

Introduction to Programming

Scratch Lesson 1

Goals

- Sequence of commands
- Scratch Interface
- Variables
- Conditional Statements
- Turtle Graphics
- Repetition

Sequence of statements

- A step by step process (Algorithm)
 - Instructions for making tea (Pseudocode)

```
Put water in kettle
Put on kettle
While water not boiling in kettle
    Wait
Put water in cup ...
```
 - Recipe for baking bread (Pseudocode)

```
Put 4 dl water in bowl
Add 2 dl flour
While not dissolved
    Stir
Add salt ...
```

Overview of languages

- Pseudocode
- Interpreted (e.g. Perl)
`perl -e 'print "Hello World\n;"`
- Compiled (e.g. Java)

```
public class HelloWorld {  
    public static void main(String[] args) {  
        System.out.println("Hello World");  
    }  
}
```
- Assembly (e.g. x86 instruction)
`ADD ...`
- Machine code
`0100100101010101010 ...`

Scratch

- Scratch is available for download at http://info.scratch.mit.edu/Scratch_1.4_Download
- To run: Double-click the scratch icon (The downloaded Scratch file is usually saved on the desktop)

Scratch user interface

ROTATION STYLE

Control whether costumes rotate with the sprite.

CURRENT SPRITE INFO

TABS

Click tabs to edit scripts, costumes, or sounds.

TOOLBAR

GREEN FLAG

A way to start scripts.

PROJECT NOTES

STAGE

Where your scratch creations come to life.

NEW SPRITE BUTTONS

Create a new character or object for you project.

SPRITE LIST

Thumbnails of all your sprites. Click to select and edit a sprite.

SCRIPTS AREA

Drag blocks in, snap them together into scripts.

PRESENTATION MODE

BLOCKS PALETTE

Blocks for programming your sprites.

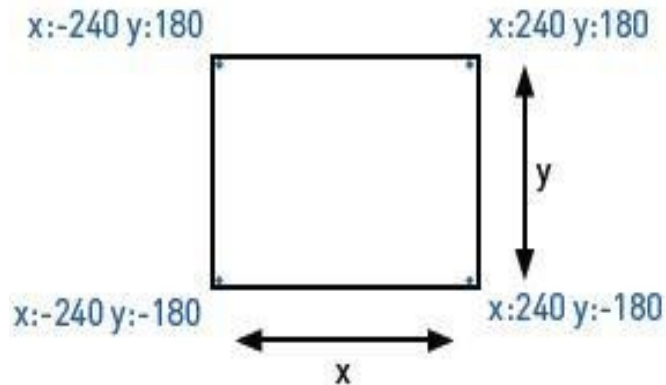


Scratch stage

STAGE

The **Stage** is where you see your stories, games, and animations come to life. Sprites move and interact with one another on the stage.

The stage is 480 units wide and 360 units tall. It is divided into an x-y grid. The middle of the stage has an x-coordinate of 0 and a y-coordinate of 0.



mouse x: -601
mouse y: -364

To find out x-y positions on the stage, move the mouse around and look at the **mouse x-y display** just below the stage, on the right.



Click the **Presentation Mode** button to see projects at full-screen size.
To exit Presentation Mode, press the Esc key.

Stage + Sprite

- **Exercise:**
 - Point your mouse to coordinate $x=0$, $y=0$
- **Exercise:**
 - Get a new sprite on the screen

First scratch program

The image shows the Scratch IDE interface. At the top, the word "SCRATCH" is displayed in a stylized font. Below it are several buttons: "New", "Open", "Save", "Save As", "Share!", "Undo", "Language", "Extras", and "Want Help?".

On the left side, there are two columns of category buttons: "Motion", "Looks", "Sound", "Pen" in the first column, and "Control", "Sensing", "Numbers", "Variables" in the second column. The "Scripts" category is currently selected.

The main workspace is divided into three sections:

- Scripts:** Contains a script for "Sprite2" starting with a yellow "when green flag clicked" block, followed by a purple "say Hello!" block.
- Costumes:** Shows a preview of the unicorn sprite.
- Sounds:** Currently empty.

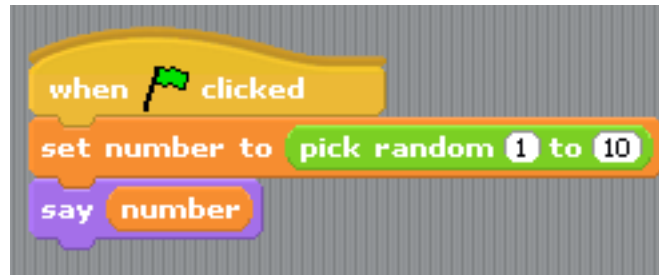
The stage area on the right shows the unicorn sprite on a white background. A speech bubble above the unicorn's head contains the text "Hello!".

At the bottom of the interface, there is a "Stage" area with a white square and a "Sprite2" area with a small unicorn icon and the text "1 script".

Variables

Exercise:

Say a random number



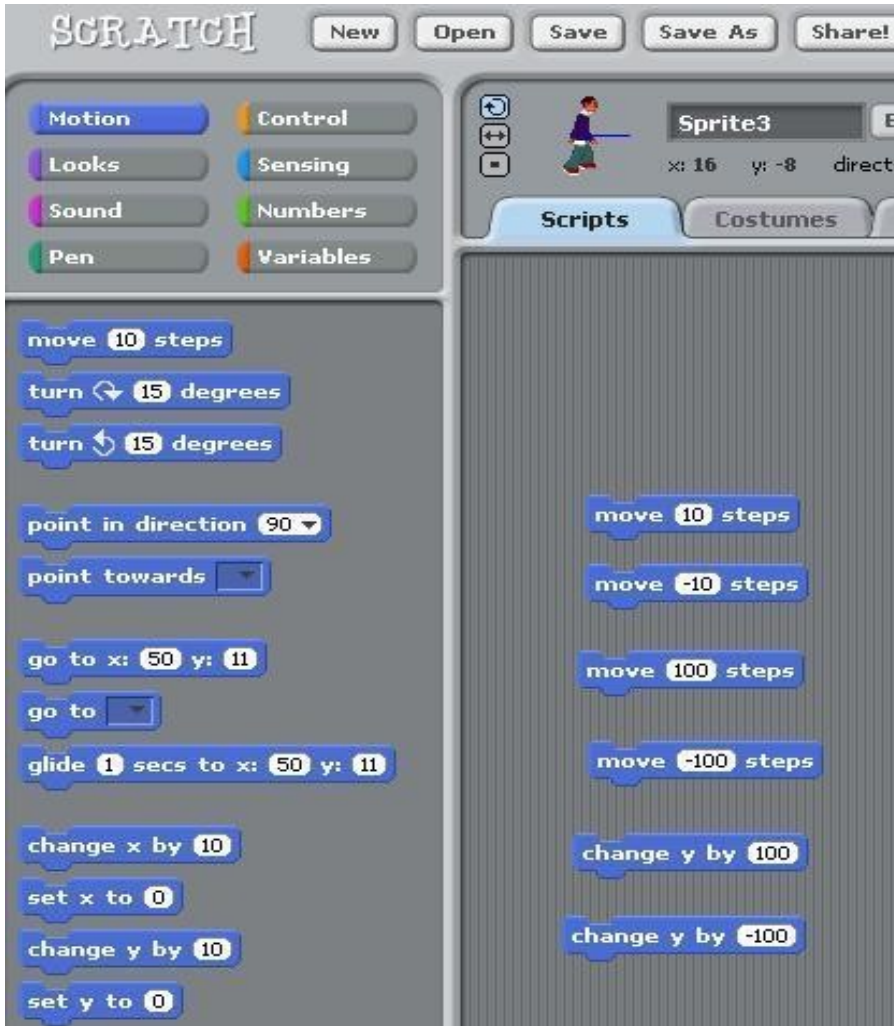
Conditions

Exercise:

- What does this code do?
- What are the errors in the code?

```
when clicked
  set number to pick random 1 to 10
  say number
  if number > 5
    think Greater than 5
  else
    think Less than 5
```

Motion statements

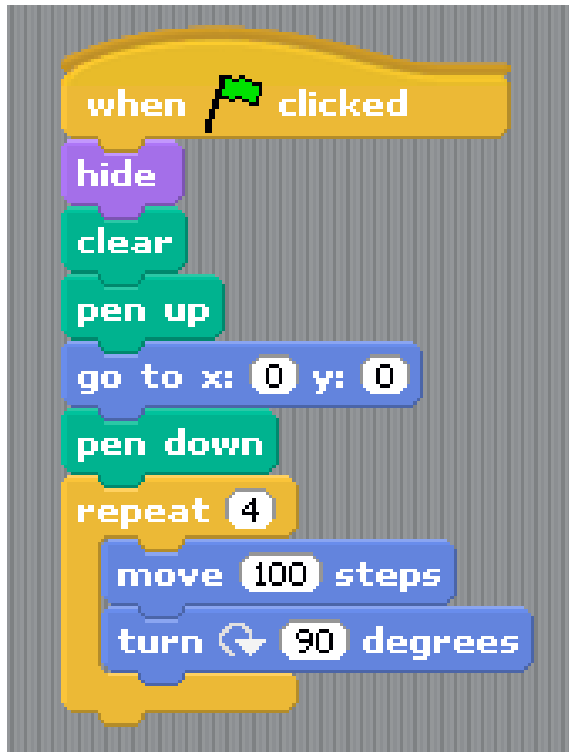


- Move Right
- Move Left
- Big Steps
- Small Steps
- Move Up
- Move Down
- **Exercise:**
Double-click on the blocks to see what happens

More motion action

- **Exercise**
 - Make the sprite go to $x=0$, $y=0$
- **Exercise**
 - Make the sprite move 100 steps and turn 90 degrees
- **Exercise**
 - Make the sprite go in a square pattern
- **Exercise**
 - Draw a line after the sprite

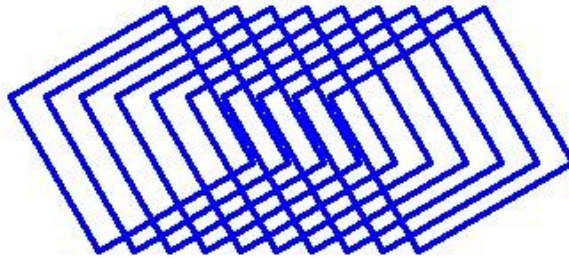
Iteration



- Repeat statements
- **Exercise:**
Guess what this code does
- Test your guess

Loop exercises

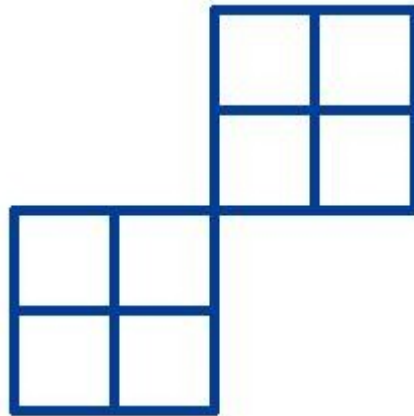
- **Exercise:** Draw this (10 diamonds)



- **Exercise:** Try to write your programs with as few statements as possible

More repeating exercises

- **Exercise:** Draw this in any colour



- **Exercise:** Change the colour of each square
- **Exercise:** Draw a triangle, a pentagon a hexagon and a circle.