

Activity 7: Substitution

Teacher's notes

Framework reference: Page 138

Strand: Algebra
Topic: Equations, formulae and identities
Pupils should be taught to: Use formulae from mathematics and other subjects
Year group: 7
Objectives: Substitute positive integers into simple linear expressions.
Key Vocabulary: Substitute, expression, variable, statement
Resources required: Class set of calculators plus Viewscreenor TI-SmartView emulator

Summary

This activity uses calculator memories to examine the effect of substituting into algebraic expressions. The activity assumes no previous calculator experience.

Instructions for the teacher

(1) Begin by resetting the calculator as on Handout 1. Note that this has the effect of storing a zero in every memory location.

(2) Notice the alphabetic characters above the corresponding keys on the keyboard. To enter these letters you must first press [ALPHA].

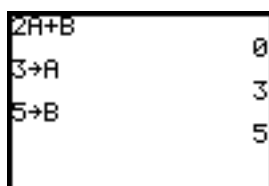
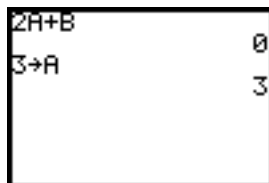
- Type 2
- Type the A by pressing [ALPHA] followed by A
- Type +
- Press [ALPHA] B
- Press [ENTER]



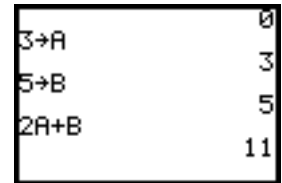
Discuss: what's happened.

Now give some values for A and B. Ask the class for possibilities. e.g. A = 3 and B = 5.

- Press 3 [STO] [ALPHA] A
- Press [ENTER]
- Press 5 [STO] [ALPHA] B
- Press [ENTER]



Now type 2A+B as before.
 "We have *substituted* the values A=3 and B=5 into the expression 2A+B".



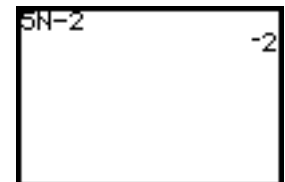
Repeat with other values of A and B. In particular extend to include negative values. Be sure to use the [-] key for negative.

Notice that using [CLEAR] will clear the screen but has no effect on the content of the memories. Values stay in the memory until they are overwritten or until the calculator is reset.

(3) Now use different expressions and other variables. e.g. Suppose a sequence has Nth term $5N - 2$. What is the Nth term?
 i.e. what is the value of $5N - 2$?

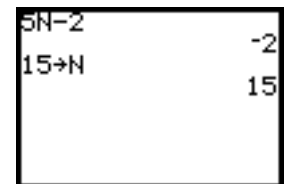
- Press 5 [ALPHA] N [-] 2
- Press [ENTER]

(Why do we get -2?)



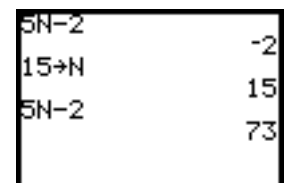
What is the 15th term?

- Press 15 [ALPHA] N
- Press [ENTER]



Now instead of typing the $5N - 2$ again you can use [2nd] [ENTRY] to recall previous entries. In this case $5N - 2$ was the last but one entry.

- Press [2nd] [ENTRY] to recall the last entry.
- Press [2nd] [ENTRY] again to recall the $5N - 2$.
- Press [ENTER] to evaluate the expression.



Now work out the 10th term, the 18th term, etc.

Answers to questions on handouts

- 1 a) 17 b) 7 c) 37 d) -13 e) 4.5
 2 a) 6 b) 0 c) -3 d) 9 e) 15
 3 a) 16 b) 18 c) -1 d) 8 e) -27
 4 a) 5 b) 2 c) 1 d) 17 e) 2

First, reset your calculator...

- Press **2nd** **[MEM]** to get the **MEMORY** menu
- Choose **7 (Reset...)**
- Choose **1 (All RAM...)**
- Choose **2 (Reset)**

Entering expressions

You can use the **[ALPHA]** key to type letters.

Enter the expression $3A + 1$...

- Type: **3**
- Press **[ALPHA]**
- Type **A** (It's written above the **[MATH]** key)
- Type **+** **1**
- Press **[ENTER]**

Why did you get 0?

If you substitute the value $A = 5$ into this expression, what do you think the value of the expression will be?

Write it down.

Enter the value $A=5$...

- Type **5**
- Press **[STO▶]**
- Press **[ALPHA]**
- Press **A**
- Press **[ENTER]**

Recall the expression $3A + 1$...

- Press **[2nd]** **[ENTRY]** to recall the previous entry
- Press **[2nd]** **[ENTRY]** to recall the $3A + 1$
- Press **[ENTER]**

Explain why you get 16.

Work these out

Write down your own idea first.

Then use the graphics calculator to check.

1. Use the expression $5A + 2$.

What is the value of the expression when:

- a) $A = 3$
- b) $A = 1$
- c) $A = 7$
- d) $A = -3$
- e) $A = 0.5$

Use the $(-)$ key to enter a negative

2. In the expression $12 - 3B$, what is the value of the expression when:

- a) $B = 2$
- b) $B = 4$
- c) $B = 5$
- d) $B = 7$
- e) $B = -1$

3. Here is an expression: $3C + 2D$.

What is the value of the expression when:

- a) $C = 2$ and $D = 5$
- b) $C = 4$ and $D = 3$
- c) $C = -3$ and $D = 4$
- d) $C = 4$ and $D = -2$
- e) $C = -5$ and $D = -6$

4. Now use the expression $E^2 + 1$

What is the value of the expression when:

- a) $E = 2$
- b) $E = 1$
- c) $E = 0$
- d) $E = -4$
- e) $E = -1$

Use the x^2 key to enter the ² (squared)

5. Write a short explanation to tell someone else how to substitute values into expressions. Give examples.