Loops, Variables, Conditionals

1. Introduction

Computers can draw pictures. Actually, they can be programmed to draw pictures. They draw pictures the same way people do. They put a pen down on a piece of paper and move the pen along, leaving a line. They can pick up the pen, move somewhere else, then put it down again and draw some more. But you have to tell the computer the exact steps to follow to draw the shape you want.

Today we look at basics of drawing in Scratch and the essential programming ideas that allow us to create complex shapes by repeating simple actions.

2. Simplifying Instructions by using Repeat

Computers can perform many actions quickly. Finding the lowest card in a hand can take many comparisons, but the computer is fast. Typing many steps is boring. Computer languages include vocabulary and grammar that makes the human’s work easier.

Compare these two versions of an algorithm:

**Notes:** \(c[2]\) is shorthand for ‘card in spot 2’

\(\text{swap } n, m\) is shorthand for ‘swap cards in spots } n \text{ and } m’

**Algorithm 1**

**Version 1:**

```
if c[2] < c[1] then swap 2, 1
if c[3] < c[1] then swap 3, 1
if c[4] < c[1] then swap 4, 1
if c[5] < c[1] then swap 5, 1
if c[6] < c[1] then swap 6, 1
if c[7] < c[1] then swap 7, 1
if c[8] < c[1] then swap 8, 1
if c[9] < c[1] then swap 9, 1
if c[10] < c[1] then swap 10, 1
```

**Version 2:**

```
repeat with n = 2...10 
   if c[n] < c[1] then swap n, 1
```

3. Simplifying Drawing in Scratch

The same idea is available in Scratch:

**Version 1:**

```
when flag clicked
   clear
   hide
   pen up
   go to x:(0) y:(0)
   point in direction (90)
   pen down
   set pen color to (pick random (1) to (100))
   move (40) steps
   turn cw (90) degrees
   move (40) steps
   turn cw (90) degrees
   move (40) steps
   turn cw (90) degrees
   move (40) steps
   turn cw (90) degrees
```

**Version 2:**

```
repeat with n = 2...10
   move (40) steps
   turn cw (90) degrees
   move (40) steps
   turn cw (90) degrees
   move (40) steps
   turn cw (90) degrees
```

4. Some Pictures to Draw using Scratch

Now put these ideas to work by writing code to draw: