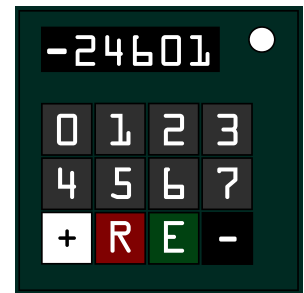


## On the Subject of Polynomial Solver

*"Where did 8 and 9 go?" You know full well the monster that is 7...*

- A Polynomial Solver module will cycle between at least 2 numbered displays, and a blank display.
- The module will generate 5 stages, each increasing the number of displays by one.
- Each display is the result of a standard polynomial function.
  - The input is the number of displays since the blank displays. This will also be referred to as the display number. (The display immediately after the blank display has a display number of 1)
  - The output is displayed on the screen.
- To complete a stage, input the coefficients of the standard polynomial function in order, starting from the one associated with the leading term, going down.
- Correctly completing a stage will generate a new function, and therefore, new displays. Completing all 5 stages will solve the module.
- Incorrectly completing a stage will not generate a new function, and will not generate the next stage. However, it will cause a strike.



### How to generate the standard polynomial.

1. Note down the stage number, this is your target degree.
2. Note down all the displays in order, this is your list.
3. **Preform the following step a number of times equal to the target degree, or skip this step if it's 0.** Find the difference between the second and the first number in your list. If you have more numbers in the list, find the difference between the third and second, the fourth and third, and so on. This should leave you with one fewer number than before. Make this your new list.
4. Take this number and divide it by the factorial\* of the target degree. This is the coefficient of the term corresponding to the target degree. Note this down as part of your answer.
5. If you have the same number of coefficient as the current stage plus one, enter all of the obtained coefficients for this stage in the same order that they were obtained.
6. Otherwise, do the following:
  - Subtract (the most recent obtained coefficient \*  $x^n$ ) from each display, where  $x$  is the display number for that display, and  $n$  is the target degree. These are your new displays. Also make these your new list.
  - Decrease the target degree by one. (If it becomes negative, you have gone too far.)
  - Go back to step 3.

*\*Remember:  $0! = 1$*

Do note that there are multiple ways of obtaining the polynomial. Feel free to use a different method if preferred.

### What is a standard polynomial.

A standard polynomial is an expression that consists of multiple terms. Terms are added (or subtracted if the coefficient is negative, or non-existent if the coefficient is 0) in decreasing order of the variables' power.

- A term is any part of the expression that is separated by addition or subtraction. It consists of a coefficient and a power of a variable.
- The degree is the power of the highest term

Example:  $-4x^4 + 6x^2 - 7x + 2$

This standard polynomial has a degree of 4. The coefficients in order are -4, 0, 6, -7, and 2.

### How to input the coefficients.

The module has 8 numbered buttons, a positive button, a negative button, a reset button, and an enter button.

Pressing the positive/negative button set the sign of any following inputs to be positive/negative. The module will remember its current sign between inputs. It is set to positive at the beginning of the bomb.

Pressing a numbered buttons will enter that number into the module. If the current sign is positive, then it will enter the positive version of the selected number, and vice versa for if the current sign is negative. The module will not allow you to input more numbers than required.

The reset button will clear all inputs from submission.

The enter button will submit the inputs. The module will continue to the next stage (or solve if at stage 5) if the inputs are identical to the generated polynomial, and strike otherwise. Inputting too few numbers will strike the module as well. Striking will not reset the module in any way aside from clearing inputs.