Activity 1: There and back again — Teacher's notes

Framework reference: Page 85

Strand: Calculations
Topic: Number operations and the relationships between them
Pupils should be taught to: Consolidate understanding of the operations of multiplication and division, their relationship to each other and to addition and subtraction
Year group: 8
Objectives: Use inverse operations
Key Vocabulary: Inverse, order of operations
Resources required: Class set of calculators plus Viewscreen, or TI-SmartView emulator.

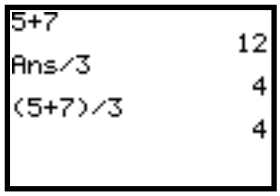
Summary

For this activity students need only simple calculator skills. Using the machine for the actual calculations shifts attention onto the operations and their inverses.

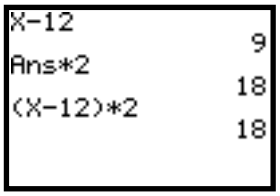
Instructions for the teacher

(1) Remind students of the need for brackets when dealing with some compound operations such as "add 7 then divide by 3". This can be done by asking them to choose any starting number and then produce screens such as these: the compound expression must give the same answer as the two simple operations.

Add 7 then divide by 3



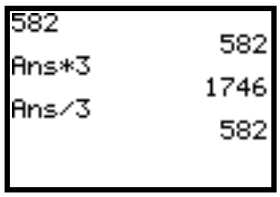
Subtract 12 then multiply by 2



In the second screen the starting number has been previously stored in X.
In this lesson it may be best *always* to use brackets around the first binary operation.

(2) Remind students of the meaning of inverse and that addition and subtraction are inverses, as are multiplication and division. Do this using the demo calculator as shown in the following example.

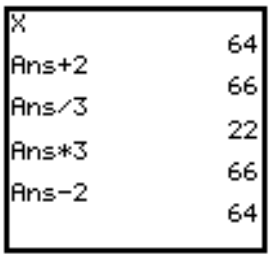
- Choose any number and press [ENTER]
- Press [×] **3** [ENTER] (Now we are "there".)
- Press [÷] **3** [ENTER] (Now we are "back again".)

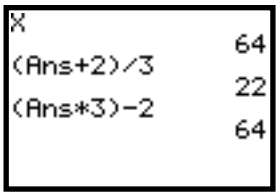


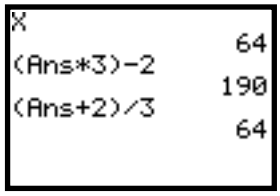
Repeat, but this time divide first and then multiply.

(3) Students work through Handout 1. You may wish to use the last question only with more able students. (The problem referred to in Activity 4 shows up if you choose a negative value for X.)

(4) Class-teach the inverse of a multiple operation, perhaps beginning as shown on the right and then moving on to the shorter version below. Keep using the phrase "there and back again".







You will need to use [2nd] [ANS] here and repeated use of [2nd] [ENTRY] will also save some time.

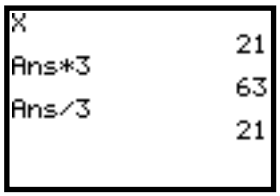
(5) Move on to Handout 2.

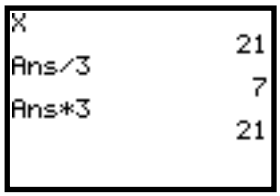
(6) Finally, draw together results from Activities 5-7 and work towards a statement of a general rule for finding the inverse of multiple operations.

This activity was first published in
30 Calculator Lessons for Key Stage 3
(*A+B Books*).

1) Screensnap

Make your calculator look exactly like these.
Hint: To store a number in X use [STO▸] and [X,T,Θ,n].





This illustrates that ***multiply by 3***
is the inverse of ***divide by 3***.
But what if X were a really big number, or a fraction, or a negative number...?

2) Pick your own

Why not choose a really nasty X number?

Store any number you like in X and repeat Activity 1.
Make sure you end up with the same number you started with.
Is ***multiply by 3*** the inverse of ***divide by 3***, whatever number you start with?

3) Other inverses

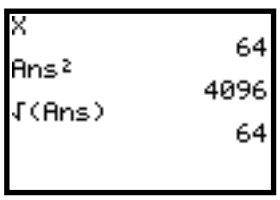
(a) Produce two screens to show that ***add 3*** is the inverse of ***subtract 3***.
Draw your screens here.

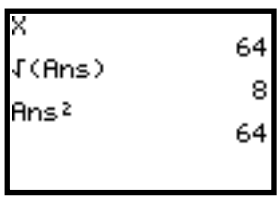
(b) Write the inverse of ***subtract 0.125***
here _____
Draw two screens to show this.

(c) Write the inverse of **divide by 0.125**
here _____
Draw two screens to show this.

4) There-and-back with a square

These screens seem to show that squaring and square rooting are inverses. Try this with your own nasty X numbers.
To enter **√(Ans)** press [2nd] [√‾] [2nd] [ANS] [)].



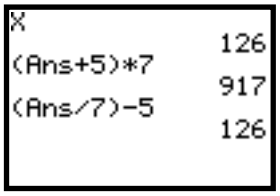


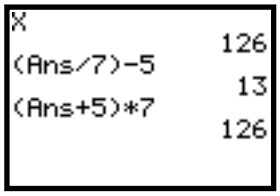
If you make X nasty enough you'll find that this won't work. What's the problem?

5) Screensnap back again

Make your calculator look exactly like these.
Hints:

- To enter **Ans** press [2nd] [ANS].
- Save yourself time on the second screen by using [2nd] [ENTRY] several times.





This illustrates that **divide by 7 then subtract 5** is the inverse of **add five then multiply by 7**.

6) Find the inverse

In each case draw two screens to illustrate your answers.

(a) What is the inverse of
add six then multiply by 17?

_____

(b) What is the inverse of
divide by 19 then subtract 51?

_____

(c) What is the inverse of
add 0.25 then multiply by 0.005?

_____

7) Longer journeys there and back

(a) What is the inverse of...
add 2 then divide by 3 then subtract 4?

_____

Draw two screens to illustrate your answer.

(b) Make up some more long there-and-back journeys.