



Black Holes Everywhere

Finding Successive Square Roots

In the RUN Menu:

Enter a value

Press \wedge key

0.5

EXE key

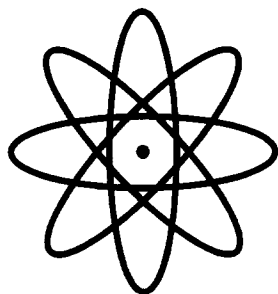
\wedge key

Shift key

(-) key (Ans)

EXE key

Repeat process.



Using the Fraction Key

To enter the fraction $\frac{3}{4}$

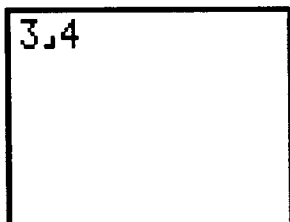
Press 3

α b/c key

4

The screen displays three-fourths on the CFX-9850G.

The \downarrow symbol between the 3 and the 4 represents the fraction bar.



Standards: Problem Solving, Communication, Reasoning, Connections, Algebra, Functions, and Trigonometry

Materials: CFX-9850G or CFX-9850Ga PLUS

Calculator Menu: RUN

Astronomers define black holes as regions in space where the force of gravity is so great that even light cannot escape the environment. In mathematics, some situations consistently collapse into a given number, creating a mathematical "black hole."

On the calculator:

Enter a whole number

Multiply by 2

EXE

Add 4

EXE

Divide by 2

EXE

Subtract the original number

EXE

What is your answer? **A.** _____

Repeat the process above using a different whole number. What is your answer? **B.** _____

Repeat the process with a fraction using the fraction key on the CFX-9850G. What is your answer? **C.** _____

Repeat the answer using a decimal. What is your process? **D.** _____

Prove why **A - D** have the same answer. **E.**

Create a mathematical "black hole" that will always yield 7. Give the algebraic steps to verify that any real number will result in 7 for the mathematical "black hole" you created. **F.**

Is there another mathematical "black hole" that will yield 7 besides the one you created? Explain your response. **G.**

Black Holes Everywhere

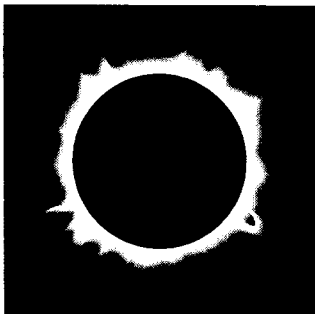
Using Ans to Access a Previous Answer

In the RUN Menu
 Press SHIFT key
 X² key
 16
 EXE key
 SHIFT key
 X² key
 SHIFT key
 (-) key (Ans)
 EXE key

? represents a high level question

Changing From Radians to Degrees

In GRAPH or RUN Menu
 Press SHIFT key
 MENU key
 ↓ to Angle
 F1 (Deg)
 EXIT key



Adapted from an NCTM's Student Math Notes, September 1991.

Choose any 4 digits without repeating the digits. Subtract the smallest possible number **formed** by the 4-digits from the largest possible number **formed** by the 4-digits (For example, choose 2431. The smallest possible number formed in 1234 and the greatest is 4321). Repeat the process using the missing addend (answer) from the subtraction problem (note that digits might repeat now). Continue until something unusual happens. Describe what happened. **H.**

Take any counting number greater than one, square each digit, add the squares, and repeat the process until something unusual happens. Describe what happens. **I.**

Select a counting number. Take the square root of the selected number and then take the square root of that answer. Having done that, take the square root of the new answer, repeating the process until something unusual happens. Describe what happens. **J.**

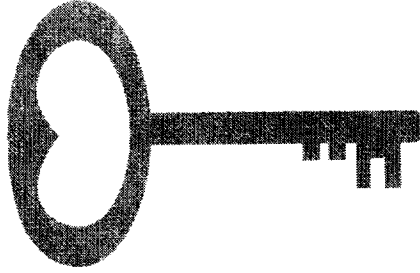
? Repeat the above process by taking the cube of each digit. Describe what happens. **K.**

Change your calculator to the degree mode. Find the sine of 57°. Having done that, take the sine of the new answer, repeating the process until something unusual happens. Describe what happens. **L.**

What happens with the cosine and tangent when the repetitive procedure is applied to them? **M.**

? What happens with sine, cosine and tangent when the repetitive process is applied to them and the angle is expressed in terms of radians? **N.**

Solution Key



Black Holes Everywhere

A. - D. 2

E. Let X be the number selected. The algebraic steps of the problem in answer A would be: X ; $2X$; $2X+4$; $(2X+4)/2=X+2$; $X+2-X=2$. X can be any real number.

F. Answers will vary.

G. Yes. Answers will vary.

H. Answers will vary. Eventually a constant answer is derived.

I. Answers will vary. It will go to a constant or loop. **J.** Answers will vary. The result will approach 1.

K. Answers will vary. Loops.

L. Answers will vary. The value approaches zero.

M. - N. Answers will vary.
