

Session #34

# Using Graphing Calculators to Improve PSSA Scores

## Calculator Activities

by

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# Activity 4

## Perimeter, Circumference, Area, Surface Area and Volume

### TEACHER NOTES

**Topic Area:** Measurement of Perimeter, Circumference, Area, Surface Area and Volume.

**NCTM Standard:** Apply appropriate techniques, tools, and formulas to determine measurements.

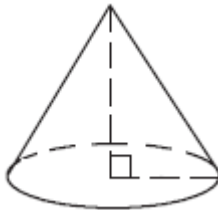
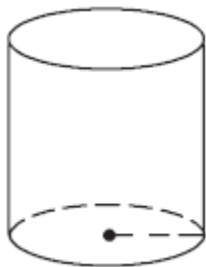
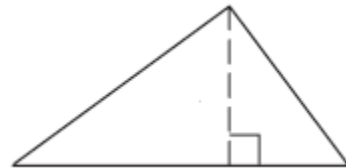
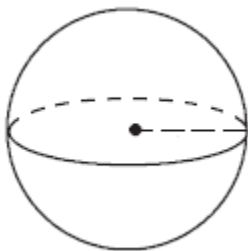
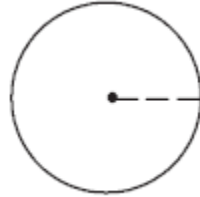
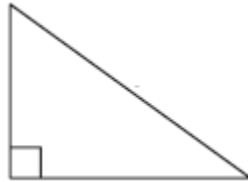
**Objective:** The student will be able to utilize the Equation Solver of the Casio fx-9750G Plus calculator in the various activities included in this unit.

**Introduction:** Most state tests supply a formula sheet which includes the formulas for area, surface area and volume. The formulas are supplied with the calculator notes. The low achieving math student struggles with the steps of learning the parts of the geometric shapes, learning the formulas, and applying the formulas. The state test makes it easier for these students by listing the formulas and the Casio fx-9750G Plus calculator can make it easier for these students by solving the equation. Therefore, if the students understand and recognize the parts of the geometric shape, they can solve the geometric formulas.

The students should be familiar with the following terms:

Area  
Base  
Circumference  
Diameter  
Height  
Length  
Parallelogram  
Perimeter  
Perpendicular  
Pi ( $\pi$ )  
Radius  
Rectangle  
Rectangular Solid  
Right Angle  
Surface Area  
Trapezoid  
Triangle  
Volume  
Width

Students should also recognize the following geometric shapes:

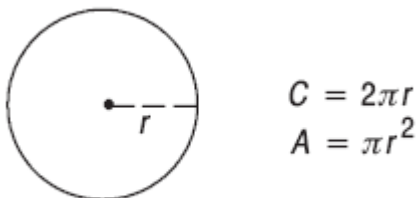
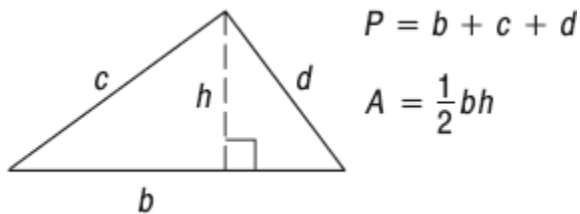
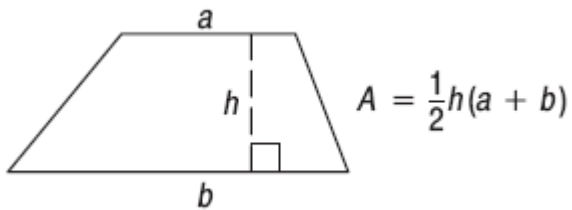
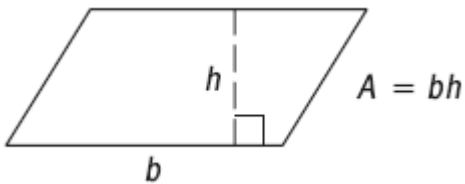
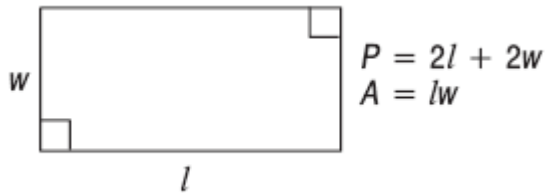


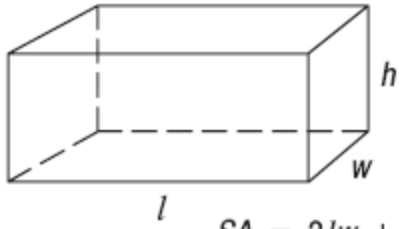
# Calculator Notes for Activity 4

## Objective

The student will be able to utilize the Casio fx-9750G Plus calculator in the various activities included in this unit.

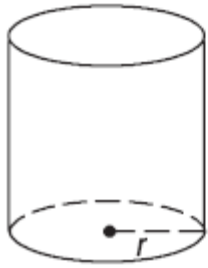
## Formulas





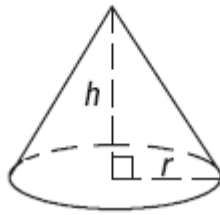
$$SA = 2lw + 2lh + 2wh$$

$$V = lwh$$



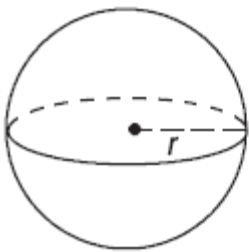
$$SA = 2\pi r^2 + 2\pi rh$$

$$V = \pi r^2 h$$



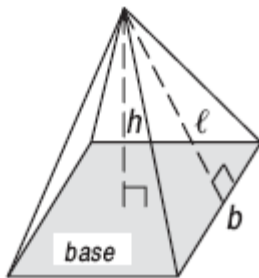
$$SA = \pi r^2 + \pi r \sqrt{r^2 + h^2}$$

$$V = \frac{1}{3} \pi r^2 h$$



$$SA = 4\pi r^2$$

$$V = \frac{4}{3} \pi r^3$$



$$SA = (\text{Area of the base}) + \frac{1}{2} \ell (\text{number of base sides})(b)$$

$$V = \frac{1}{3} (\text{Area of the base}) \times h$$

**Problem:** Find the surface area of a cylinder. The height is 5 and the radius is 2.6.

### Steps for Solving

1. From the formulas, find the cylinder and the formula for surface area. What does **r** represent? What does **h** represent?
2. From the main menu of the calculator, use the arrow keys to highlight the **EQUA** Menu and press **EXE**.



3. At the top of the calculator, press the **F3** key to get to the Equation Solver.

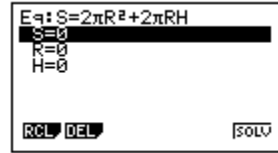
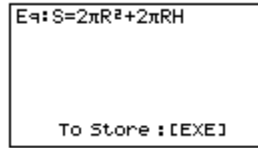


4. If there is an equation filled in your calculator, it must be cleared. To do this, at the top of the calculator, choose **F2** (DEL) and then choose **F1** (Yes).

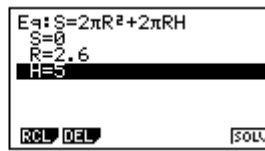
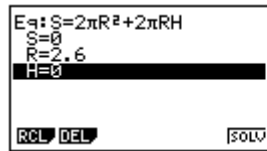


5. Fill the formula for the surface area of a cylinder into the calculator. The calculator does not understand a two variable representation like SA, so use just S to stand for surface area. To do this, press the **ALPHA** Key, then S (which is in red above the multiplication sign), **SHIFT** Key, decimal point

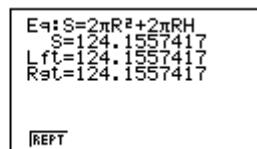
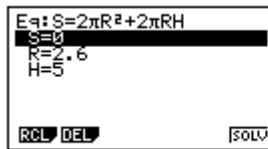
(which displays the equal sign), 2, **SHIFT** Key, **EXP**(which is  $\pi$ ), **ALPHA** Key, R,  $x^2$ , +, 2, **SHIFT** Key, **EXP**, **ALPHA** Key, R, **ALPHA** Key, H, **EXE**.



6. Notice that the calculator displays the three variables you entered: S, R, and H. Use the arrow keys to highlight the R and enter the radius, which is 2.6, and press **EXE**. Use the arrow keys to highlight the H and enter the height, which is 5, and press **EXE**.



7. Now that your variables are filled into the calculator, you can solve for the Surface Area. To do this, first use the arrow keys to highlight the S, and press **F6** (SOLV). Always make sure the variable you are solving for is set for 0 before you press the **F6**.



8. The second line of your screen is the surface area which is 124.1557417.
9. To do another problem, press **F1** (REPT). Always clear the equation before beginning a new problem (Step 4).

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## **Activity 4: Worksheet**

### **Perimeter, Circumference, Area, Surface Area and Volume**

Solve the following problems:

1. What is the area of a rectangle whose length is 5 and width is 4?
2. What is the length of a rectangle whose area is 42 and width is 7.1?
3. Find the Surface Area of a sphere whose radius is 16.3 inches. What is the volume of this sphere?
4. If the area of a trapezoid is 216 sq.ft. and the height is 8 ft when one of the bases is 12ft, what is the length of the other base? The calculator reads only one A (the base a, call x).
5. If the volume of a cylinder is 158 cu.in. when the height is 6 inches, what is the radius? What is the surface area of this cylinder?
6. The height of a cone is 8 in. and the radius is 3.5 in. Find the surface area and volume of the cone.
7. If a rectangular solid has the length of 24 in., the width of 19.5 in., and the surface area of 1658.1sq.in., find the volume of the rectangular solid.

8. A wood deck is shaped like a parallelogram, the base is 55 ft and the height is 22 ft., how many gallons of water sealant is needed to cover the deck if one gallon covers 125 sq.ft.?

### Solutions to Activity 4 Worksheet

1. 20

```
Eq: A=LW
  A=20
  Lft=20
  Ret=20

|REPT
```

2. 5.915492958

```
Eq: A=LW
  L=5.915492958
  Lft=42
  Ret=42

|REPT
```

3. 3338.759009 sq.in.; 18140.59061cu.in

```
Eq: S=4πR²
  S=3338.759009
  Lft=3338.759009
  Ret=3338.759009

|REPT
```

```
Eq: U=(4.3)πR³
  U=18140.59061
  Lft=18140.59061
  Ret=18140.59061

|REPT
```

4. 42 ft.

```
Eq: A=(1.2)H(X+B)
  B=42
  Lft=216
  Ret=216

|REPT
```

5. 2.895196079 in.; 161.8129875 sq.in.

```
Eq: U=πR²H
  R=2.895196079
  Lft=158
  Ret=158

|REPT
```

```
Eq: S=2πR²+2πRH
  S=161.8129875
  Lft=161.8129875
  Ret=161.8129875

|REPT
```

6. 134.4992347 sq.in.; 102.62536 cu.in.

```
Eq: S= $\pi R^2 + \pi R \sqrt{R^2 + H^2}$ 
S=134.4992347
Lft=134.4992347
Rst=134.4992347
|REPT
```

```
Eq: U= $(1.3)\pi R^2 H$ 
U=102.62536
Lft=102.62536
Rst=102.62536
|REPT
```

7. 3884.4 cu.in.

```
Eq: S= $2LW + 2LH + 2WH$ 
H=8.3
Lft=1658.1
Rst=1658.1
|REPT
```

```
Eq: U=LWH
U=3884.4
Lft=3884.4
Rst=3884.4
|REPT
```

(Did you remember to find the height before finding the volume?)

8. 9.68 gallons

```
Eq: A=BH
A=1210
Lft=1210
Rst=1210
|REPT
```

```
1210÷125          9.68
|REPT
```

# Activity 11

## Best-Fit Line

### TEACHER NOTES

**Topic Area:** Data Analysis and Probability

**NCTM Standard:** Select and use appropriate statistical methods to analyze data.

**Objective:** The student will be able to utilize the Casio fx-9750G Plus calculator to determine the best-fit line or line of regression of bivariate data in the various activities included in this unit.

**Introduction:** This activity is designed to help students to relate their knowledge of slope-intercept to constructing a line of best-fit. Using the line of best-fit, students will be required to make predictions. This topic of best-fit line is a common topic for state testing especially for open-ended tasks or multi-step written questions.

Students should be familiar with the following vocabulary.

Best-Fit Line

Bivariate Data

Line of Regression

Slope

Slope-Intercept Form

Y-Intercept

## Calculator Notes for Activity 11

**Objective:** The student will be able to utilize the Casio fx-9750G Plus calculator to determine the best-fit line or line of regression of bivariate data in the various activities included in this unit.

### Steps for Constructing a Line of Best-Fit

Problem: The following is a table displaying the death rates in California from 1970 to 2003. You are to construct a scatter plot on the calculator, draw the best-fit line, determine the equation of best-fit, and then predict what the death rate will be in the year 2050.

Year	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987
Death Rate	6.7	6.6	6.7	6.6	6.7	6.8	6.8	6.8	6.9	6.9	6.9	6.8	6.9	7	7.4	7.6	7.6
Year	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1776	1775	1974	1973	1972	1971	1970
Death Rate	7.5	7.6	7.6	7.4	7.6	7.6	7.8	7.6	7.7	7.6	7.8	7.9	8.1	8.3	8.3	8.3	8.3

### Steps to Solve Best-Fit Problem

1. First you must enter the data into the calculator. To make it easy, let 1970 = 0; 1971 = 1; 1972 = 2, ... 2003 = 33. Turn the calculator on, use the arrow keys to choose the **STAT Menu** and press **EXE**. IF there is data in the calculator, delete it by pressing F6, then press F4 and then press F1 for each list that contains data. Fill the years into List 1 by pressing 33, **EXE**, 32, **EXE**, 31, **EXE**, and so on until you get to 0, **EXE**. Your screen should look like this.



Press the right arrow to move the cursor to List 2.

	List 1	List 2	List 3	List 4
1	33			
2	32			
3	31			
4	30			
5	29			

SRTA SRTD DEL DELT INS D

Enter the death rates into list 2 by pressing 6.7, EXE, 6.6, EXE, 6.7, EXE, and so on until all the data is entered.

	List 1	List 2	List 3	List 4
31	3	8.3		
32	2	8.3		
33	1	8.3		
34	0	8.3		
35				

SRTA SRTD DEL DELT INS D

2. Once the data is entered, you need to tell the calculator to make the scatter plot of the points. Press F6 to get back to the following choices at the bottom of the screen.

	List 1	List 2	List 3	List 4
31	3	8.3		
32	2	8.3		
33	1	8.3		
34	0	8.3		
35				

GRPH CALC TEST INTB DISTR D

Choose F1 (GRPH).

	List 1	List 2	List 3	List 4
31	3	8.3		
32	2	8.3		
33	1	8.3		
34	0	8.3		
35				

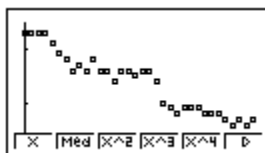
GPHE GPHE GPHE SEL SET

Choose F6 (SET). In Graph Type, choose F1 (Scat), for XList choose F1 (List1), for YList choose F2 (List2), for Frequency choose F1 (1), and for Mark Type choose whatever you want but F1 is the easiest to view. Your screen of choices should look like this:

StatGraph1	
Graph Type	:Scatter
XList	:List1
YList	:List2
Frequency	:1
Mark Type	:*

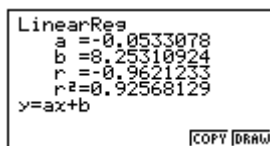
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To draw the graph, press EXIT, then press F1 (GPH1). Your graph should look like the following.



This graph is called your scatter plot.

3. To draw your best-fit line on the scatter plot, you need to find the equation of best-fit first. To do this press F1 (x). This is your best-fit line selection. You should see this screen.



Copy these numbers down because they are used to find the equation of best-fit. The a is the slope of the line, b is the y-intercept, r is the correlation coefficient which you will not need at this time, the  $r^2$  will not be needed either. Under these letters, you will find the equation:

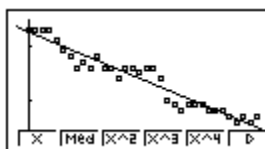
$$y = ax + b$$

You should recognize this as slope-intercept form which means that you substitute the a and b values into the equation to get:

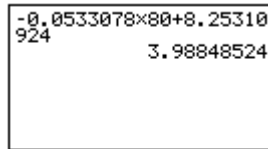
$$y = -0.0533078x + 8.25310924$$

This is your equation of best-fit.

4. To draw this equation of the best-fit line, or the regression line on the graph, press F6 (DRAW). Your screen should look like this.



5. Your last step is to predict what the death rate in California will be in 2050. If the year 1970 is 0, then to find what 2050 is subtract 1970 from 2050. Therefore, the  $x = 80$ . Substitute 80 for  $x$  into the equation of best-fit. On the calculator, press Menu, use the arrow keys to the RUN Menu, press (-), then press 0.0533078, press  $\times$  (multiplication sign), press 80 instead of the  $(x, \theta, T)$  key, press +, and then press 8.25310924, EXE.



A calculator display showing the calculation of the death rate for 2050. The display is divided into two sections. The top section shows the equation  $-0.0533078 \times 80 + 8.25310924$ . The bottom section shows the result  $3.98848524$ .

This means that in the year 2050, the death rate will be 3.99%.

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## Activity 11: Worksheet Best-Fit Line

1. Using the data in the following table, you are to construct a scatter plot on the calculator, draw the best-fit line, determine the equation of best-fit, and then predict what  $y$  will be when  $x$  is 38.

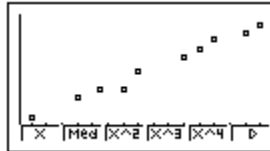
<b>x</b>	4	7	8.5	10	11	14	15	16	18	19
<b>y</b>	150	450	600	600	900	1100	1250	1400	1500	1650

2. Using the data in the following table, you are to construct a scatter plot on the calculator, draw the best-fit line, determine the equation of best-fit, and then predict what  $y$  will be when  $x$  is 1000.

<b>x</b>	50	75	80	100	150	175	210	250	260	320
<b>y</b>	0.35	0.5	0.6	0.7	0.75	0.85	1.05	0.9	1.05	1.15

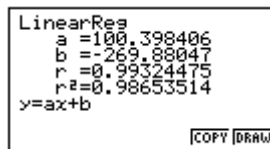
## Solutions to Activity 11 Worksheet

3. The scatter plot should look like this:

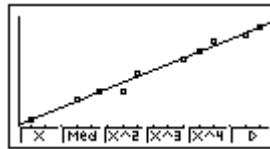


The equation of best-fit is:

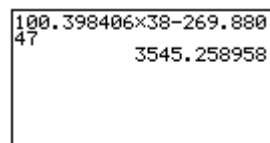
$$y = 100.398406x - 269.88047$$



Drawing the best-fit line should look like this:



To make the prediction:



When x is 38, y will be 3545.258958.

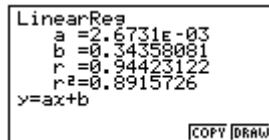
2. The scatter plot should look like this:



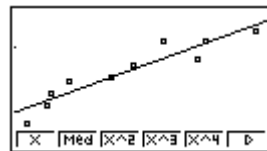
The equation of best-fit is:

$$y = .0026731 x + 0.34358081$$

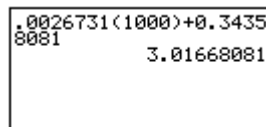
(2.6731E-03 means  $2.6731 \times 10^{-3}$  or .0026731)



Drawing the best-fit line should look like this:



To make the prediction:



When x is 1000, y will be 3.01668081.

