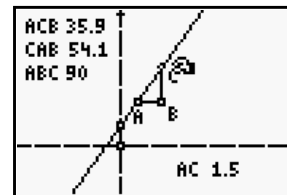


Figure 4b

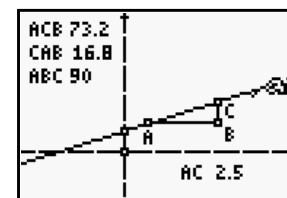


Figure 5

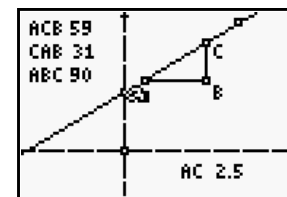


Figure 6

- This visualization foreshadows the property of parallel lines having equal slopes.
 - Some students may see the motion of the line as it is dragged by the y-intercept as a parallel translation.
5. It is very important that students orient the coordinate plane from left to right.
 - This orientation is what makes all of the arguments about positive and negative slope work.
 - If students always move from left to right, then “uphill” can be associated with positive slopes and “downhill” can be associated with negative slopes. See Figure 7.
 6. As the line is rotated, the lengths of segments **AB** and **BC** will change. See Figure 8.
 - The ratio $\frac{BC}{AB}$ changes, becoming larger as the line approaches a vertical position and smaller as it approaches a horizontal position.
 - Students may see the inverse pattern that as one gets longer the other gets shorter or that sometimes the lengths are equal.
 7. As points **A** or **C** move along the line, the ratio $\frac{BC}{AB}$ remains unchanged.
 - This is the “promise” every algebra teacher makes that no matter what two points you choose on a line, the slope is the same. See Figure 9.
 - The reason this is true for this construction is that as points **A** or **C** move, all versions of $\triangle ABC$ are similar by the Angle-Angle similarity theorem for triangles.
 7. The absolute value of the ratio $\frac{BC}{AB}$ and slope are equal.
 - The ratio $\frac{BC}{AB}$ gives only positive values for slope since the two distances making up this ratio are always positive.
 - The Slope measurement tool computes slope correctly for all lines.

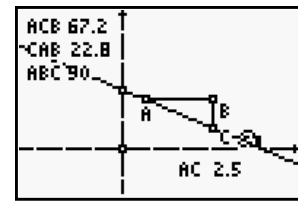


Figure 7

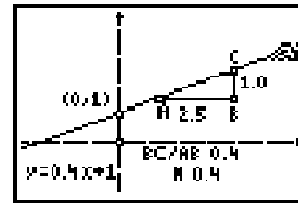


Figure 8

- Like the ratio

$$\frac{BC}{AB}$$

the value of slope remains unchanged as A and C are dragged along the line.

- The slope is constant at all points on a fixed line.

8. The function version of the equation of a line is $y = mx + b$ where m equals the slope of the line and b is the y -intercept, $(0, b)$.

- As the line is rotated around y -intercept, the slope of the line is equal to the coefficient of x in the equation (Figure 9).

- When the line is neither horizontal nor vertical, the ratio:

$$\frac{BC}{AB}$$

is the same as the absolute value of the coefficient of x .

- The ratio and the coefficient are equal when the line passes through the first and third quadrants with a positive slope.
- The ratio and the slope differ by their sign when the line passes through the second and fourth quadrants with a negative slope.

9. Dragging the y -intercept changes the value of b in the equation. See Figure 10.

10. This exploration forms the basis for understanding the slope-intercept form of a linear function, $y = mx + b$, and helps build the notion for the future study of the vertical shifting of the linear function from $y = mx$ to $y = mx + b$.

11. Construct the lines $y = x$ and $y = -x$ to organize the different zones for estimating slope.

- Note: an effective way to construct these two lines is to use the Angle Bis tool to bisect the first and second quadrants. These lines create four distinct zones:
- When the line is between $y = x$ and the y -axis, $m > 1$? See Figure 11a.
- When the line is between $y = -x$ and the y -axis, $m < -1$? See Figure 11b.
- When the line is between $y = x$ and the x -axis, $0 < m < 1$? See Figure 11c.
- When the line is between $y = -x$ and the x -axis, $-1 < m < 0$? See Figure 11d.

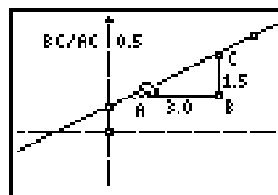


Figure 9

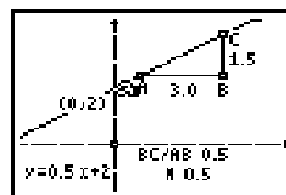


Figure 10

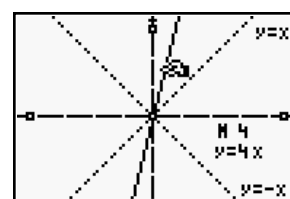


Figure 11a

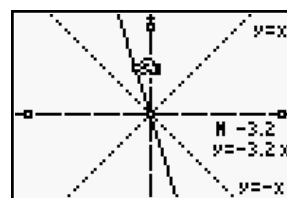


Figure 11b

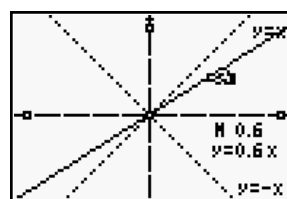


Figure 11c

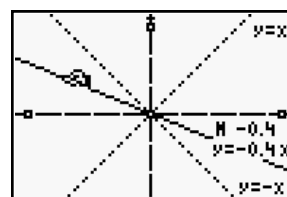


Figure 11d

12. The line $y = x$ has slope of 1 and the line $y = -x$ has slope of -1 .
- When the line is on the x -axis, the slope is zero?
 - When the line lies on the y -axis, the line has infinite or undefined slope.
13. By dragging the original line around the screen, students should be able to discover that parallel lines have the same slope. See Figure 12.
14. The relationship of the slope of perpendicular lines is more difficult to discover without a hint.
- Since perpendicular lines have negative reciprocal slopes, suggest that the students compute the product of the two slopes and then drag the original line on the screen. See Figure 13.
 - Negative reciprocal slopes can be deduced from the fact that the product of the slopes always equals negative one.

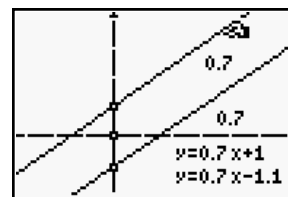


Figure 12

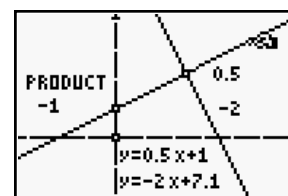


Figure 13

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They Keep Disappearing!

Concepts

- Features of the exponential function
- The effect of changes in the parameters of the exponential function on the graph of the function

Materials

- TI-84 Plus
- TI-Navigator™ software
- Transformation Graphing App
- 40 dice, 40 M&Ms®, 40 cards or 40 coins for each group of 3 to 4 students.
- Worksheet *Casting Out*.

Overview

The class is divided into groups to complete a full-class exploratory activity. The focus of the activity is the development of the exponential function. Each group will use dice, coins, M&Ms, or cards to model decay. The data from all groups will be combined by use of the TI- Navigator system.

Group Exploration

1. Divide the class into groups of 3 or 4 students.
2. Instruct students to clear all data from lists L1, L2, L3, L4, L5, and L6 in their calculators.
3. Pass out the worksheet *Casting Out* and 40 dice, 40 cards, 40 M&Ms, or 40 coins to each group.
 - If enough die can not be found, students can use the randBin() function on their TI-84 Plus to simulate this activity. See Figure 1 and procedure below.
4. Allow 10 minutes for the students to create the data by following the activity instructions on the worksheet.

Student Procedure

1. To clear all lists press $\boxed{2\text{nd}} \boxed{+} \boxed{4}$:ClrAllLists.
2. To use the TI-84 Plus to simulate the dice portion of the activity, have students press $\boxed{\text{MATH}} \boxed{\blacktriangleright} \boxed{\blacktriangleright} \boxed{\blacktriangleright} \boxed{7}$:randBin.
 - This will paste the random binomial command to the Home Screen.
 - Enter the number of dice left and then 5/6.
 - Press $\boxed{\text{ENTER}}$. The number that appears is how many dice are left after each roll.
 - Figure 1 illustrates a simulation of the first 3 rolls of the dice portion of the activity.

```

randBin(40,5/6)
34
randBin(34,5/6)
29
randBin(29,5/6)
25

```

Figure 1

Data Aggregation and Discussion

1. Remind students to have only one TI-84 Plus attached to TI-Navigator during the first data exchange.
2. Remind students that their data must be in the correct lists.
 - The dice group should use L1 and L2.
 - The M&Ms and coins groups L3 and L4.
 - The card group L5 and L6.
3. Once each group has finished the data collection portion of the activity, collect each group's data using Activity Center.
 - Start Activity Center to collect lists L1, L2, L3 and L4 from students' calculators.
 - Stop the Activity when all lists have been collected.
 - Save the lists to a convenient location on your computer.
 - Start Activity Center to collect lists L5 and L6.
 - Settings are: Contribute Lists, Configure, Create New Lists, Create Data Set, 2 lists, rename L1 as L5 and rename L2 as L6. Click OK.
 - Stop the activity.
 - Save these lists.
 - Select Edit, Clear Activity Data.
 - Select File, Load, Load Lists, select L1 through L6.
4. Go to the List-Graph tab and click Configure Plots to display the aggregated class data. Show all three data plots (L1, L2), (L3, L4), (L5, L6) at the same time. Figure 2 shows an example of a total class' data displayed on a calculator.
5. Have the class discuss what they see. There should appear to be three different relationships plotted.
 - Have each group try to determine which of the three plots appear to be theirs.
 - During the discussion show each plot individually and then all together again.
 - By the end of the discussion students should understand why the dice, coins, and M&Ms are exponential (Figures 3 and 4) while the cards are linear (Figure 5).

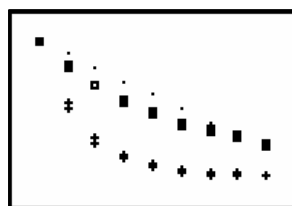


Figure 2

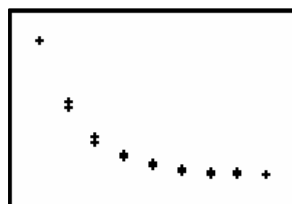


Figure 3

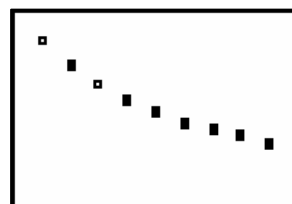


Figure 4

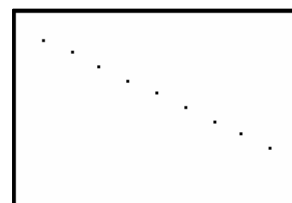


Figure 5

Group Model Practice

1. Have each group set up and display a plot of their group data. Ask each group to find a model for their individual data. Have each group display their model with their data.
2. Use TI-Navigator to collect a screen shot from each calculator.
3. Once all screens have been captured, show the screens to the class, discussing what you see.

Individual Formative Assessment

1. Have each student attach to the Navigator hubs. Send the aggregated data to the students by selecting the Send to Class icon. Select lists L1 through L6, click Next, check the Force Send to Students Now box. See Tip Sheet for further details.
2. Have each student find and display a model for each of the three data plots. Once all models have been found, have each student display all three models and all three data sets at the same time on their individual handhelds.
3. Collect a screen shot from each student calculator. Use these screen shots to assess your students' success with this activity.

They Keep Disappearing Worksheet

1. Follow the directions that are given below for the objects that were provided for your group. As you work the activity enter the data in the table below.
2. When you have finished, enter the data from the table into your group's handheld.

Number of "rolls"	0	1	2	3	4	5	6	7	8
Number left	40								

Instructions

1. Detach all handhelds from the TI-Navigator system.
2. Clear lists L1, L2, L3, L4, L5, and L6 in your groups handheld.
3. When you have completed the data collection, enter your group's data into the proper list in the group TI-84 Plus.
 - The last step in the following instructions will explain which list your group is to use.
4. Follow the instructions in the table on the next page for your "object."

Dice	M&M	Coins	Cards
Start with 40 dice. Your teacher might ask you to use your TI-83 Plus to simulate this activity.	Start with 40 M&Ms.	Start with 40 coins.	Remove all face cards from a deck of cards. You should have 40 cards left.
Record the number of dice remaining before each roll.	Record the number of M&Ms remaining before each roll.	Record the number of coins remaining before each flip.	Record the number of cards remaining before each shuffle.
Roll all remaining dice.	Roll all remaining M&Ms.	Flip all remaining coins.	Shuffle all remaining cards.
Remove any die with a "6" on the top face.	Remove any M&Ms candy with an "M" on the top.	Remove any coin with a "head" as the top face.	Cut the cards and remove all cards with the same value. For example if you cut to the ace of hearts remove all aces.
Return to the first step if there are any dice left or you have not rolled 8 times. NOTE: If it takes less than 8 rolls for all to disappear, complete the remaining cells in the bottom row of the table with zeros.	Return to the first step if there are any M&Ms left or you have not rolled 8 times. NOTE: If it takes less than 8 rolls for all to disappear, complete the remaining cells in the bottom row of the table with zeros.	Return to the first step if there are any coins left or you have not flipped 8 times. NOTE: If it takes less than 8 flips for all to disappear, complete the remaining cells in the bottom row of the table with zeros.	Return to the first step if there are any cards left or you have not shuffled 8 times.
Record your data in L1, L2.	Record your data in L3, L4.	Record your data in L3, L4.	Record your data in L5, L6.

- Record the data in the indicated list in all your handhelds.
- Reattach the group TI-84 Plus to the TI-Navigator system.

Pre-Discussion Questions

While you are waiting for all groups to finish the data collect phase of the activity, discuss the following questions in your group.

- Do you think all the plots, (L1, L2), (L3, L4), (L5, L6), will appear to come from the same function family?
- Why do you think the coins and M&Ms were entered in the same lists?
- What is the y-intercept of an appropriate model for each situation?
- Enter $Y1 = AX + B$ and $Y2 = AB^x$ in your handheld. Use the Transformation Graphing application and try to find a reasonable model for your data.
- Which function do you think will model each situation? What do you think the values of A and B represent?
- Why do you think the cards appear to be linear while the others do not?

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Optimization – The Garden Problem

Concepts

- Optimization
- Scatter plots
- Curve fitting
- Mathematical models
- Using TI-Navigator™ to collect and aggregate data

Materials

- TI-84 Plus
- TI-Navigator™ software

Overview

Each student will calculate the area of a rectangular garden that can be enclosed by 100 yards of fence. Each student's garden will be different because the length and width they use will differ from other students. The TI-Navigator will be used to collect, aggregate, and send the combined data back to the participants. Students will then scatter plot and analyze the data. Students can find an equation to fit the data and use the derivative to determine the maximum area.

Introduction

1. One challenge a student faces in optimization problems is finding an equation for the object that is to be optimized.
 - It is easier for students to find this equation if they have seen several specific numerical examples first.
2. Students often fail to realize that there are many solutions that meet the constraints of the problem, so it seems strange to talk about the optimum solution.
 - For example, in the garden problem, students sometimes think that all possible rectangles have the same area since they all use the same roll of fence.
3. By having each student work with a different rectangle and then aggregate their results, these challenges are more easily overcome.

Procedure

1. Each participant should read Step 1 and 2 in the student handout.
 - Participants should perform the computations for the sample garden and answer the questions about area and perimeter.
2. The instructor should assign various lengths to the participants who will then compute the corresponding width and area.
 - The participants should record their results in Step 3 of the student handout.

- The participants should record their length data in L1 and area data in L2.
3. The instructor will collect and aggregate the class data in L1 and L2 and send it back to all participants.
 - See the Tip Sheet for Aggregating Data and Lists.
 4. The participants should then complete the remainder of the student handout.

Optimization Worksheet

1. If you were going to make a rectangular shaped garden and enclose it with 100 feet of fence, what dimensions would make the largest garden?
 - This is an example of an optimization problem because we are trying to optimize (maximize) the area of the garden.
 - Since 100 feet of fence is used in every case, it may not be intuitive that there are many different rectangles possible and that each rectangle may have a different area from the others.
2. A few examples might make this clearer. If you decide the length of the garden should be 30 feet that would leave 20 feet for the width.
 - The value of 20 is obtained by subtracting 30 feet for the front and 30 feet for the back from the original 100 ft roll of fence.
 - This leaves 40 feet for the sides.
 - Divide 40 in half and you have 20 feet for each side. Draw what this would look like.
 - The area of the 30 ft x 20 ft is 600 ft^2 .
 - Find the dimensions of the garden if the length is 15.
 - Length 15 Width _____ Area _____
 - Are the areas of the two rectangles the same? Are the perimeters of the rectangles the same? Explain.
3. Since different rectangles have different areas (even though all have the same perimeter), we might want to know which rectangle has the largest area.
 - In order to help answer this question each member of your class will find the area of a different rectangle. Your instructor will assign a length to you and then you will need to find the width and area of your rectangle.
 - Length _____ Width _____ Area _____

4. Your instructor will collect lists from your handheld.
 - Clear lists L1 and L2 on your handheld.
 - Enter the length you were given in #3 into L1 and the area you calculated into L2.
 - Go to the Activity Center.
 - Press SEND when the activity is loaded.
 - Wait for the instructor to send the class results back to you.
5. After you have class results, make a scatter plot with L_1 (length) on the x -axis and L_2 (area) on the y -axis. Sketch the scatter plot in the space provided.

6. Based on the data and your scatter plot, what are the dimensions of the largest garden? Mark the part of the scatter plot that corresponds to your answer.
 - Largest garden: Length _____ Width _____ Area _____
 - Are there dimensions for the garden that are impossible? Give a few examples.

 - What are the set of possible values for length and width? Explain.
7. We can use the data provided by the class to find a function that models the relation between length and area of the garden.
 - Perform quadratic regression on L1 and L2 and store the result in Y1.
 - Graph the regression equation along with the scatter plot in the space provided and write down your regression equation.

Regression equation _____

8. Find the derivative of the regression equation and use this derivative to find the dimensions and area of the largest rectangle.
- Derivative: _____
 - Length _____ Width _____ Area _____
 - How does your answer compare with the answer you obtained using the scatter plot?
9. Let the length of the rectangle be x and use algebraic methods to find the equation for area as a function of x .
- How does this equation compare to the regression equation?

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Paper Folding

Concepts

- Exponential functions

Materials

- TI-84 Plus
- TI-Navigator™ software
- TI DataEditor

Overview

In this activity, TI-Navigator is used throughout a complete lesson. A class starter activity is used to review previous concepts. Paper folding is used to explore a pattern of "doubling", which introduces students to a model for an exponential function. Two class ending activities providing for immediate feedback are used to check for student understanding.

Class Starter Activity

- Modify the files N.8xn and O.8xn to the Transfer List after modifying the files (see Teacher Notes).
- Send the program GUESSGRA.8xp, the file N.8xn, and Program Score.edc to each student calculator using the TI-Navigator system (or have this done automatically when they log into NavNet – see Teacher Notes).
 - The program, using a random routine, displays a scatter plot representing any of the following functions: linear, absolute value, quadratic, cubic or square root.
 - Students are to identify the type of function displayed. See Figures 1, 2, and 3.
 - The number of questions that students answer is determined (by the file N.8xn) prior to downloading the program.
 - In addition, the specific functions displayed on individual calculators will be different.
- At the completion of this activity, a score will be displayed on the student calculator.
 - This score represents the total correct responses to the total number of attempts. Multiple attempts are allowed per question.

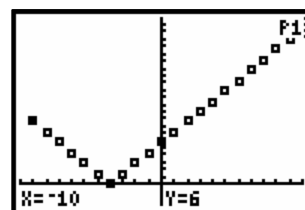


Figure 1

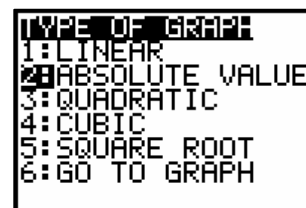


Figure 2

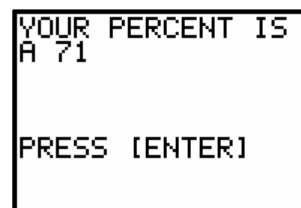


Figure 3

4. The teacher can monitor the students by using the Screen Capture tool of the TI-Navigator system.
5. Once a student receives a score, the student can enter their score into the LearningCheck document Program Score.edc.
6. The class scores can be collected using Class Analysis and displayed using the Slide Show feature.
7. Conduct a class discussion as necessary.

Student Activity

1. If you could fold a piece of typing paper 20 times, how thick would it be?
 - Ask participants to guess an answer (do not use your handheld technology!) and record their guess in the LearningCheck assignment Paper Folding.edc.
2. If you could fold a piece of typing paper 40 times, how thick would it be?
 - Again, ask them to guess and record their guess in the LearningCheck assignment Paper Folding.edc.
 - You might also have participants guess how many times they could actually fold a piece of paper.
3. Collect the class results of Paper Folding.edc (for viewing at a later time) while the participants consider the following question.
 - Have the participants intuitively guess how many folds would create a thickness that would surpass the St. Louis Arch in height.
 - First, discuss the pattern in the number of thicknesses before discussing the thickness of paper after folding. Use the table and the discussion below.

Folds	Thicknesses	Thickness
0		
1		
2		
3		
4		
5		

Folds	Thicknesses	Thickness
0	$1 = 2^0$	≈ 0.004
1	$2 = 2^1$	$\approx 0.008 = 0.004 \cdot 2$
2	$4 = 2^2$	$\approx 0.016 = 0.004 \cdot 2 \cdot 2 = 0.004 \cdot 2^2$
3	$8 = 2^3$	$\approx 0.032 = 0.004 \cdot 2 \cdot 2 \cdot 2 = 0.004 \cdot 2^3$
4	$16 = 2^4$	$\approx 0.064 = 0.004 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 0.004 \cdot 2^4$
5	$32 = 2^5$	$\approx 0.128 = 0.004 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 0.004 \cdot 2^5$
x	2^x	$\approx 0.004 \cdot 2^x$

- Participants will quickly see that the number of thicknesses is 2 raised to the power of the number of folds. So, the number of thicknesses after x folds is 2^x .
- Now, address the question of the thickness of the paper. Suggest that students measure the thickness of a ream of paper and divide that number (in inches or centimeters) by 500. One sheet of paper is about 0.004 inches thick.
- Build the third column with the actual thickness in inches. After the first fold, the paper is 0.008 inches thick. After the second fold, the paper is 0.016 inches thick.
- To show these computations and the thickness after subsequent folds, enter .004 on the Home Screen of the TI-84 Plus and press **[ENTER]**.
- Press the multiplication key followed by the number 2 and press **[ENTER]**. The result is .008.
- Continue to press **[ENTER]** and count until the twentieth fold is completed. The result is 4194.304 inches. Convert this to feet.

An Exponential Scatter Plot

1. Use TI-Navigator to send the data of L1 and L2 (which was computed above) and the file WindowRange1.8xw.
2. Graph the scatter plot (L1, L2) by turning on the scatter plot only. The window settings are already adjusted. See Figures 4 and 5.
3. Send the file WindowRange2.8xw using TI-Navigator.
4. Re-graph the scatter plot with the new Window Settings which were sent. See Figure 6 and 7.

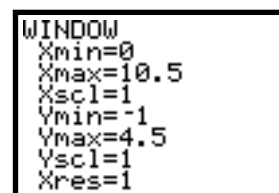


Figure 4

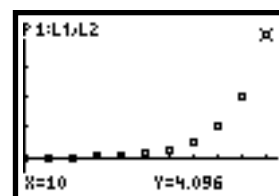


Figure 5

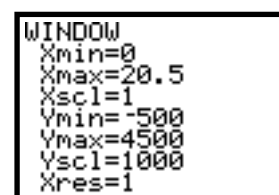


Figure 6

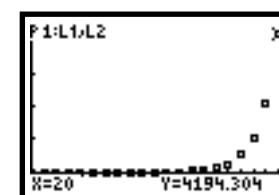


Figure 7

Find and Graph a Model

1. Find a model to fit the data.
 - Build a function so that the thickness after x folds can be found.
 - In the third column above, show that the second thickness, .008 inches, as $0.004 * 2$. The next thickness, .016 inches, is $0.008 * 2$ or $0.004 * 2^2$. In the same manner, .032 inches (the thickness after the third fold) can be written as $0.004 * 2^3$.
 - Continuing this pattern, the thickness of the paper after the 20th fold is $0.004 * 2^{20}$ or 4194.304 inches. Therefore, the thickness of the paper after the 40th fold is $0.004 * 2^{40}$.
 - Compute this number (in inches) and then convert to feet and then to miles. Discuss why this thickness is not twice the thickness of the paper after 20 folds.
 - The participants can compare the answer for the thickness after 40 folds to known quantities such as the circumference of the Earth (approximately 25,000 miles).
2. Graph the model and the data together. See Figure 8.
3. Use a graph and a table to answer the following:
 - How thick would it be if you could fold the piece of paper 25 times?
 - How many times would you have to fold the paper to reach the top of your school building?
 - If you have not yet, this would be a fine place to demonstrate guess-and-check solving using a table in the ASK mode. Assume your school is 40 feet = 480 inches tall.
 - Type in a guess and the table immediately evaluates Y_1 . Then guess again until you reach the desired accuracy. See Figures 9 to 11.
 - Of course, the domain of the problem situation is a whole-number fold, but it can be fun to continue to numerically zoom in on the real number solution to the equation.

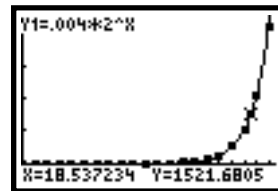


Figure 8



Figure 9

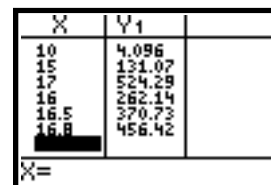


Figure 10

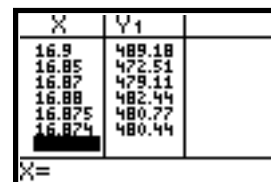


Figure 11

Lesson Assessment

1. After sending the program GUESSGRB.8xp and file O.8xn to each student calculator using the TI-Navigator, students will again identify the graphs of specific functions, including exponential.
2. When students complete the number of problems assigned, a score will be displayed.
3. Monitor student progress and provide additional instructions if necessary.

End of Class Activity

1. Send the Post Test.edc to the student calculators using TI-Navigator.
 - Students will complete a set of questions that could be used as a summative assessment.
 - You may also want to delete the two programs, Guessgra.8xp and Guessgrb.8xp, from the student calculators.
2. Collect the class results using Class Analysis and display using the Slide Show feature.

Teacher Notes

1. Copy the "Paper Folding" folder from CD to computer.
2. At the beginning of class, open the "Paper Folding" folder on the computer.
3. The letter N represents the number of questions to be asked during the class starter activity.
 - To set the number of questions, open the file N.8xn.
 - The TI DataEditor will open.
 - Enter a new value for N.
 - Exit out of the DataEditor to save this value.
4. The letter O represents the number of questions used for the formative assessment at the end of the lesson.
 - To set the number of questions, open the file O.8xn.
 - Enter a new value for O.
 - Exit out of the DataEditor to save.

5. Open TI-Navigator and begin class.
 - Set up the following files to be received by the student automatically when they log into the class: N.8xn, O.8xn, GUESSGRA.8xp, and Program Score.edc
6. When the students log into the NavNet, they will automatically receive the files on their calculators.
 - Students will need to exit the NavNet when they have received the files and run the program GUESSGRA through the PRGM key.
7. Use TI-Navigator file Paper Folding.edc to collect and display results of these questions using the Slide Show in Class Analysis.
 - See Tip Sheet to send an education document and collect an education document.
 - This activity may need to be modified when using with students.
8. Send the files WindowRange1.8xw, L1.8xi, and L2.8xi to the student calculators.
 - The WindowRange1.8xw file will automatically set up the student calculators with the window settings of Figure 4.
9. Send the file WindowRange2.8xw to the student calculators.
 - The WindowRange1.8xw file will automatically set up the student handhelds with the window settings of Figure 6.
10. Send O.8xn and GUESSGRB.8xp to the student calculators.
 - This program is similar to GUESSGRA.8xp.
11. The questions used in file Post Test.edc can be modified, added to or deleted to meet the needs of the students.
12. Use Class Analysis to collect the class results from the Post Test.edc. The Slide Show feature can be used to display results to the class, and to motivate class discussion.
13. Before class is dismissed, you may want to delete the programs, GUESSGRA.8xp and GUESAGRB.8xp from the student calculators.

Dilations in the Plane

Concepts

- Dilations
- Similar figures
- Fundamental Theorem of Similarity

Materials

- TI-84 Plus
- TI-Navigator™ software
- Cabri Junior Application
- Cabri Geometry II Plus Software

Overview

Students will use the dilation tool in Cabri Junior to discover properties of dilations.

Prerequisite Skills

- Cabri Junior construction skills

- Using TI-Navigator send the following items to the class.
 - The Cabri Junior application, if not yet on the student calculators, using the App Transfer tool.
 - The Cabri Junior figures *Dilate1* and *Dilate2*. These files have the .8xv extension.
 - The Teaching Notes gives instructions for creating these figures.
- Wait for all the students to receive the two Cabri Junior figures (the Class Record indicates when the students have received the files).
- On the student calculator, open the Cabri Junior App, and select [Open] from the F1 menu.
 - Open the Dilate1 figure. See Figure 1.
- This figure displays a triangle, a center of dilation (point P), and a numerical dilation factor.
 - The numerical dilation factor is controlled by dragging point B along the line at the bottom of the screen.
 - It has a range of approximately -4.5 to 4.5 units. See Figure 2.
- Use the Dilation tool from the F4 menu to dilate the triangle using point P as the center and the numerical value as the dilation factor.
 - Select the object to dilate, the center of dilation, and the numerical dilation factor in that order. See Figure 3.
 - Be careful to select the whole triangle as the object to dilate, and not just one side of it.

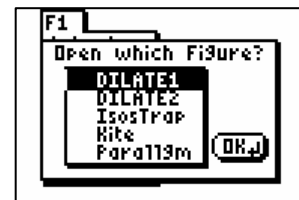


Figure 1

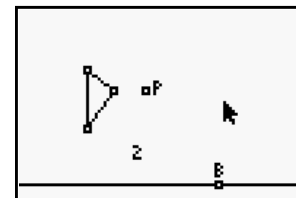


Figure 2

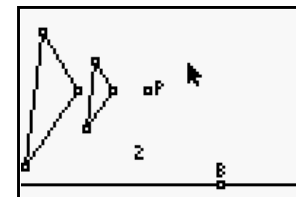


Figure 3

6. Investigate the features of the new triangle (the image) compared to the original triangle (the pre-image).
 - Drag a vertex of the pre-image.
 - Drag the center of dilation (point P).
 - Use the tools from the *Measure* submenu in the F5 menu to find the lengths and slopes of corresponding sides, measures of angles, and areas of the triangles.
 - Use the *Calculate* tool in the F5 menu to divide each of your measurements from the new triangle by the original triangle's measurements.
 - Discuss the relationship between the ratio of angles, ratio of sides, and ratio of areas.
7. Explore different dilation factors by dragging point B and explain what happens to the image triangle.
 - What happens when the dilation factor is smaller than 1?
 - What happens when the dilation factor is a negative number?
 - When does the triangle change orientation?
 - Is there another transformation that is equivalent to a dilation of a factor of -1 ?
8. Draw lines from the point of dilation P to two of the “outer” vertices of the triangle to help visualize the “perspective” of the dilations. See Figure 4.
 - Measure the distance from the point of dilation (P) to two corresponding vertices of the pre-image and the image.
 - Make a conjecture about the two distances. What happens when the dilation factor is negative? Explain.
9. Explore the effect of dilations through the origin in the coordinate plane.
 - Open the Dilate2 figure. See Figure 5.
 - In this figure, the origin is the center of dilation.
 - Show the coordinates of corresponding vertices on the image and pre-image using the *Coord. & Eq.* tool in the F5 menu.
 - Make and explain a conjecture about the effect of dilations on the coordinates of figures.

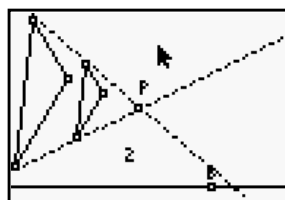


Figure 4

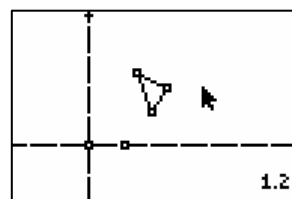


Figure 5

10. After ample time has been given for exploration, use TI-Navigator to send the LearningCheck document “Dilate3.edc” to the class.
11. Have students answer the questions in the Dilate3 assignment.
12. Students can return to Cabri Junior for further investigation, if needed, by pausing the LearningCheck App.
 - Choose 5: Pause App from the LearningCheck menu. See Figure 6.
13. Collect the LearningCheck answer file from the class and review the results.
 - Use the Class Results Slide Show, if desired.

**Figure 6**

Teaching Notes: Dilations in the Plane

Creating The *Dilate1* Figure In Cabri Junior

1. This figure provides a “slider” control to adjust the dilation factor, a center of dilation, and a triangle to use as the pre-image object.
2. Draw the line AC horizontally across the bottom of a new screen with point A near the left edge and point C near the middle of the screen. See Figure 1.
3. Construct point B on line AC to the right of point C.
4. Use the D. & Length tool to measure the distances AB and AC (as a point-to-point distance measurement).
5. Use the Calculate tool to compute the difference $AB - AC$. See Figure 2.
 - Drag point B along the line and observe the difference $AB - AC$ as it changes.
 - When point B is to the right of point C, the difference is positive.
 - When point B is between points A and C, the difference is negative.
 - This construction produces a dynamic number (the difference $AB - AC$) in the range of approximately -4.5 to 4.5 units.
6. Use the Clear tool to delete all the labels except “B.”
7. Use the Hide/Show tool to hide all points and measurement except the numeric difference and point B.
8. Draw small scalene triangle to the left side of the screen and point P in the center of the screen. See Figure 3.

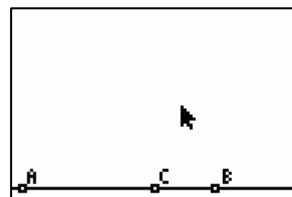


Figure 1

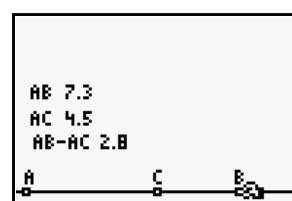


Figure 2

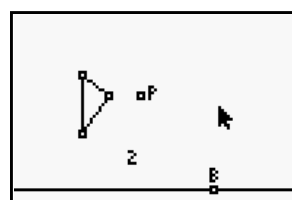


Figure 3

Creating The *Dilate2* Figure In Cabri Junior

1. This figure provides a “slider” control on the x -axis to adjust the dilation factor, the origin as center of dilation, and a triangle to use as the pre-image object.
2. Establish the coordinate plane on a new screen using Hide/Show: Axes in the F5 menu. See Figure 4.
3. Drag the origin to the center of the screen.
4. Construct a point at the extreme left end of the x -axis and another point on the positive x -axis.
5. Measure the distance between the two points and from the left point to the origin.
6. Calculate the difference between the two-point distance and the point-origin distance to produce the dynamic dilation factor. See Figure 5.
 - This dynamic number acts like the x -coordinate of a point on the x -axis.
7. Use the Hide/Show tool to hide the two point-to-point measurements and the point at the extreme left end of the x -axis.
8. Drag the origin to its original location, offset to the left to provide more space in the first quadrant.
9. Construct a small scalene triangle in the first quadrant to use as the pre-image object. See Figure 6.

Results Of Exploration Step 7

1. Students should discover that the image is not congruent to the pre-image, but rather is similar to it.
 - This means that corresponding angles are equal (see Figure 7a) and the corresponding sides have the same ratio as the dilation factor (see Figure 7b).
2. In addition, the Fundamental Theorem of Similarity states that in similar figures:
 - The ratio of any corresponding lengths will equal the similarity ratio (the dilation factor).
 - The ratio of any corresponding areas will equal the square of the similarity ratio. See Figure 7c.
 - The ratio of any corresponding volumes of similar solids will equal the cube of the similarity ratio.

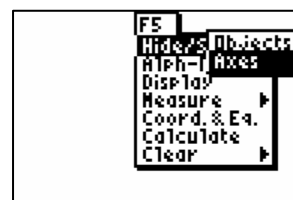


Figure 4

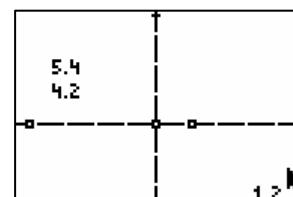


Figure 5

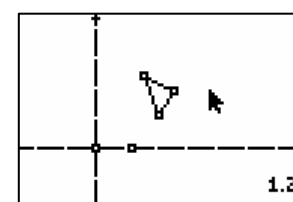


Figure 6

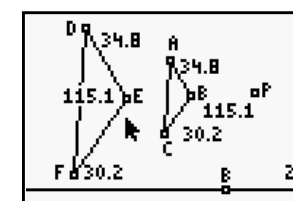


Figure 7a

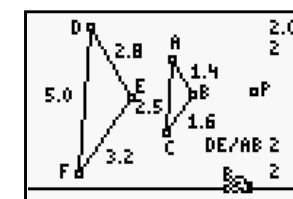


Figure 7b

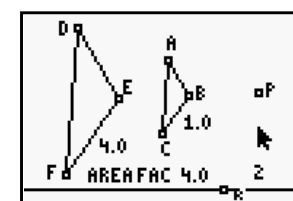


Figure 7c

Results Of Exploration Step 8

1. A dilation factor smaller than 1 will produce an image that is smaller than the pre-image.
 - Dilations preserve orientation whether the dilation factor is positive or negative.
 - Figure 8a shows dilation by a factor of -1 through point P and the start of a rotation of the pre-image around point P.
 - Rotating the pre-image around the center of dilation for a -1 dilation demonstrates that the same transformation can be accomplished using a rotation of 180° (Figure 8b).
 - This motion is sometimes called a half-turn.
 - A similar transformation can be done with the Symmetry tool from the F4 menu.

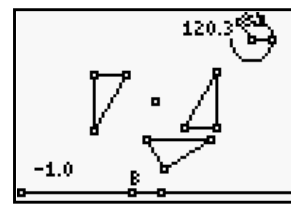


Figure 8a

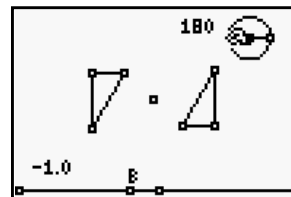


Figure 8b

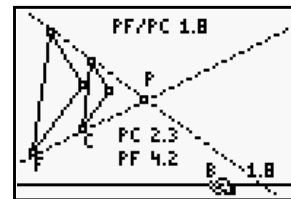


Figure 9a

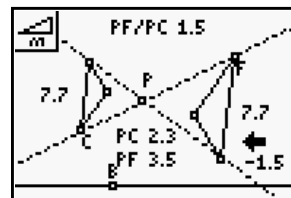


Figure 9b

Results of Exploration Step 9

1. The lines of perspective show that distances from the pre-image and the image have the same ratio as the dilation factor for positive factors. See Figure 9a.
2. If the dilation factor is negative, then the figure is rotated 180° as well as dilated.
 - The ratio becomes the absolute value of the dilation factor because distance measurements are always positive. See Figure 9b.
3. Students might also discover that the slopes of the sides of the image and pre-image triangles are the same for any dilation factor, even negatives ones.

Results of Exploration Step 10

1. Figures 10a and 10b show numerically what happens to the coordinates of a vertex of the triangle under two different dilation factors:
 - $(2, 1) \rightarrow (4, 2)$ for a factor of 2.
 - $(2, 1) \rightarrow (-1, -0.5)$ for a factor of -0.5 .
2. In general, dilation by a factor of n through the origin produces the mapping $(x, y) \rightarrow (nx, ny)$.

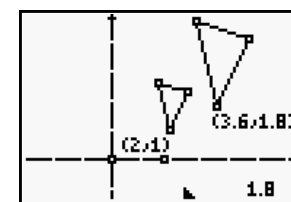


Figure 10a

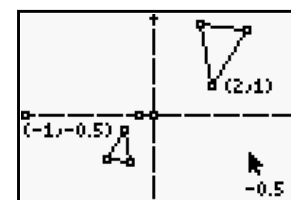


Figure 10b

Algebra LearningCheck™ Reference Sheet

Multiple Choice

- Standard Choices:
 - Title: Prime
 - Text: Six is a prime number.
 - Answer Choices: True-False
- Custom Choices:
 - Title: Properties
 - Text: Which of the following demonstrates the reflexive property?
 - Answer Choices: $x=x$, $yx=xy$, $1x=x$, $(ab)c=a(bc)$
- Choices on Image:
 - Title: Vertex
 - Text: Which of the following represents the vertex of a parabola?
 - Image: Parabola.bmp (See Figure 1)

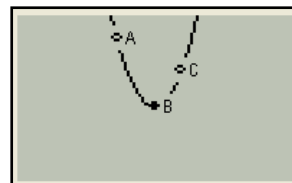


Figure 1

Fill In The Blank

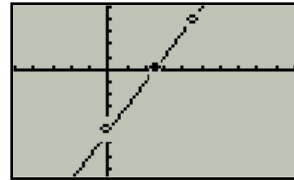
- Pull Down
 - Title: Polynomial
 - Text: A polynomial with an x^2 term as its highest power is a quadratic equation.
 - Choices for text field: linear, exponential, power, quadratic
- Text/Numeric
 - Title: Prime Number
 - Text: Zero and 1 are neither prime nor composite numbers.

Assessment Information

Title: First Assignment

- Multiple Choice:
 - Title: Equation
 - Text: Solve for x : $6x + 2 = 14$
 - Answer Choices: -2, 2, $8/3$, $-8/3$

2. Fill in the blank (drop down):
 - Title: Vocabulary
 - Text: In Algebra, a(n) variable is used to represent an unknown value.
 - Choices for text field: equation, coefficient, exponent, variable
3. Fill in the blank (multiple blank):
 - Title: Properties
 - Text: The Additive Identity property states: $a + \underline{0} = a$
4. Multiple Choice with Image:
 - Title: X-Intercept
 - Text: Which of the following represents the X-intercept?
 - Image: x-intercept.bmp (See Figure 2)
5. Sequencing:
 - Title: Order of Operations
 - Text: Put the following in correct order
 - Choices: Exponents, Add/Subtract, Brackets, Multiply/Divide
6. Open Response:
 - Title: Functions
 - Text: In the space below, describe how to determine if the graph of a curve is a function.
7. Multiple Choice with Standard Choices:
 - Title: Quadratics
 - Text: A quadratic equation has real solutions.
 - Choices: Always-Sometimes-Never

**Figure 2**

Chemistry LearningCheck™ Reference Sheet

Multiple Choice

- Standard Choices:
 - Title: Electrons
 - Text: There are 5 valence electrons in chlorine.
 - Answer Choices: True-False
- Custom Choices:
 - Title: Sig Figs
 - Text: How many significant figures in 0.0230?
 - Answer Choices: 2, 3, 4, 5
- Choices on Image:
 - Title: Atom
 - Text: Where is the proton located?
 - Image: atom.bmp (See Figure 1)

Fill In The Blank

- Pull Down
 - Title: Mass
 - Text: The Mass number is the number of protons and neutrons.
 - Choices for text field: protons, neutrons, protons neutrons and electrons, protons and neutrons
- Text/Numeric
 - Title: Atomic Number
 - Text: The atomic number of sodium is 11.

Assessment Information

Title: First Assignment

- Multiple Choice:
 - Title: Neutron
 - Text: The neutron is
 - Answer Choices: positive, negative, neutral
- Fill in the blank (drop down):
 - Title: Atomic Number
 - Text: The atomic number is the number of protons.
 - Choices for text field: electrons, neutrons, protons



Figure 1

3. Fill in the blank (multiple blank):
- Title: Ions
 - Text: Cations are positively charged ions and anions are negatively charged ions.
4. Multiple Choice with Image:
- Title: Polar Bonds
 - Text: Which bond has the greatest polarity?
 - Image: Lewis structure.bmp (See Figure 2)
5. Sequencing:
- Title: Metric System
 - Text: Put the metric units in order from largest to smallest.
 - Choices: km, hm, dam, m, dm, cm, mm
6. Open Response:
- Title: Formula Mass
 - Text: The formula mass of CH₄ is:
7. Multiple Choice with Standard Choices:
- Title: Ions
 - Text: Ions of the same atom have different number of protons.
 - Choices: Agree-Disagree

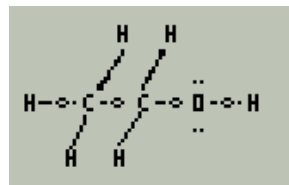


Figure 2

Geometry LearningCheck™ Reference Sheet

Multiple Choice

- Standard Choices:
 - Title: Parallel Lines
 - Text: If two lines do not cross, they are parallel.
 - Answer Choices: True-False
- Custom Choices:
 - Title: Angles
 - Text: Two angles whose sum is 90 degrees are:
 - Answer Choices: supplementary, complementary, vertical, linear pair
- Choices on Image:
 - Title: Vertex
 - Text: Which of the following represents the vertex of an angle?
 - Image: Angle.bmp (See Figure 1)

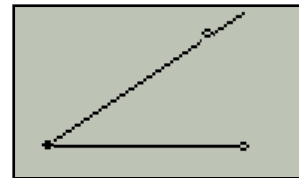


Figure 1

Fill In The Blank

- Pull Down
 - Title: Equations
 - Text: $y = 3x + 4$ is in slope-intercept form
 - Choices for text field: point-slope, standard, slope-intercept
- Text/Numeric
 - Title: Quadrilaterals
 - Text: Quadrilaterals have an angle sum of 360 degrees and two pair of sides that are parallel.

Assessment Information

Title: First Assignment

- Multiple Choice:
 - Title: Proving Triangles
 - Text: Which of the following is not a way to prove triangles congruent?
 - Answer Choices: ASA, SSA, SAS, AAS

2. Fill in the blank (drop down):
 - Title: Vocabulary
 - Text: Two lines that intersect at a right angle are perpendicular.
 - Choices for text field: parallel, skew, perpendicular, none of these
3. Fill in the blank (multiple blank):
 - Title: Squares
 - Text: Squares have all sides congruent and all angles equal to 90 degrees.
4. Multiple Choice with Image:
 - Title: Midpoint
 - Text: The midpoint of segment AB is:
 - Image: Midpoint.bmp (See Figure 2)
5. Sequencing:
 - Title: Number of Sides
 - Text: Put the following in least to greatest order based on the number of sides.
 - Choices: Rhombus, Hexagon, Triangle, Pentagon
6. Open Response:
 - Title: Linear Pair Postulate
 - Text: In the space below, explain the linear pair postulate.
7. Multiple Choice with Standard Choices:
 - Title: Rhombus
 - Text: The diagonals of a rhombus bisect each other.
 - Choices: True-False

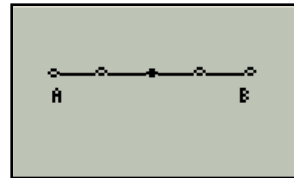


Figure 2

Physics LearningCheck™ Reference Sheet

Multiple Choice

- Standard Choices:
 - Title: Gravity
 - Text: All objects fall with the same acceleration on earth.
 - Answer Choices: True-False
- Custom Choices:
 - Title: Friction
 - Text: Which objects would probably give the greatest frictional force when in wood?
 - Answer Choices: metal, rubber, sand paper, ice
- Choices on Image:
 - Title: SHM
 - Text: Identify where the pendulum would have the greatest kinetic energy.
 - Image: Pendulum.bmp (See Figure 1)



Figure 1

Fill In The Blank

- Pull Down
 - Title: Free Fall
 - Text: An object starting at rest will fall 5 m in one second.
 - Choices for text field: 10 m, 15 m, 32 m, 5 m
- Text/Numeric
 - Title: Falling Objects
 - Text: If a rock is thrown downward with a velocity of 3 m/s, its final velocity after 4.2 seconds is -44 (with a tolerance of +/- 1)

Assessment Information

Title: Sound

- Multiple Choice:
 - Title: Wave Type
 - Text: Sound waves are which type of waves?
 - Answer Choices: Transverse, Longitudinal, Electromagnetic

2. Fill in the blank (drop down):
 - Title: Terms
 - Text: A common term for frequency is pitch.
 - Choices for text field: loudness, noise, scale, pitch
3. Fill in the blank (multiple blank):
 - Title: Interference
 - Text: When sound waves combine to form larger than normal amplitudes it is called positive interference and when they cancel each other it is called negative interference.
4. Multiple Choice with Image:
 - Title: Wave Form
 - Text: Identify the node on the sine wave.
 - Image: wave.bmp (See Figure 2)
(Answer is point c, when $X = 0$)
5. Sequencing:
 - Title: Musical Instrument
 - Text: If the following instrument played a middle C, place them in order from simple to complex sounds produced.
 - Choices: tuning fork, piccolo, flute, oboe
6. Open Response:
 - Title: Acoustics
 - Text: Explain the factors that must be considered when designing a perfect sound system for your car.
7. Multiple Choice with Standard Choices:
 - Title: Ultrasonic
 - Text: Sound waves can be used to see through things that can not be seen with your eyes.
 - Choices: True-False

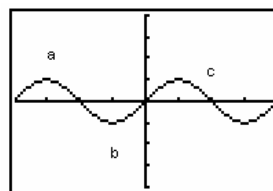


Figure 2

Social Studies LearningCheck™ Reference Sheet

Multiple Choice

- Standard Choices:
 - Title: Census
 - Text: The federal census of population is taken every five years.
 - Answer Choices: True-False
- Custom Choices:
 - Title: President
 - Text: To serve as President of the United States, a person must have attained:
 - Answer Choices: 25 years of age, 35 years of age, 40 years of age, 45 years of age
- Choices on Image:
 - Title: Equilibrium Point
 - Text: Which point represents the equilibrium point for the quantity demanded and quantity supplied?
 - Image: Equilibrium.bmp (See Figure 1)

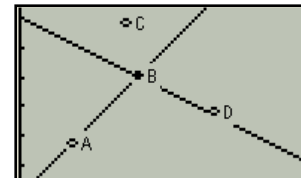


Figure 1

Fill In The Blank

- Pull Down
 - Title: Government
 - Text: The chief executive and the administrative offices make up the Executive branch of government.
 - Choices for text field: Legislative, Judicial, Executive
- Text/Numeric
 - Title: Original 13
 - Text: Of the original 13 states, the one with the largest representation in the first Congress was Virginia.

Assessment Information

Title: First Assignment

- Multiple Choice:
 - Title: Communism
 - Text: Communism was the type of government in:
 - Answer Choices: Canada, Russia, Germany

2. Fill in the blank (drop down):
 - Title: Presidents
 - Text: The first Republican party candidate elected president was Lincoln.
 - Choices for text field: Roosevelt, Reagan, Jefferson, Lincoln
3. Fill in the blank (multiple blank):
 - Title: Economic Policies
 - Text: The Federal Reserve sets monetary policy while the Federal Government sets fiscal policy.
4. Multiple Choice with Image:
 - Title: Quantity vs Price Graph
 - Text: Which point represents where quantity demanded equals quantity supplied?
 - Image: Equilibrium.bmp (See Figure 2)
5. Sequencing:
 - Title: Economists
 - Text: Place in chronological order the following economists:
 - Choices: Adam Smith, Karl Marx, John Maynard Keynes, John Kenneth Galbraith
6. Open Response:
 - Title: President
 - Text: A President elected in the general election in November takes office the following year on what date?
7. Multiple Choice with Standard Choices:
 - Title: Chief Lawmaker
 - Text: The Supreme Court is the chief lawmaking body of the state.
 - Choices: True-False

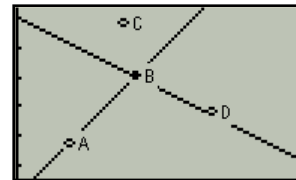


Figure 2

Tip Sheet: Upgrading TI-84 OS

Check for the latest OS Version for a Calculator

You have two options to verify if you have the latest operating system on your graphing calculator.

1. Go to the following website to identify the latest version for your calculator and check the version on your calculator.
<http://education.ti.com/us/product/apps/latest.html>
2. Open TI-Connect and connect your calculator to the computer using the TI Connectivity cable. Then click the blue circle above “Updates”. You need to have an internet connection as the software checks the TI site for the version of the latest OS. See Figure 1.



Figure 1

Check OS Version of the TI-84 Calculator

1. Turn on your graphing calculator.
2. Press **2nd** **+** [MEM].
3. Select 1: About.
4. Check for OS version number under the type of calculator. See Figure 2.

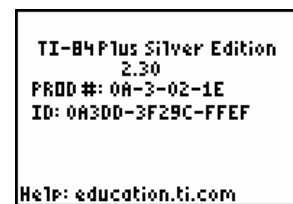


Figure 2

Upgrading the OS using the Computer

1. Before you begin to install any new Apps or update your OS, be sure you have a new set of batteries in your TI calculator for optimum performance.
2. Download the latest version of the OS from <http://education.ti.com/us/product/apps/latest.html> onto your computer desktop.
3. Open TI-Connect and connect your calculator to the computer using the TI-Connectivity cable.
4. Use the mouse to drag the OS file on the desktop to the TI Device Explorer icon in the TI-Connect window. See Figure 3.
You will see the file transfer to the calculator.



Figure 3

Upgrading the OS from Another Calculator

1. Link a calculator with the correct OS to another calculator which needs the OS using a unit to unit cable.
2. On the “Receiving Calculator”:
 - Turn the calculator on if it is not on.
 - Press **2nd** **[X,T,θ,n]** **[LINK]**.
 - Use the **▶** button to move to the RECEIVE menu.
 - Choose 1:Receive by pressing **[ENTER]**.
 - The calculator is “Waiting” to receive the OS.
3. On the “Sending Calculator”:
 - Turn the calculator on if it is not on.
 - Press **2nd** **[X,T,θ,n]** **[LINK]**.
 - Scroll using the **▼** button to the option G:SendOS under the SEND menu.
 - Choose G:SendOS by pressing **[ENTER]**.
 - The calculator will now send the OS to the other calculator.
4. Note: The receiving calculator will give you a warning that by upgrading the OS all RAM will be erased and it may erase archived files. Select “Continue” if you want to continue with the upgrade.

Tip Sheet: Sending Apps Via App Transfer

Sending Apps

1. Open TI-Navigator™ software.
2. Click on Tools tab. See Figure 1.
3. Click on App Transfer icon. See Figure 2.
4. You will see the App Transfer Window. See Figure 3.
5. Click Start Transfer button. You will see the transfer window with the status of the transfer. See Figure 4.
6. When all calculators are done, click the stop transfer button.



Figure 1



App Transfer

Figure 2

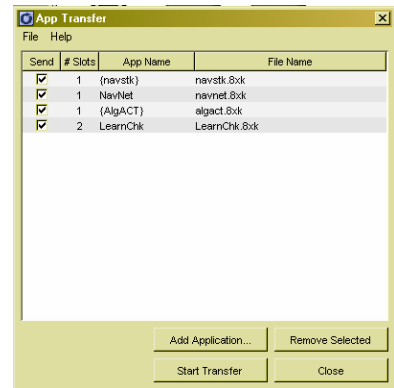


Figure 3

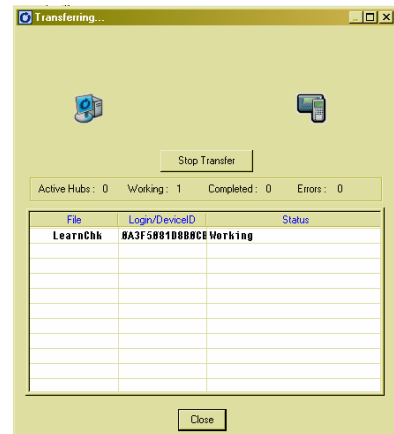


Figure 4

7. When the Progress screen (see Figure 5) closes, click the close button in the transfer window.
8. Click the close button at the bottom of the transfer window.

Notes

- To add applications to be sent, click on the Add Application button (see Figure 6) and navigator to the location of the app.
- Apps to be sent must be checked in the send column.
- To remove an app from being sent, uncheck the box to the left of the app name by clicking in the box.
- A class must not be in session for App Transfer to work.

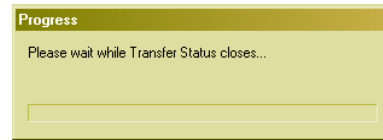


Figure 5



Figure 6

Tip Sheet: NavNet Student Login

Logging In

1. Press the **[APPS]** button.
2. Access the NavNet App by using the down arrow **⏏** on the upper right side of the calculator to move the cursor to NavNet. See Figure 1.
3. Press **[ENTER]** to open the NavNet application. See Figure 2.
4. Students login to NavNet with a username and password assigned by the teacher.
 - The minimum number of characters required to log in is three. The maximum number of characters is 32.
5. Now the student is ready to participate in a TI-Navigator enhanced classroom. See Figure 3.
6. Some teachers create “Direction Cards” to aid students in learning the procedure of logging into the Navigator classroom. See Figure 4.
 - It is also helpful for students to write their name and password on it.

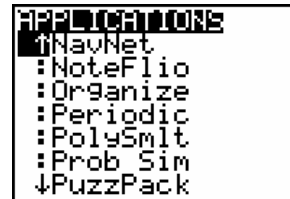


Figure 1



Figure 2



Figure 3

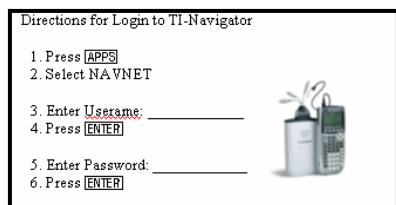


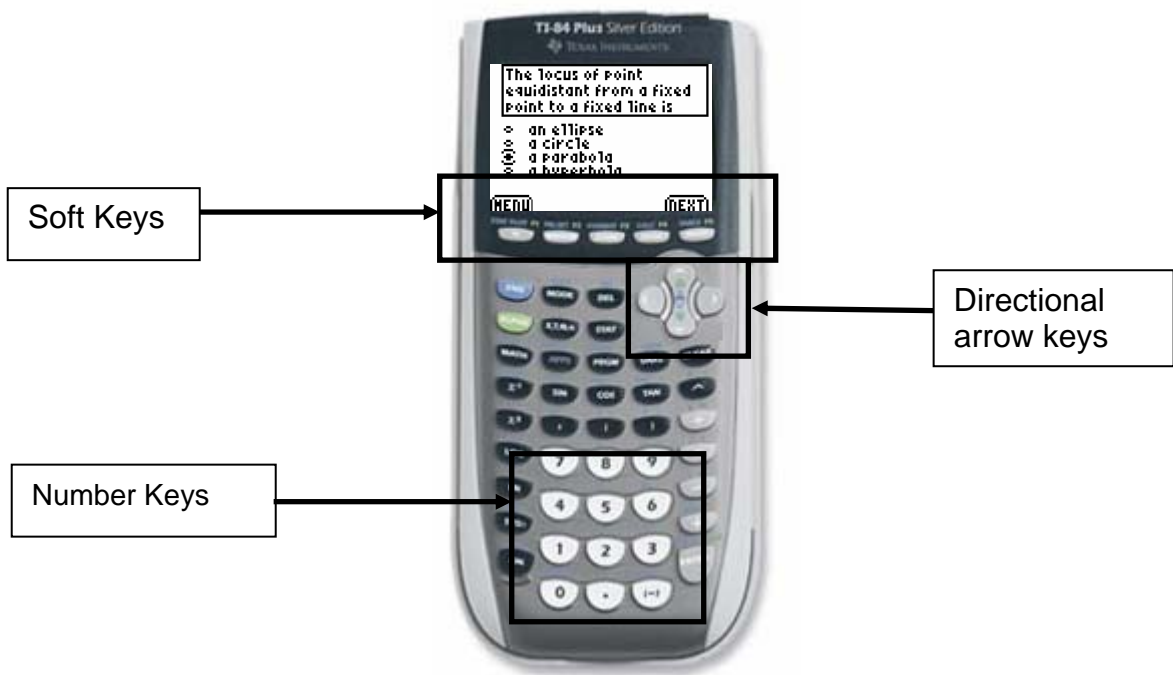
Figure 4

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TI-84 Plus LearningCheck™ App

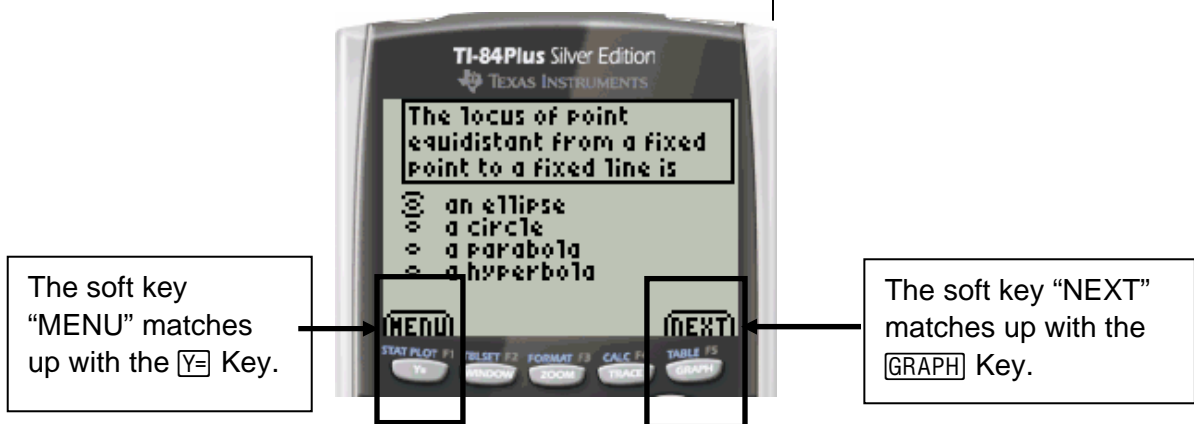
Navigation: Overview

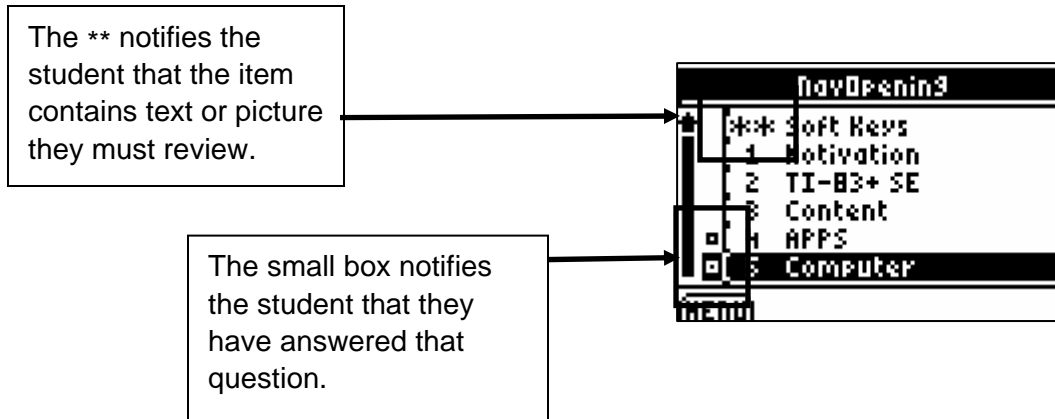
1. LearningCheck uses the directional arrow keys, number keys, and soft keys for navigation. The diagram below shows the location of these keys.



Navigation: Soft Keys

1. The Soft Keys correspond with the five keys located at the top of the TI-84 Plus.





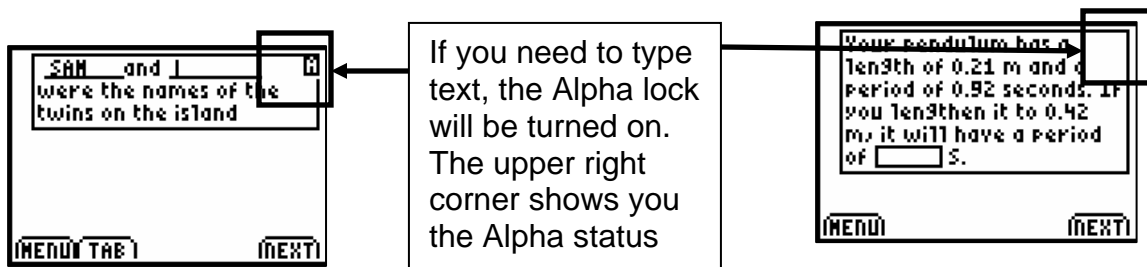
Entering Answers: Multiple Choice

1. Use the directional arrow keys to scroll through answer choices and the **ENTER** key to select the answer.
2. If you want to deselect an answer, press **ENTER** again.
3. To move to the next item, press the soft key "NEXT."



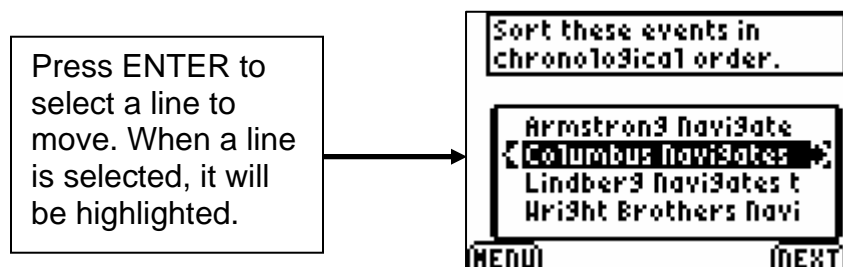
Entering Answers: Fill-In-The-Blank

1. To select a blank, press the **ENTER** key.
2. Type or select your answer.
3. To move to another blank, press the soft key, "TAB."



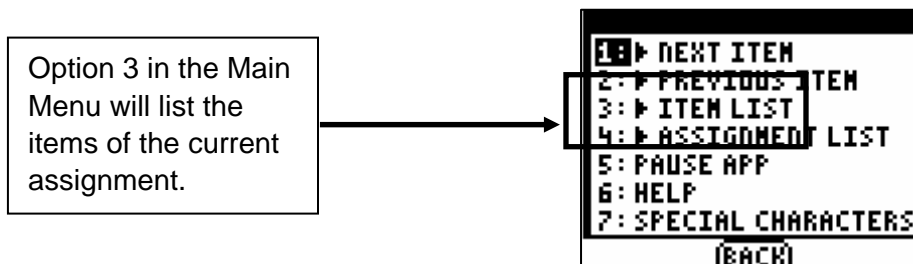
Entering Answers: Sequencing

1. To select a line to move, press the **ENTER** key.
2. To move the line, use the directional up and down keys.
3. Press **ENTER** to deselect the line.



Menu Options: Item List

1. Press the "MENU" soft key to access the main menu for LearningCheck.
2. To view the complete list of items in the assignment, press the **3** key to select the *Item list* option.



Menu Options: Special Characters

1. At times, you may want to put special characters (Greek, math symbol, etc) into your answers.
2. You can do so by going to the main menu and selecting *Special Characters*.

Use the Directional Arrows to highlight the character you want. Press **ENTER** to paste it into your answer.



Menu Option: Pause App

1. You can pause the App to use some of the functionality of the TI-84 Plus. You can do so by going to the menu screen and selecting the *Pause App* option.
2. To resume the assignment, press the **APPS** key and select NavNet.
3. Select 2:Network Apps.
4. Scroll to LearnChk and press **ENTER**.

Option 5 in the Main Menu will Pause the LearningCheck App.
Option 8 will allow you to attach and use the keyboard.



Menu Option: Use Keyboard

5. When a student is logged into the NavNet app the I/O port is dedicated to the Navigator Network.
6. To use a TI keyboard to answer a LearningCheck question, you must go to the menu screen and select Use Keyboard. Then you may plug the calculator to a keyboard and answer the questions.
7. To reconnect the calculator to the Navigator system you must go to the menu screen and select Resume Network.

Tip Sheet: Previewing A Question

Previewing A Question

1. When creating questions for LearningCheck™, you may need to preview the question format using the Preview function.
2. Choose the type of question you would like to create from the right side of the LearningCheck software. See Figure 1.
3. Enter the text and/or graphic(s) for your question. See Figure 2.
4. When you are finished entering the question, go to Tools, Preview, Preview Selected.
 - Note: You can also create all your questions first, and then choose Preview All. See Figure 3.

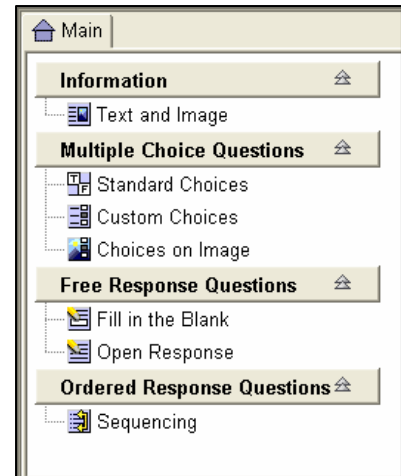


Figure 1

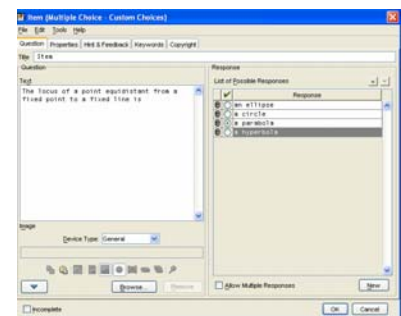


Figure 2

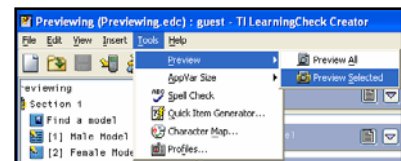


Figure 3

5. It is important to preview your questions to check the actual appearance of the question on the calculator screen. See Figures 4 and 5.
- The question in Figure 4 shows answers that have been cut off on the right-hand side of the calculator screen.
 - The question in Figure 5 shows answers that fit correctly in the screen.
 - Although this may be a teacher preference, previewing the question can prevent horizontal scrolling.

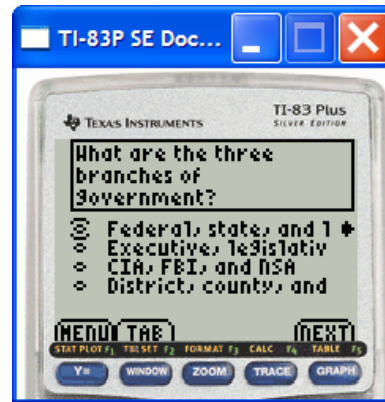


Figure 4

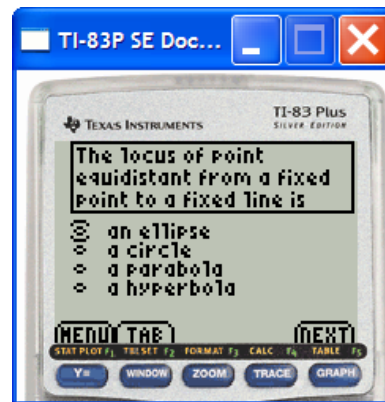


Figure 5

Tip Sheet: Collecting An Education Document

Method 1 – Using Class Analysis

1. Open the TI-Navigator software.
2. Begin Class and have the students log into the NavNet application.
3. Open the Class Analysis software by clicking on the Class Analysis icon. See Figure 1.
4. Click the “Choose an Assignment for Analysis” icon to associate the education document which is to be collected. See Figure 2.
5. Browse for the education document for which you wish to collect the answers.
6. Click Open.
7. You should see the document listed after “Assignment Title”. See Figure 3.
8. Click on the Collect Answer Files from Classroom Devices icon. See Figure 4.
9. Select the appropriate properties and click the Start Transfer button. See Figure 5.
10. You will be returned to the TI-Navigator software screen and you will receive the following message. See Figure 6. Click OK.

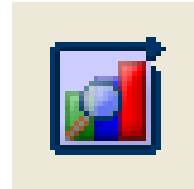


Figure 1



Figure 2

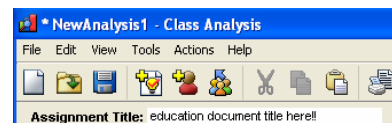


Figure 3



Figure 4

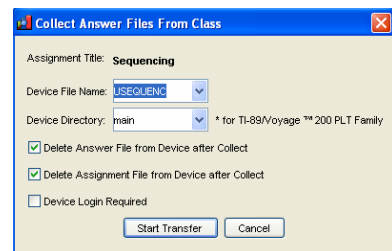


Figure 5

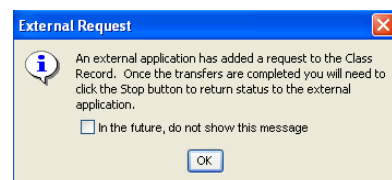


Figure 6

11. The answer file will be listed under the Class Record listing (UASSIGNM) with the blue collect arrow in front of it. See Figure 7.
12. If you choose to delete the assignment file and/or answer file, the red x symbol will be in front of them in the Class Record listing. See Figure 8.
13. Once you have received all the answer files that you expect to receive, click the Stop button located above the Class Record listing under External Request. This is what the warning was earlier. See Figure 9.
 - Remember, if you click on a file in the Class Record listing, you can see who had completed the request (green box around the student) and who has not completed the request (red box around the student).
14. Returning to the Class Analysis software, the assignment has been graded and populated into a spreadsheet.
15. The slide show of anonymous class results can be viewed by clicking the Class Results Slide Show icon. See Figure 10.
16. Adjustments can be made to the spreadsheet and saved for future analysis.
17. When collecting an education document through Class Analysis, it will be collected from the entire class as a “force collect”.

Method 2 – Not Using Class Analysis

1. Open the TI-Navigator software.
2. Begin Class and have the students log into the NavNet application.
3. Click on the “Collect from Class” icon. See Figure 11.
4. Select the education document for which you want to collect the answer file(s) and click Next.
 - If you would like to collect more than one file from the student calculators, then highlight all desired files by using the CTRL key.
 - If you want to collect a file you recently sent the class, choose “Recent Files” and the files will be listed which have been recently sent. See Figure 12.



Figure 7



Figure 8

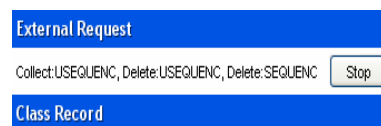


Figure 9

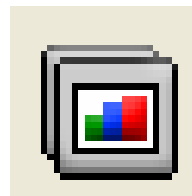


Figure 10

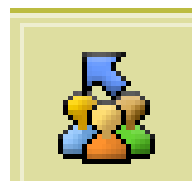


Figure 11

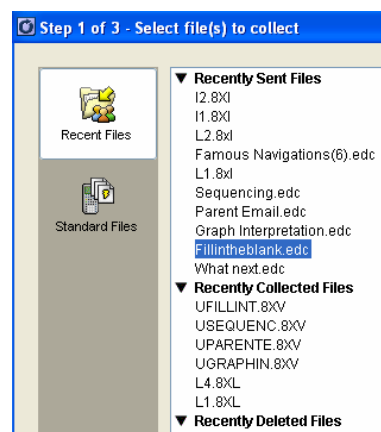


Figure 12

5. Select Class Send or Individual Student(s) using the CTRL key to select nonconsecutive students. See Figure 13.
6. If force collect is desired, click in the white box to the left of “Force collect from students now”. See Figure 14.
7. If delete after collecting is checked, collection will delete both assignment and answer file from the calculators.
8. Click on Next.
9. Choose location where you would like the collected answer file(s) to be saved. This is very important to remember for when you look at the files. See Figure 15.
10. Click Finish.
11. You will see the collected answer file listed in the Class Record List on the Navigator Home screen. This line will also show how many of the student answer files have been collected. Remember, answer files begin with the letter “U” followed by the first seven letters of the assignment file. See Figure 16.
12. To view the answer files, they need to be opened in Class Analysis.
13. Open the Class Analysis software by clicking the Class Analysis icon. See Figure 17.
14. Click the “Choose an Assignment for Analysis” icon to associate the education document which is to be collected. See Figure 18.
15. Browse for the education document for which you wish to collect the answers.
16. Click Open.

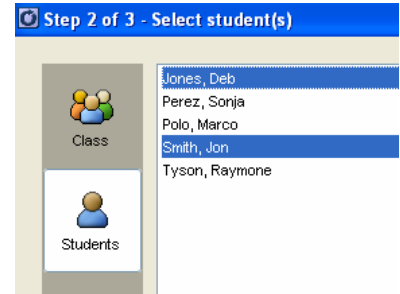


Figure 13

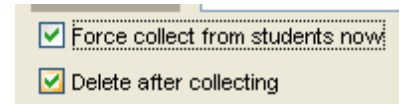


Figure 14

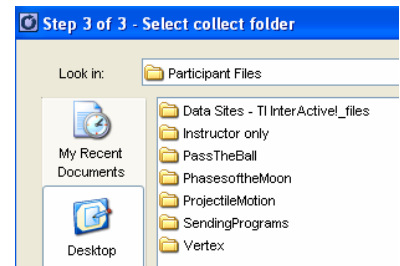


Figure 15

Class Record		
Action	File Name	Status
	Unprompted from Class	
	UFILLINT	2 of 5

Figure 16

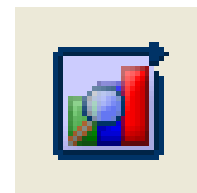


Figure 17



Figure 18

17. You should see the document listed after Assignment Title. See Figure 19.
18. Since the files have already been collected, we need to open those particular student answer files.
19. Click on the Add Student Answer Files icon. See Figure 20.
20. Browse for the answer files. The names will have the following format: LastName_FirstName_UASSIGNM. (e.g. Smith_Jon_UTEST).
21. Click Open and the files are loaded into the spreadsheet.
22. The slide show of anonymous class results can be viewed by clicking the Class Results slide Show icon. See Figure 21.
23. Adjustments can be made to the spreadsheet and save for future analysis.

Verifying Transfer of Files from Students

1. From the Navigator Home Screen, select the file to be verified in the Class Record.
2. The seating chart view of the class will indicate if a student has successfully transferred the file, not attempted to transfer the file, or there was a problem with the transfer of the file by a colored box around the student icon. See Figure 22.
3. If the file was transferred successfully, then the box will be green.
4. If the file has not been transferred, then the box will be red.
 - If the transfer was a “Force collect”, this may be because the student is not logged into the Navigator class.
 - If the transfer was not a “Force collect”, then the student hasn’t initiated the transfer yet.
5. If there was a problem with the transfer of the file, then the box will be yellow.
 - If the transfer was a “Force collect”, this indicates that the student did not have the requested file on their calculator.

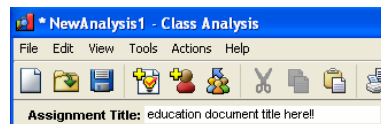


Figure 19

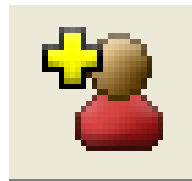


Figure 20

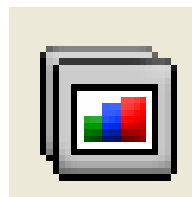


Figure 21



Figure 22

Tip Sheet: Collecting Files

Collecting Files

1. Open the TI-Navigator software.
2. Begin Class and have the students log into the NavNet application.
3. Click on the “collect from class” icon. See Figure 1.
4. Select the file(s) to be collected and click Next. See Figure 2.
 - If you would like to collect more than one file from the student calculators, then highlight all desired files by using the “Ctrl” key.
 - If you want to collect a file you recently sent the class, choose “Recent Files” and the files will be listed which have been recently sent.
5. Select Class or Individual Student(s) using the “Ctrl” key to select non-consecutive students.
6. If “Force collect” is desired, click in the white box to the left of “Force collect from students now”. See Figure 3.
7. If “Delete after collecting” is checked, after the collection both the assignment and answer file will be deleted from the calculators. See Figure 4
8. Click on Next.
9. Choose location where you would like the collected file(s) to be saved. See Figure 5.
10. Click Finish.
11. You will see the collected file listed in the Class Record List on the Navigator Home Screen. This line will also show how many of the students’ files have been received. See Figure 6.

Student Transfer of Files in Class Record

1. If the file(s) were collected as a “Force collect”, then the students will transfer the file(s) automatically.
 - All students who have already logged into the Navigator classroom will automatically transfer the files even if they are not currently in the NavNet App.

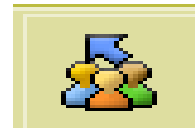


Figure 1

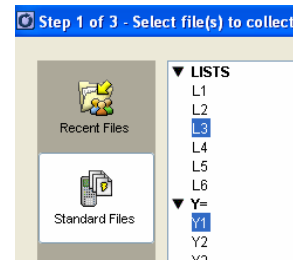


Figure 2

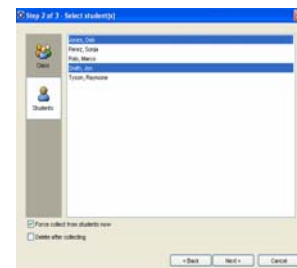


Figure 3

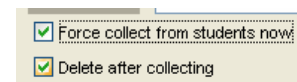


Figure 4

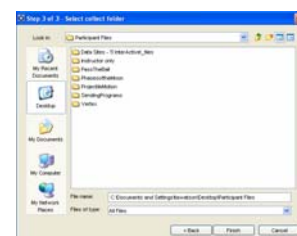


Figure 5

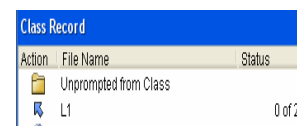


Figure 6

- If the student hasn't logged into the Navigator classroom yet, then they will transfer the files as soon as they log into the NavNet App.
2. If the files were not forced from the students, then the students must transfer them.
 3. From the TI-Navigator (NavNet) Home Screen on the calculator, select 3:Transfers.
 4. Select 1:Auto Send/Recv.
 5. The students will transfer all file(s) designated for them in the Class Record.

Verifying Transfer of Files from Students

1. From the Navigator Home Screen, select the file to be verified in the Class Record.
2. The seating chart view of the class will indicate if a student has successfully transferred the file, not attempted to transfer the file, or there was a problem with the transfer of the file by a colored box around the student icon. See Figure 7.
3. If the file was transferred successfully, then the box will be green.
4. If the file has not been transferred, then the box will be red.
 - If the transfer was a "Force collect", this may be because the student is not logged into the Navigator class.
 - If the transfer was not a "Force collect", then the student hasn't initiated the transfer yet.
5. If there was a problem with the transfer of the file, then the box will be yellow.
 - If the transfer was a "Force collect", this indicates that the student did not have the requested file on their calculator.



Figure 7

Tip Sheet: Sending Files

Setting Up The Class Record to Send All Types of Calculator Files

1. Open the TI-Navigator™ software.
2. Begin Class and have the students log into the NavNet application.
3. Click on the “Send to Class” icon. See Figure 1.
4. Select all the files you wish to send to the class. Use the CTRL key to select nonconsecutive files. Click Next. See Figure 2.
5. Select Class Send or Individual Student(s) Send.
 - If you would like to send to a subset of students only, then highlight all desired students by using the CTRL key. See Figure 3.
 - An alternative would be to select the students before clicking on the “Send to Class” icon from the Seating Chart view of the class on the Navigator Home screen.
6. If force send is desired, click in the white box to the left of “Force send to students now”. See Figure 4.
7. Click on Finish.
8. You will see the sent file(s) listed in the Class Record List on the Navigator Home screen. This line will also show how many of the students have received the files. See Figure 5.

Student Retrieval of Files in Class Record

1. If the file(s) were sent as a “force send”, then the students will receive the files automatically.
 - All students who have already logged into the TI-Navigator classroom will automatically receive the files even if they are not currently in the NavNet App.
 - If the student hasn’t logged into the TI-Navigator classroom yet, then they will receive the files as soon as they log into the NavNet App.
2. If the file(s) were not forced to the students, then the students must retrieve them.



Figure 1

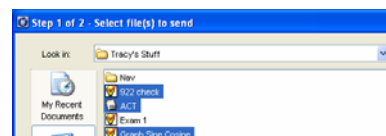


Figure 2

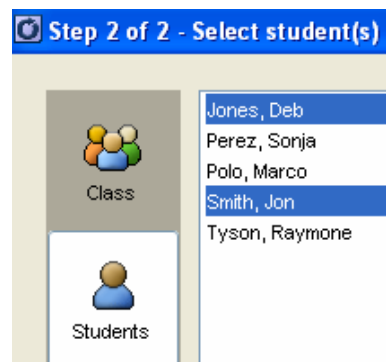


Figure 3

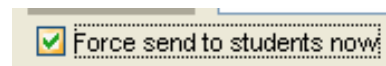


Figure 4

Class Record		
Action	File Name	Status
	Unprompted from Class	5 of 5
	Graph Sine Cosine.edc	0 of 2
	ACT.8xp	0 of 2
	922 check.edc	0 of 2

Figure 5

3. From the TI-Navigator Home screen on the student calculator, select 3:Transfers.
4. Select 1:Auto Send/Recv.
5. The student will receive all file(s) designated for them in the Class Record.
6. If there are no files to receive, then the student receives the message “No Files To Transfer”.

Verifying Transfer of Files to Students

1. From the TI-Navigator Home screen, select the file to be verified in the Class Record.
2. The seating chart view of the class will indicate if a student has successfully received the file or has not received the file by a colored box around the student icon. See Figure 6.
3. If the file was successfully received by the student, then the box will be green.
4. If the file was not received by the student, then the box will be red.
 - If the transfer was a “force send”, this may be because the student is not logged into the TI-Navigator class.
 - If the transfer was not a “force send”, then the student has not initiated the transfer yet.



Figure 6

Tip Sheet: Sending An Education Document (Alternative Method)

Sending An Education Document

1. Open the TI-Navigator™ software.
2. Begin class and have the students log into the NavNet application.
3. Open the LearningCheck software by clicking the LearningCheck icon. See Figure 1.
4. Click OK on the User Profile Section window.
5. Open the education document which is to be sent by clicking the Open file icon (or choosing Open under the File menu). See Figure 2.
6. Choose the file to be sent.
7. Click on the Send to Class icon in the LearningCheck software. See Figure 3.
8. Select the appropriate properties and click the Send button. See Figure 4.
9. You will be returned to the TI-Navigator software screen and the file will be listed under the Class Record listing. See Figure 5.
10. When sending an education document through LearningCheck, it will be sent to the entire class as a “force send”.

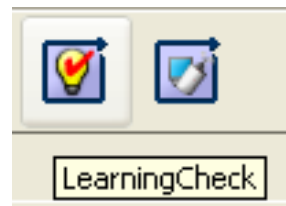


Figure 1

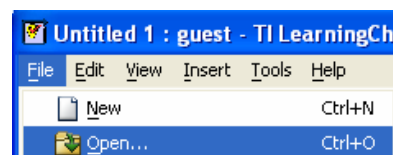


Figure 2

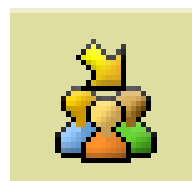


Figure 3

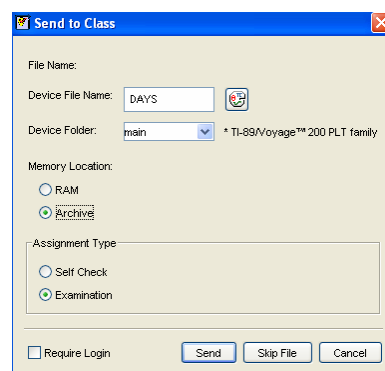


Figure 4

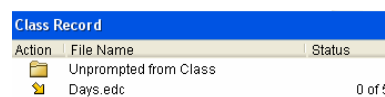


Figure 5

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Tip Sheet: Aggregating Data and Lists

Aggregating

There are two types of aggregating data: aggregating of data sets and aggregating of lists. The aggregating of data sets has the assumption that the collected lists of data from the students are considered pairs whose dimensions must match. The aggregating of lists has the assumption that the lists are independent and may have different dimensions. In either case, the aggregated data may be returned to the students for further investigation on their calculators.

Aggregating of Data Sets

1. Open the TI-Navigator™ software.
2. Begin Class and have the students log into the NavNet application.
3. Open the Activity Center in the Navigator software.
4. Select the List tab.
5. From the Contribute pull-down menu within the Activity Center select Lists. See Figure 1.
6. Select “Create New List”. See Figure 2.
7. Select “Group Lists as a Data Set” and choose the number of lists you wish to collect from the students (e.g. (x, y, z) pairs requires 3 lists). If desired, change the names of the lists.
8. Click OK.
9. Select the Configure button.
10. Choose the settings you wish for the activity along with the setting “Students start with: Empty lists”.
11. Click OK.
12. Click the “Start Activity” button.
13. Once the students enter the Activity Center on their calculators, they are able to enter their data sets into the given lists and send them.

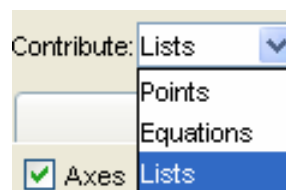


Figure 1

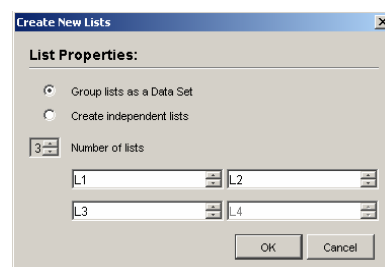


Figure 2

14. If the student enters data which do not have the same dimensions, they will get an error message “Lists Must Be The Same Length” when they try to send.
15. All the students’ data will appear on the Navigator’s Activity Center.
16. If desired, the data can be plotted on the screen from the List-Graph tab and clicking the “Configure Plots” to set up the plot.
17. Click the “Stop Activity” button.

Aggregating of Lists

1. Open the TI-Navigator software.
2. Begin Class and have the students log into the NavNet application.
3. Open the Activity Center in the TI-Navigator software.
4. Select the List tab.
5. From the Contribute pull-down menu within the Activity Center select Lists. See Figure 3.
6. Select “Create New List”. See Figure 4.
7. Select “Create independent lists” and choose the number of lists you wish to collect from the students.
8. Click OK.
9. Select the Configure button.
10. Choose the settings you wish for the activity.
11. Click OK.
12. Click the “Start Activity” button.
13. Once the students enter the Activity Center on their calculators, they are able to enter their data into the given lists and send them.
14. All the students’ data will appear on the TI-Navigator’s Activity Center.
15. If desired, the data can be plotted on the screen from the List-Graph tab and clicking the “Configure Plots” to set up the plot.
16. Click the “Stop Activity” button.

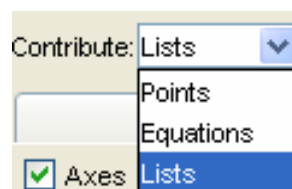


Figure 3

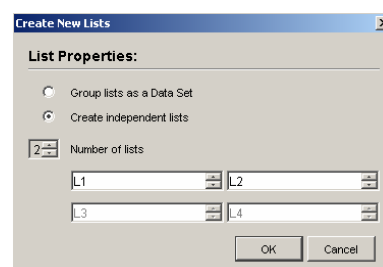


Figure 4

Returning Aggregated Data to the Student Calculators

1. After receiving data from the students, it is desirable to return the aggregated lists to the student calculators.
2. In the Activity Center, click the “Configure” button.
3. Choose the “Students start with: Existing activity lists”.
See Figure 5.
4. Click OK.
5. Click the “Starting Activity” button.
6. The students who are in the Activity Center on their calculators will receive the aggregated lists on their calculators.
7. When all the students have received the lists, click the “Stop Activity” button.
8. Students may now exit the NavNet application and investigate the aggregated data using their calculator.

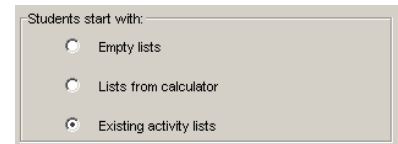


Figure 5

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