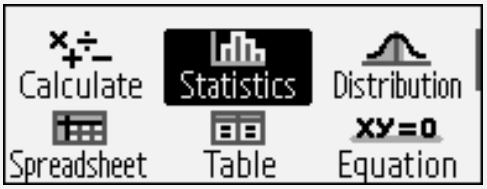
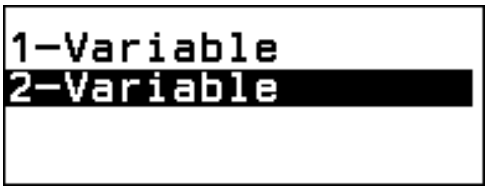
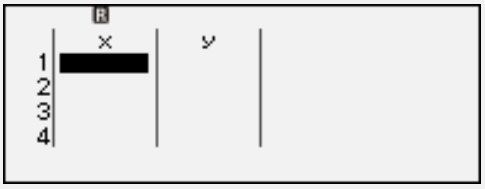
Unit 3: Lesson 3 – Exploring Circumference: Statistics App

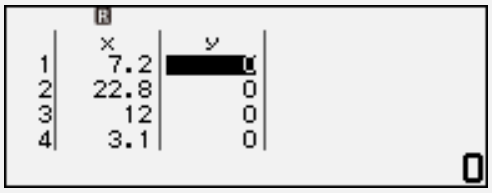
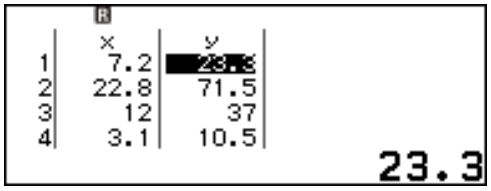
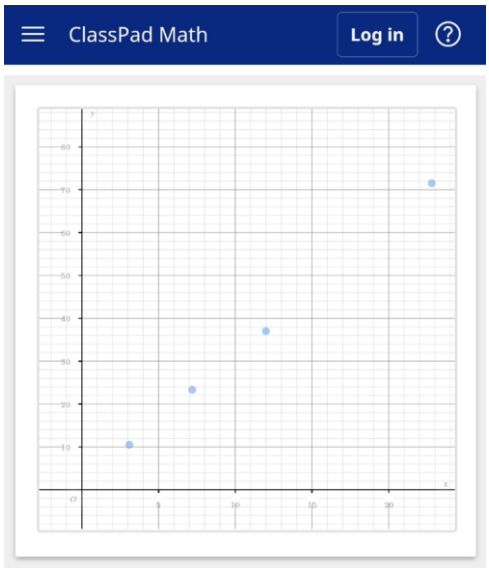
Activity 3.2: Measuring Circumference and Diameter

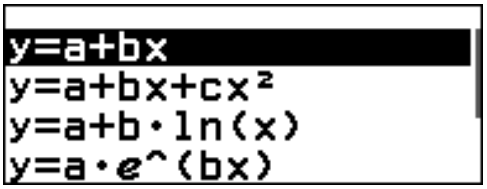
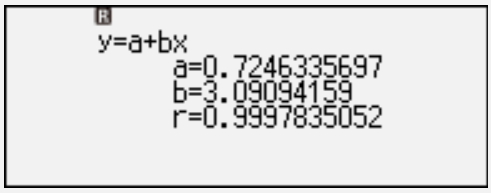
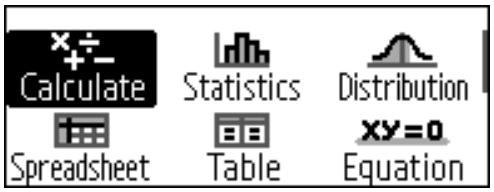
Skill: Use the Statistics app to create a scatter plot of circumference vs. diameter.

Activity Summary:

In this activity, students will measure the diameter and circumference of various circular objects, mirroring a previous activity involving squares. They will observe that these two quantities exhibit a proportional relationship. Through graphical analysis, students should be able to estimate the constant of proportionality to be approximately a number "slightly larger than 3"; introducing the constant of π. The Statistics app on the calculator can be used to create a QR Code to view a scatter plot of the circle's circumference versus its diameter on www.ClassPad.net. The formula for finding the circumference of a circle is discovered to be $C = \pi d$, where the proportionality constant is found to be π. An optional extension to this activity is calculating the line of best fit from our data and determining our percent error of the proportionality constant found to the value of π.

1. Turn on the calculator with the ⏻ **- On button**. Press ⌂ **– Home** and then use the **arrow keys** to highlight the **Statistics app**.	
2. Press either (OK) or (EXE) to open the **Statistics app**. To enter the diameter and circumference measures from the table, press the **down arrow**, ▽, to highlight **2-Variable**.	
3. Press either (OK) or (EXE). The ***x*-column** will be used to enter the **diameter** measurements and the ***y*-column**, the corresponding **circumference** measurements.	
4. Depending upon the size of the circular objects available, measurements will vary. Enter the **diameter** measurements in the **x-column** first. Press either (OK) or (EXE) to enter a value and move down to enter the next value. Four sample objects are used for these notes.	

5. To quickly move to the top of the next column, press the **down arrow**, ⓥ, to return to the **top value** and then the **left arrow**, ⓢ, to move to the ***y*-column** to enter the circumferences.	
6. Enter the corresponding **circumference** measurements. Press either ⓞ or ⓔ after each entry to move down to enter the next value. Another way to return to the top of a column is pressing the **scroll up key**, ⓐ.	
7. To view a **scatter plot** of the **circumference** versus **diameter** data, first obtain the **QR Code**; press ⓤ, ⓧ and then **scan** with an **internet enabled device**.	
8. The **ClassPad.net** page will open on the device, as shown on the right, where further investigation can be made. 9. **The Scatter Plot** can now be used to help determine the **proportionality constant** between a circle's **circumference** and **diameter**. 10. The data points lie on a **nearly straight line** which would appear to go through the **origin**, **(0,0)**. This indicates a **proportional relationship** between **circumference** and **diameter**. 11. To **estimate** the **proportionality constant**, divide each object's **circumference** by its **diameter**. Each are a value slightly larger than 3.	
12. **Optional**: Find the **equation** of the **line of best fit** for your data by performing a **linear regression** on the calculator. Press either ⓞ or ⓔ while a data value is highlighted to open the **stats calculation menu**. Press the **down arrow**, ⓥ, to highlight **Reg Results**.	

13. Press either ▷, OK, or EXE to view the **regression models** available. The top highlighted model is a **linear model**.	
14. Press either OK or EXE to see the values of ***a*** and ***b*** of the **line of best fit**. If our **model** was "perfect", ***a*** would be **zero**. The value of ***b*** for our model was **3.09**, which is slightly less than the expected value of π.	
15. Let's determine the **percent error** in our measurement. Press ⌂ **– Home** and use the **arrow keys** to select the **Calculate app**.	
16. From the **measurements** of our circular objects, our **estimate** for the value of π had an **error** of about **1.6%** from the actual value.