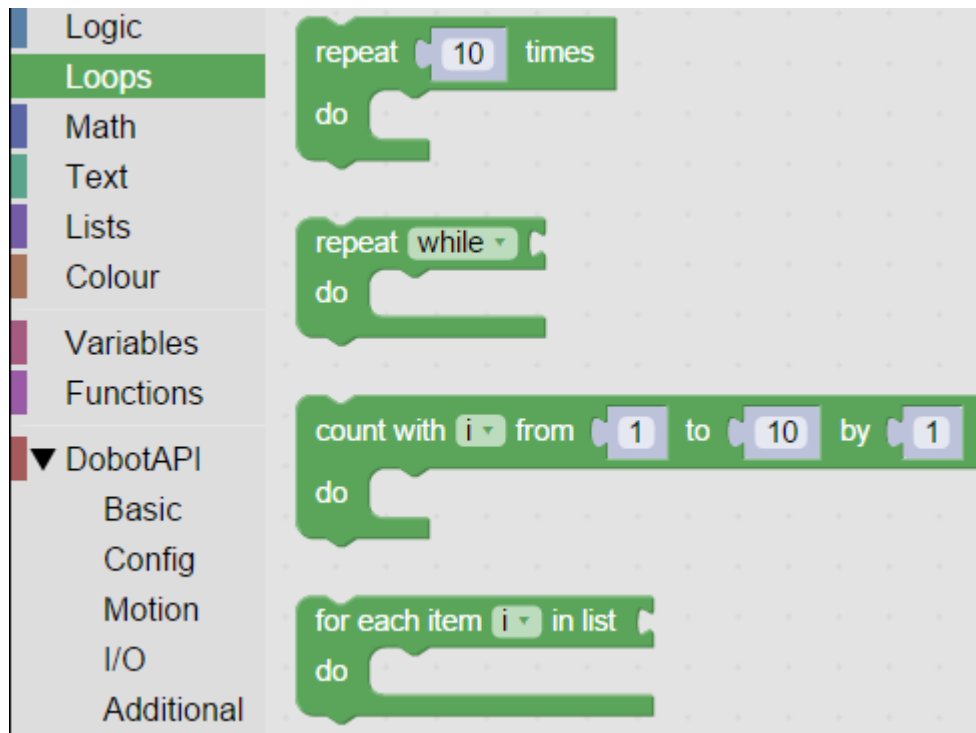
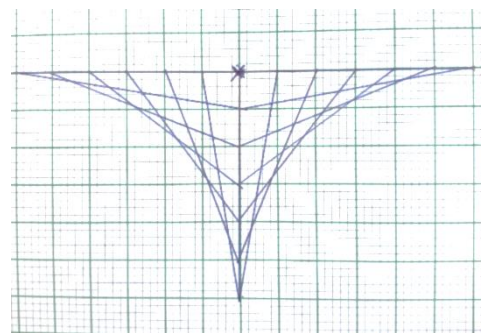
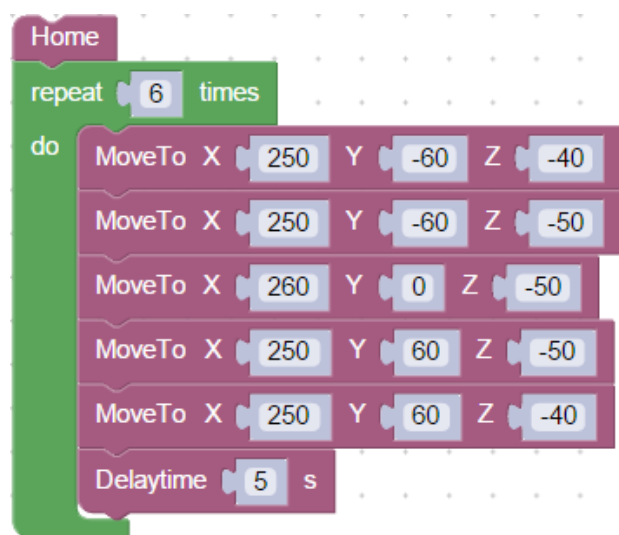


Iteration in programming

Iteration in programming means **repeating instructions** over and over again. This is often called a '**loop**'. Blockly provides few loop constructs



When designing a program, there may be some instructions that need to be repeated. We can use loop structure to shorten lengthy programs and reduce the repetition of instruction duplications.



Can the above program be used to draw the figure in Lesson 5? Why or why not?

Variable

A computer program instructs the computer how to process data. Sometimes the data comes from the user. Other times, the data is already stored in the program, just like when our program starts from a position (250, -60). The program can instruct the computer to store the data in variables. Every variable has a name and a value. This value may change over time, which is why it is "variable".

Study carefully the coordinate values of the 6 V-shaped lines. Circle the values that change over time.

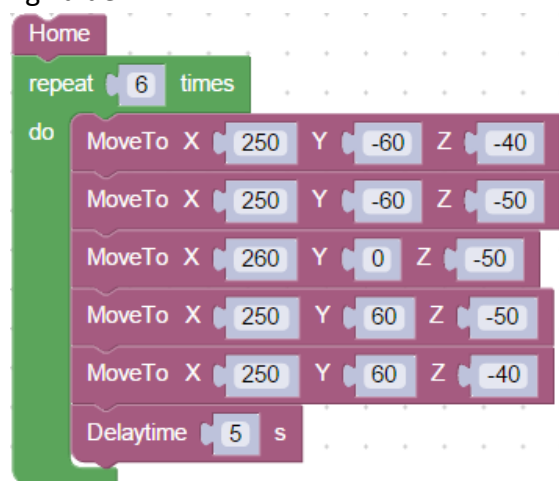
Line number	From (point1)	To (point2)	T0 (point3)
L1	(250, -60)	(260, 0)	(250, +60)
L2	(250, -50)	(270, 0)	(250, +50)
L3	(250, -40)	(280, 0)	(250, +40)
L4	(250, -30)	(290, 0)	(250, +30)
L5	(250, -20)	(300, 0)	(250, +20)
L6	(250, -10)	(310, 0)	(250, +10)

How many variables are needed?

What is the initial value of each of these variables?

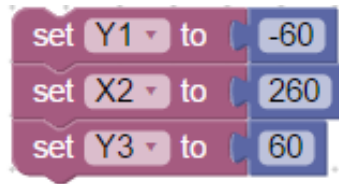
What is the amount of change in each variable?

Modify the program shown on page 1 by substituting a variable name for each varying value.

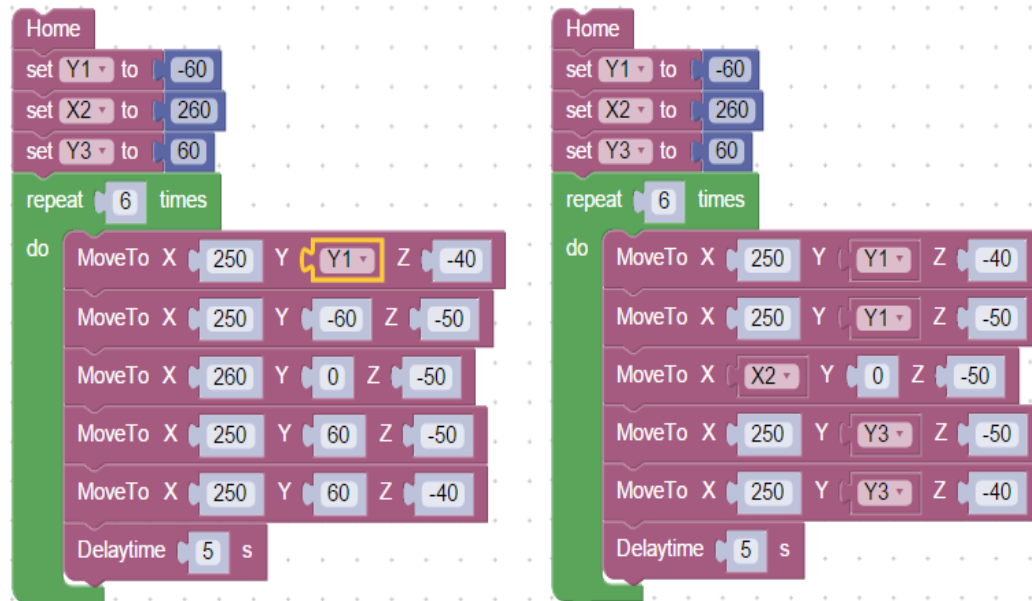


Defining and assigning variables

Here is how we use **variable block** to create variables named Y1, X2, and Y3, and use **math block** to create numeric values for each variable.



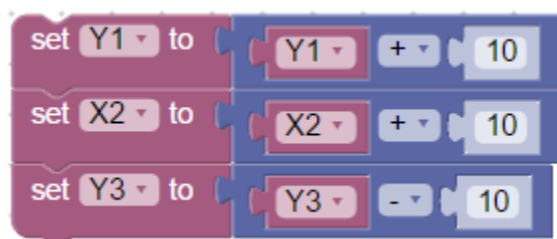
Modify the program by substituting a variable name for each varying value.



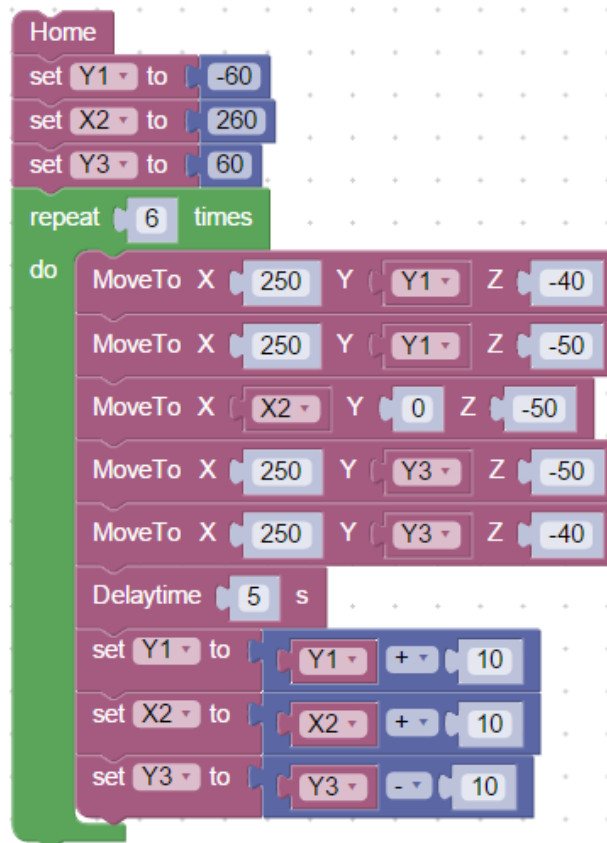
Re-assigning variables

Some values will not remain the same. The location is usually here and there. This means that we need to be able to change the values of these variables in the loop body.

After the program draws the first line, we know that we need to change the value of the variable to draw the second line.



Where should the block be inserted? Why?



A typical loop looks like:

Initial values before entering the loop

Loop start

- **The repeat action**
- **Update values**

Loop end

Circle the blocks of statements and label using **initialization**, **repeat action** and **value updating**

Discussion

Is there any further improvement for the program?

Hints:

- Examine the values of variables Y1 and Y3. Are they independent or related to each other?
- If we want to try different level of the pen to draw the figure, is there any efficient way to change the value (besides -40 or -50)?
