A loop executes instructions repeatedly while a condition is true.

As long as the condition remains true, the statements inside the *while* statement are executed. Condition is checked before the loop executed.

When you declare a *variable* inside the loop body, the variable is created for each iteration of the loop and removed after the end of each iteration.

Hand-tracing is a simulation of code execution in which you step through instructions and track the values of the variables.

Hand-tracing can help you understand how an unfamiliar algorithm works.

Hand-tracing can show errors in code or pseudocode.

The *for* loop is used when a value runs from a starting point to an ending point with a constant increment or decrement.

The for loop is in certain format, counter int must be declared outside of the loop, *for(initial counter, stop condition, counter update ){loop body}*

Some people call *for* loop count-controlled, Another commonly used term for a count-controlled loop is *definite,* You know from the outset that the loop body will be executed a definite number of times

*while* loop can be called an event-controlled loop because it executes until an event occurs. It is consider *indefinite*, because you do not know how many times till the loop end from the while condition

The do loop is appropriate when the loop body must be executed at least once. Because condition check is the last step, while-loop is pre-check, do loop is post-check, which means the counter for the loop must be declared outside of the loop and it must have initial value.

A *sentinel* value denotes the end of a data set, but it is not part of the data.

a value, which is not an actual input, but serves as a signal for termination, is called a *sentinel*

The actual test for loop termination is in the middle of the loop, not at the top. This is called a ***loop and a half***

Use input redirection to read input from a file. All input commands get their input from the file numbers.txt. java SentinelDemo < numbers.txt This process is called *input redirection*.

Use output redirection to capture program output in a file. java SentinelDemo < numbers.txt > output.txt This process is called *output redirection*

A storyboard consists of annotated sketches for each step in an action sequence.

Developing a storyboard helps you understand the inputs and outputs that are required for a program.

loop must be placed inside the preceding loop. We say that the inner loop is *nested* inside the outer loop.

You can introduce randomness by calling the *random number generator*. **Math.ramdom();**

to obtain a random integer between 0 and b - a, then add a, yielding a random value between a and b:

int r = (int) (Math.random() \* (b - a + 1)) + a;