

Related Procedures

Grades 2 - 6

Overview

Students will use the two constant operations ($\boxed{Op1}$ and $\boxed{Op2}$) to compare the results of different mathematical procedures and determine how they are related.


Math Concepts

- whole numbers
- addition, subtraction, multiplication, division
- fractions (Grades 5-6)
- decimals (Grades 5-6)

Materials

- TI-15
- pencil
- student activity (page 23)

Introduction

1. Have students program $\boxed{Op1}$ with +2 and $\boxed{Op2}$ with -2.
 2. Have students enter **8** on their calculators, press $\boxed{Op1}$, and read the output (**1 10**, which means adding 2 once to 8 gives 10).
 3. Have students press $\boxed{Op2}$ to apply the second constant operation to the output of the first constant operation, and then read the output (**1 8**, which means subtracting 2 once from 10 gives 8).
 4. Have students continue this process with various numbers as their first input. Discuss their results. (Pressing $\boxed{Op1}$ and then $\boxed{Op2}$ always gets you back to the first input number, which means $\boxed{Op1}$ and $\boxed{Op2}$ are inverse procedures.)
 5. Challenge students to find more pairs of procedures for $\boxed{Op1}$ and $\boxed{Op2}$ that will follow the same pattern and record their investigations using the *Related Procedures* student activity page.
-  To use $\boxed{Op1}$ and $\boxed{Op2}$:
1. Press $\boxed{Op1}$ (or $\boxed{Op2}$).
 2. Enter the operation and the number (for example, $\boxed{+}$ 2).
 3. Press $\boxed{Op1}$ (or $\boxed{Op2}$).
 4. Enter the number to which you want to apply the constant operation.
 5. Press $\boxed{Op1}$ (or $\boxed{Op2}$).
The display will have a **1** on the left and the result on the right. If you press $\boxed{Op1}$ (or $\boxed{Op2}$) again, the calculator will apply the constant operation to the previous output and display a **2** at the left, indicating the constant operation has been applied twice to the original input.

Related Procedures (Continued)

Collecting and Organizing Data

As students use $\boxed{\text{Op1}}$ and $\boxed{\text{Op2}}$, have them record their results in the appropriate tables on the Student Activity page. For example, if a student is exploring the relationship between $\times 2$ and $\div 2$, the tables might look something like this:

Table for $\boxed{\text{Op1}}$

Input	Procedure	Output
1	$\times 2$	2
2	$\times 2$	4
3	$\times 2$	6

Table for $\boxed{\text{Op2}}$

Input	Procedure	Output
2	$\div 2$	1
4	$\div 2$	2
6	$\div 2$	3


Analyzing Data and Drawing Conclusions

Ask students:

- *What patterns do you see in your data?*
- *Are the procedures inverses of each other? How do you know?*

If the output number for $\boxed{\text{Op1}}$ is used as the input number for $\boxed{\text{Op2}}$ and gives an output number equal to the original input number for $\boxed{\text{Op1}}$, then the procedures may be inverses of each other, as in $\times 2$ and $\div 2$.

- *Does the pattern work with special numbers like 1 and 0? With fractions and decimals? With positive and negative integers?*
- *What happens if you use $\boxed{\text{Op2}}$ first, and then $\boxed{\text{Op1}}$?*

 To recognize the equivalent procedures, students may need to use the $\boxed{\text{F}\leftrightarrow\text{D}}$ key to change outputs from decimal to fraction form or vice versa.

Related Procedures (Continued)

Continuing the Investigation

Older students can investigate equivalent procedures, such as dividing by a number and multiplying by its reciprocal. For example, if a student is exploring the relationship between $\times \frac{1}{2}$ and $\div 2$, the tables might look something like this:

Table for **Op1**

Input	Procedure	Output
1	$\times \frac{1}{2}$	$\frac{1}{2}$
2	$\times \frac{1}{2}$	1
3	$\times \frac{1}{2}$	$1.5 = 1\frac{1}{2}$

Table for **Op2**

Input	Procedure	Output
1	$\div 2$	$0.5 = \frac{5}{10} = \frac{1}{2}$
2	$\div 2$	1
3	$\div 2$	$1.5 = 1\frac{5}{10} = 1\frac{1}{2}$

Related Procedures

Name _____

Date _____



Collecting and Organizing Data

1. Choose a procedure for $\boxed{\text{Op1}}$ (for example, $\times \frac{1}{2}$).
2. Choose a procedure for $\boxed{\text{Op2}}$ (for example, $\div 2$).
3. Select an input number to apply the procedure to and record both the input and output numbers in the appropriate table.
4. Use the tables below to record and compare your results using $\boxed{\text{Op1}}$ and $\boxed{\text{Op2}}$.

Table for $\boxed{\text{Op1}}$

Input	Procedure	Output

Table for $\boxed{\text{Op2}}$

Input	Procedure	Output

Analyzing Data and Drawing Conclusions

5. How do the two procedures compare?

6. What patterns do you see?

7. Are the two procedures related? Explain.
