

Objective

To understand the use of the Last Answer Key in iterative calculations.
To explore the way in which series can be generated.

Explanation of the activity

The Last Answer facility found on Sharp scientific calculators is a much more versatile function than the more conventional Constant function. For example, its use can enable students to explore sequences of numbers, explore the relationship between fractions, and investigate the concepts of roots and powers.

All Sharp calculators using Advanced D.A.L. technology have the Last Answer function as a 2nd function option on the equals (=) key, shown as ANS on the keyboard. Within the calculator, a memory holds the result of a calculation after the equals (=) key was last pressed. This memory location is in addition to other memories the calculator may have, and its contents are accessed by using the ANS function.

Using the calculator

Sequences

The sequence 3 5 7 9 11 13 15 ... can be described as an 'add 2' sequence starting at three. The way in which this can be generated on the calculator is:

Press $\boxed{3} \boxed{=}$

(This places the value 3 in the ANS result memory.)

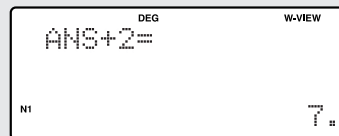
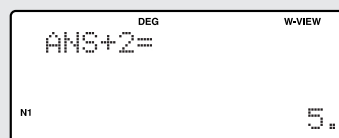
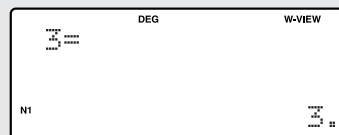
Recall this memory using

$\boxed{(\text{ALPHA})} \boxed{\text{ANS}} \boxed{+} \boxed{2}$

Successive keying of $\boxed{=}$

will generate the sequence, since on each use of the equals key the current result will overwrite the previous contents of the result memory, so that it becomes the next value used by ANS.

Do you notice the pattern?



Fractions

Depending on the way in which the calculator represents fractions, students can explore the relationship of adding, say, $\frac{1}{6}$ repeatedly to itself and seeing the build up and change (including simplification) of the result. Clear display.

Press $\boxed{1} \boxed{a/b} \boxed{6} \boxed{=}$

Recall ANS memory

$\boxed{(\text{ALPHA})} \boxed{\text{ANS}} \boxed{+} \boxed{1} \boxed{a/b} \boxed{6} \boxed{=}$

$\boxed{=}$

$\boxed{=}$ etc

The calculator displays the following sequence of results:

- Screen 1: $\frac{1}{6}$
- Screen 2: $\text{ANS} + \frac{1}{6} = \frac{2}{6}$
- Screen 3: $\text{ANS} + \frac{1}{6} = \frac{3}{6}$

Powers and roots

Concepts of powers and roots can be explored through the Last Answer facility, using repeated multiplication or division.

For this process, it may be necessary to set up an initial last answer of 2.

Press $\boxed{2} \boxed{=}$

The process

$\boxed{(\text{ALPHA})} \boxed{\text{ANS}} \boxed{x^2} \boxed{=} \boxed{=} \boxed{=} \text{ etc.}$

leads to the geometric progression
2 4 16 256 ...

The calculator displays the following sequence of results:

- Screen 1: 2
- Screen 2: $\text{ANS}^2 = 4$
- Screen 3: $\text{ANS}^2 = 16$

Powers and roots (continued)

Reversing the process starting with

$$\boxed{256} \boxed{=}$$

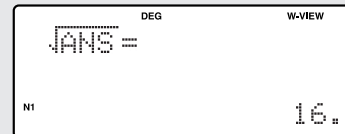
and setting up the process

$$\boxed{\sqrt{}} \boxed{\text{ALPHA}} \boxed{\text{ANS}} \boxed{=} \boxed{=} \boxed{=}$$

leads to the exploration of the reverse process, which is the square root, and continuation to the approach of the limit 1.



Calculator display showing 256= and 256.



Calculator display showing √ANS = and 16.

••••• Using the activity in the classroom •••••

Sequences

Students can be asked to generate sequences and record the rules used.

5 9 13 17 ... 24 19 14 9 ...
2 4 8 16 ... 243 81 27 9 ...
1 2 5 14 ... 1 2 5 26 ...

It is important to emphasise that there could be different rules for the same sequence. Students could be asked to find the rules for each other's sequences.

Fractions

Explore the change between mixed numbers and vulgar fractions and explore the relationship between decimal representation and fractional representation.

Powers and roots

Explore the square root and the fact that continued use of the square root approaches the limit 1.

Further ideas

Explore the concept of iteration. The Last Answer facility makes the study of iterative processes become much clearer, the convergence or divergence of the solution being easily demonstrated with successive repetitions of the equals key.