



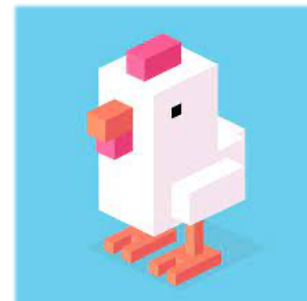
Video Gaming 101

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Principal Investigator: Wu FENG

Women in Computing Day 2022

April 8, 2022



Importance of Computer Science

- How many computers does your family own?
 - More than you might think! Would you believe 60+?

A screenshot of a New York Times article. The page header includes the New York Times logo, navigation icons, and buttons for 'SUBSCRIBE NOW' and 'LOG IN'. The article is in the 'TECHNOLOGY' section and is titled 'The Dozens of Computers That Make Modern Cars Go (and Stop)' by Jim Motavalli, dated February 4, 2010. The article text states: 'The electronic systems in modern cars and trucks — under new scrutiny as regulators continue to raise concerns about [Toyota](#) vehicles — are packed with up to 100 million lines of computer code, more than in some jet fighters.' Below the text is an image of a modern television set with a smart interface showing icons for 'Live TV', 'NETFLIX', 'YouTube', and 'amazon'.

Importance of Computer Science

- What does computer science enable?

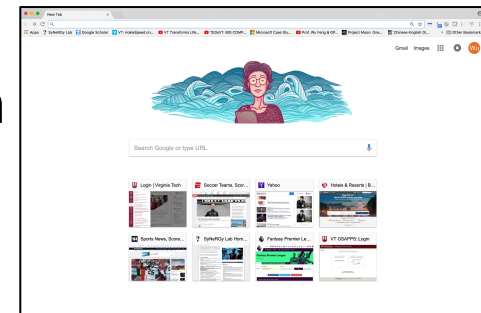
- Solve important problems



- Connect with people, e.g., at work or at play



- Collect and communicate information



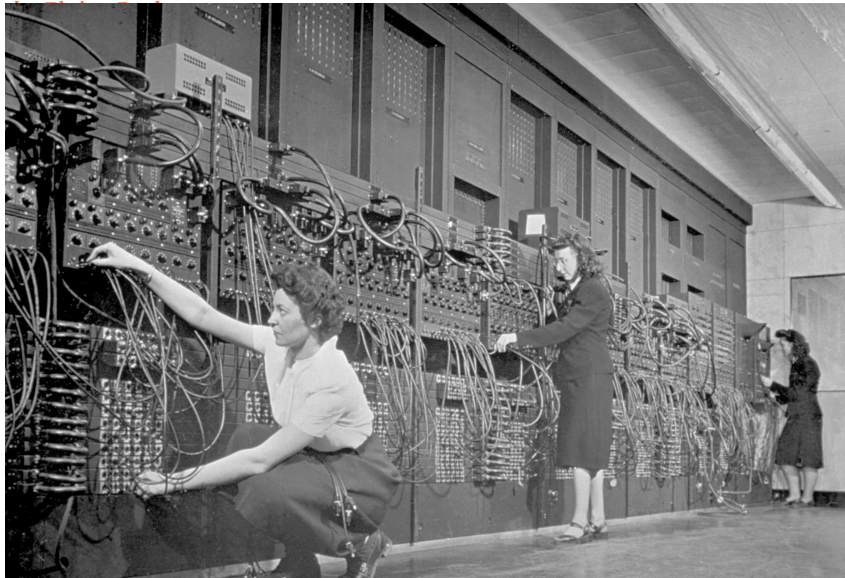
- Entertainment





PEOPLE | A woman programmer from the 1960s (judging by the hairdo) holds a plugboard control panel for IBM accounting machines. Photo via born1945/Flickr (CC BY 2.0)

The Computer Girls: 1967 Cosmo article highlights women in technology



Women computer operators program ENIAC, the first electronic digital computer, by plugging and unplugging cables and adjusting switches.

Programming was once considered to be “women’s work”.



The Computer Girls

BY LOIS MANDEL

A trainee gets \$8,000 a year ... a girl “senior systems analyst” gets \$20,000—and up! Maybe it’s time to investigate....

Ann Richardson, IBM systems engineer, designs a bridge via computer. Above (left) she checks her facts with fellow systems engineer, Marvin V. Fuchs. Right, she feeds facts into the computer. Below, Ann demonstrates on a viewing screen how her facts designed the bridge, and makes changes with a “light pen.”

Twenty years ago, a girl could be a secretary, a school teacher . . . maybe a librarian, a social worker or a nurse. If she was really ambitious, she could go into the professions and compete with men . . . usually working harder and longer to earn less pay for the same job.

Now have come the big, dazzling computers—and a whole new kind of work for women: programming. Telling the miracle machines what to do and how to do it. Anything from predicting the weather to sending out billing notices from the local department store.

And if it doesn’t sound like woman’s work—well, it just is.

“I had this idea I’d be standing at a big machine and pressing buttons all day long,” says a girl who programs for a Los Angeles bank. I couldn’t have been further off the track. I figure out how the

computer can solve a problem, and then instruct the machine to do it.”

“It’s just like planning a dinner,” explains Dr. Grace Hopper, now a staff scientist in systems programming for Univac. (She helped develop the first electronic digital computer, the Eniac, in 1946.) “You have to plan ahead and schedule everything so it’s ready when you need it. Programming requires patience and the ability to handle detail. Women are ‘naturals’ at computer programming.”

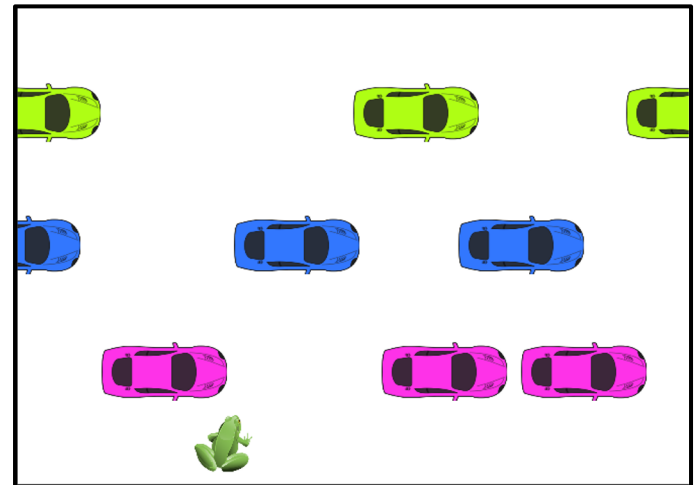
What she’s talking about is *aptitude*—the one most important quality a girl needs to become a programmer. She also needs a keen, logical mind. And if that zeroes out the old Billie Burke-Gracie: Ann image of femininity, it’s about time, because this is the age of the Computer Girls. There are twenty thousand of them in the United (cont. on page 54)



Photos by Henry Grossman. Dress by Gino Charles.

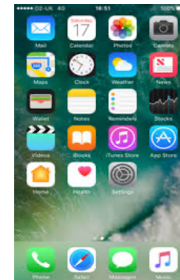
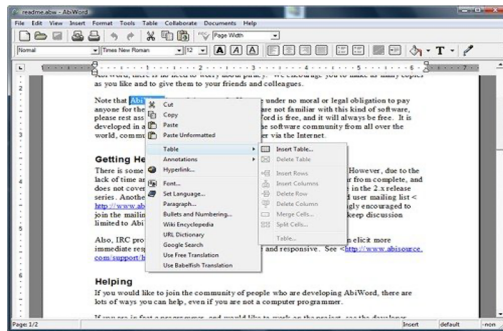
What You Will Learn

- What is a program?
- What is an algorithm?
- Introduction to visual programming in Snap!
- How to build Frogger
(similar to Crossy Road)



What is a Program?

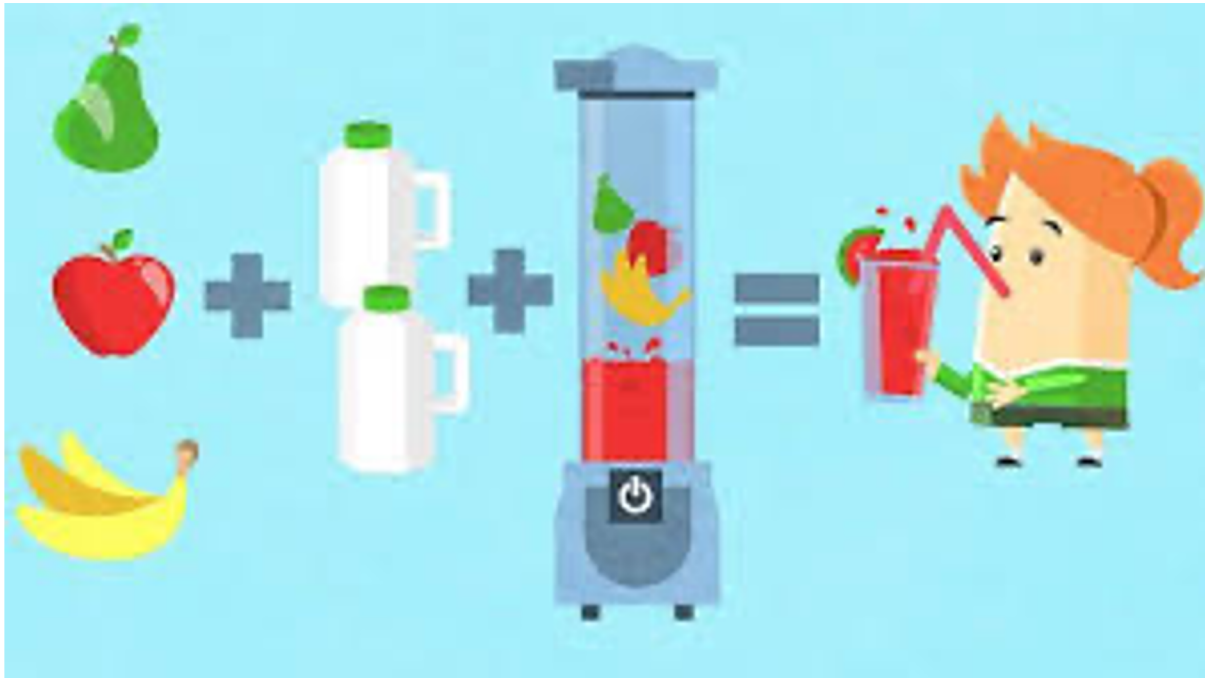
A program is an algorithm that runs on a computer.



What is an Algorithm?

An algorithm is a set of instructions that explains step by step how to do a task or solve a problem.

It's like a recipe



Algorithm: PEMDAS

1. Parentheses
2. Exponents
3. Multiplication & Division
4. Addition & Subtraction

Solve:

$$4 + 5(3 - 1)^2$$

$$4 + 5(2)^2$$

$$4 + 5 * 4$$

$$4 + 20$$

24

What is Snap!

- Visual programming environment
- Blocks-based programming language
- Based on Scratch
- Lets you easily build video games, like Frogger

Go to <http://snap.cs.vt.edu/>

Programming with Pictures

An Activity for "Women in Computing Day" at Virginia Tech



By Q. WONG, qwong@bayareanewsgroup.com

Click to Run Snap!

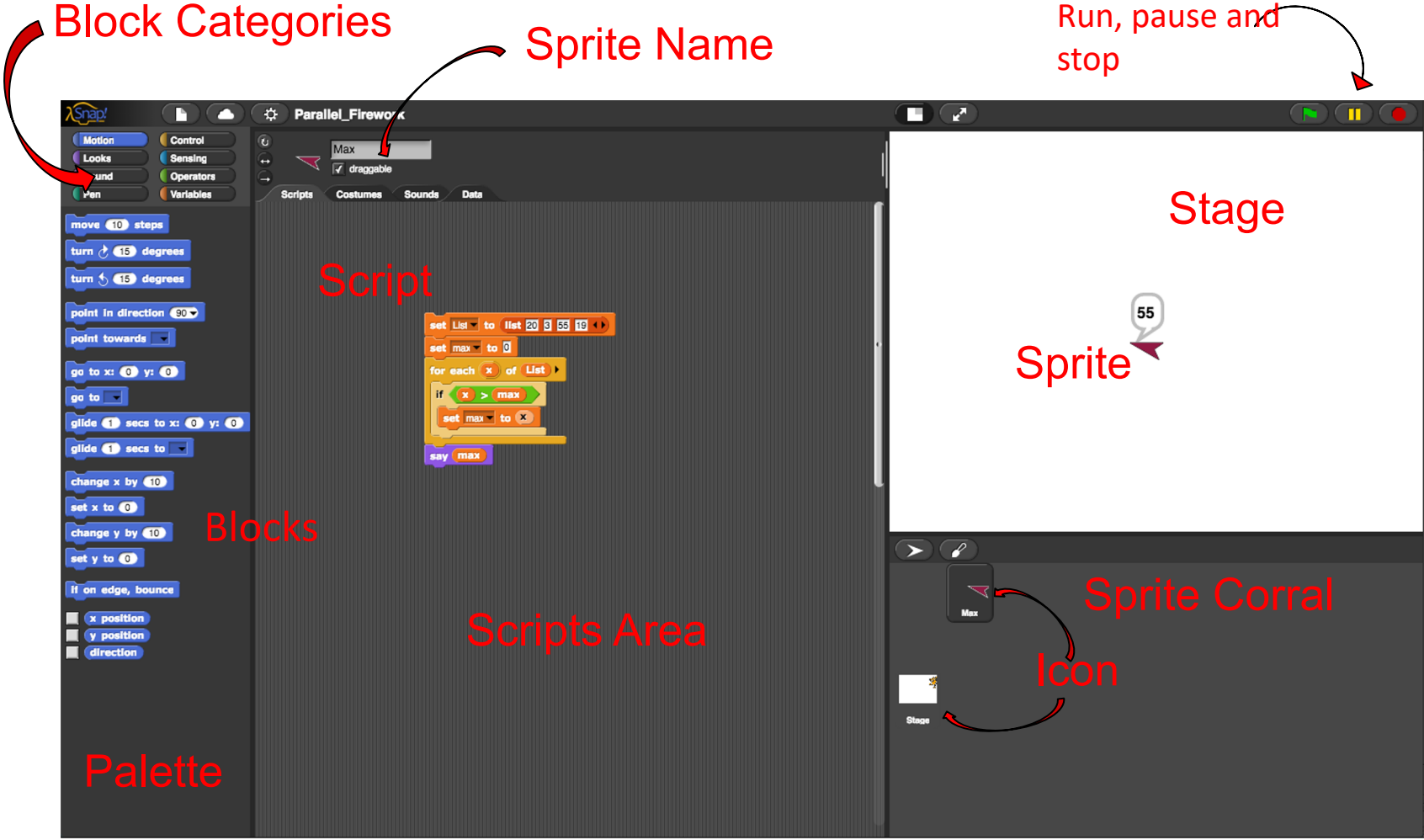
You may [download the activity handout here](#).



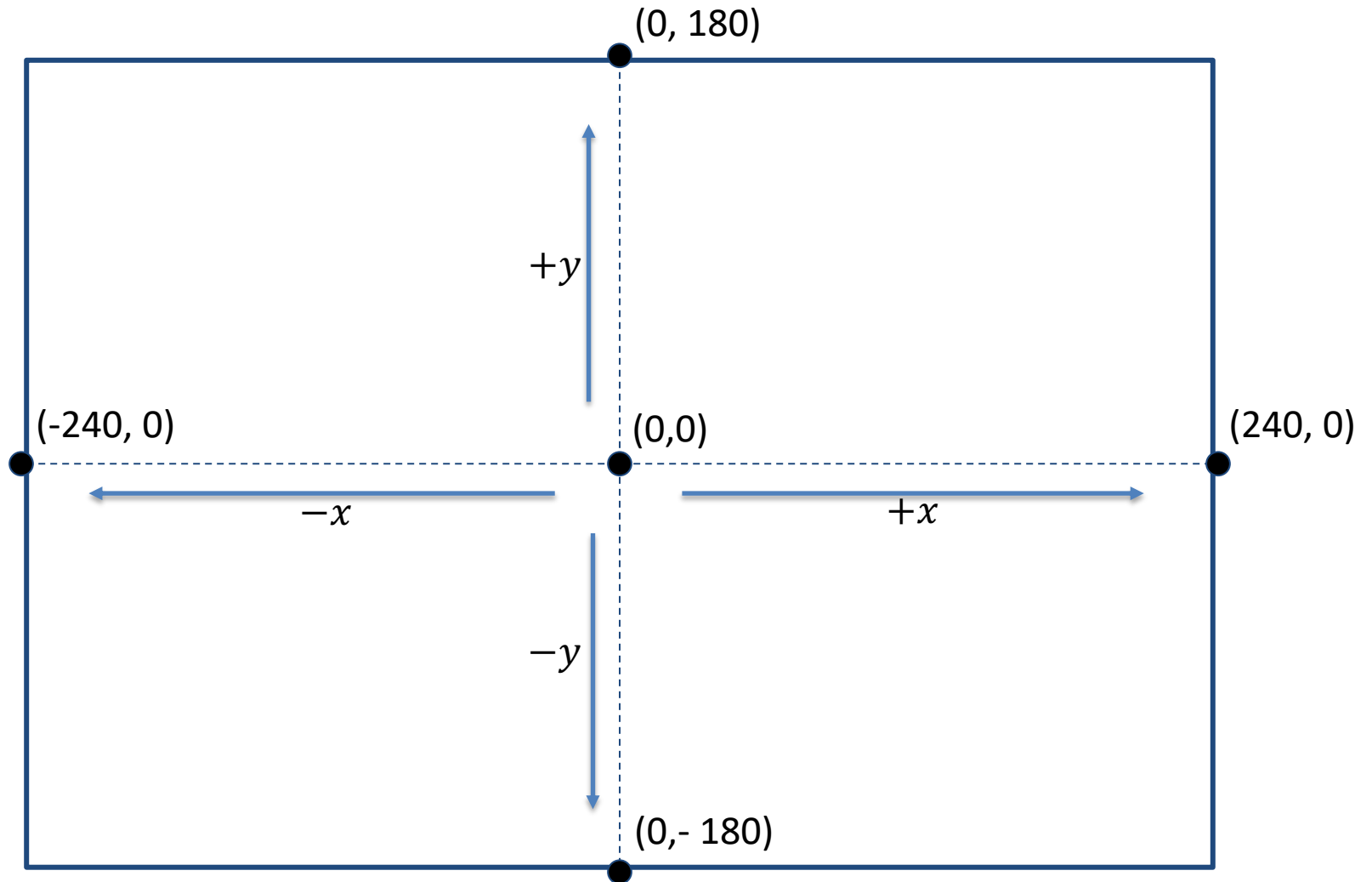
THE ASSOCIATION FOR WOMEN
IN COMPUTING
AT VIRGINIA TECH

Acknowledgements: Our ability to teach Snap is through the Snap Berkeley Project.
Last updated: March 2017

Introducing the Snap! Environment

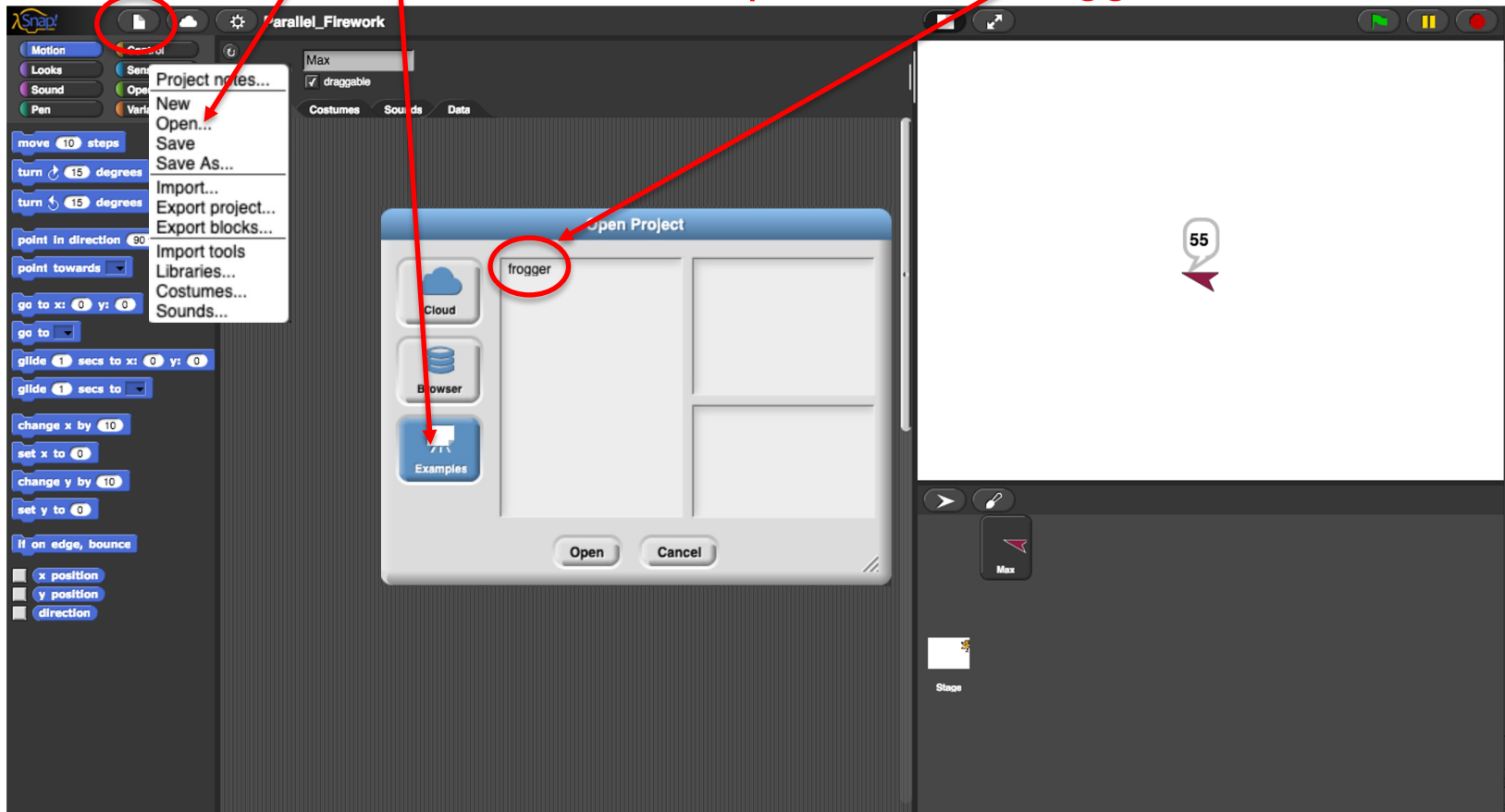


The Stage



Open The Frogger Example

1. Click on the File Menu
2. Click "Open..."
3. Select "Examples", then "frogger"



Initial Frogger Window

The image shows the Scratch IDE interface for a project named "Frogger". The main stage displays a green frog sprite centered on a white background. The Scripts area on the left contains the following code blocks:

- when clicked** block containing a **go to x: 0 y: -150** block. A tooltip for this block reads: "Frogger moves to the bottom center of the stage when the start button is clicked."
- when up arrow key pressed** block containing a **change y by 50** block.
- when right arrow key pressed** block containing a **change x by 50** block.

The Properties area shows the sprite is named "Frogger" and is **draggable**. The Sprites area at the bottom right shows the "Frogger" and "Pink Car" sprites.

First Things You Can Do

- Click and drag the *Frogger* around on the stage
- Press the Start (Green Flag) Button
- Press the Up Arrow
- Keep Pressing the Up Arrow
- Press the Down Arrow?
 - Doesn't work (yet)!
- Retrieve Frogger by pressing Start Button OR by right-clicking on the Frogger icon and selecting “show” from the menu

The Block Rainbow

Blocks are color-coded according to the kinds of things they are meant to handle.

For example,

Blue – Motion



Pink – Sound



Yellow - Control



Control of the Yellow Hats



To access the control blocks, click on the yellow “Control” button just above the blocks palette.

These first five blocks have a curved shape on top.



This top curve makes them special because no other block can attach on top of them. These blocks are called “Hat Blocks” because they can only appear at the top of a script, like a hat.

Control: Starting Scripts

Drag Frogger to a corner of the stage.

Click the Start (Green Flag) Button.



Because Frogger has a script starting with that script runs when the start button is clicked.



Look at the script.



What does it do?

Puts Frogger in his start position at the bottom center of the stage.

Control: Moving Frogger

With Frogger in his starting position, press the Up Arrow.

This moves Frogger due to the script starting with 

Because Frogger has a script starting with 

Frogger can also move to the right.

Finish Frogger's movements ...

by adding scripts for the Left Arrow and Down Arrow keys.

More Control: Adding Scripts

From the Control palette, drag and drop two blocks onto the scripts area.



Click on each input slot where the word “space” is.

Select “left arrow” for one, and “down arrow” for the other.

Switch the palette to the Motion Blocks.

Drag  and  into the scripts area.

To attach a block to another, drag it close to the bottom edge of the block until a thick white line appears between the blocks, then let go.



Final Control: Fully Mobile Frogger

Click on each input number slot and change each 10 to a -50.



When you're finished, you should have scripts that look like this




Test out your Froggers!

If you've mixed up the  and  blocks, simply change the selection on the hat blocks to match the direction!




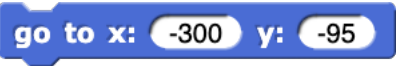

What's Next?

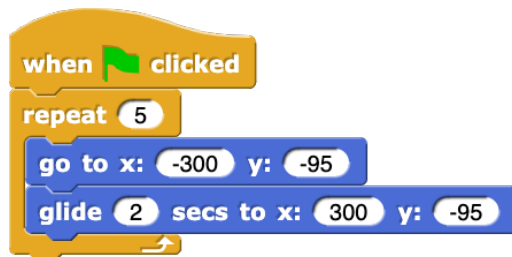
- Frogger isn't a game until it has a car to dodge!
- In the Sprite Corral, you probably noticed the pink car...
- Click on it.
- The scripts area switches from Frogger's scripts to the car's scripts.
- The car has a  too, but why can't we see the pink car on the stage?
- We can't see the pink car because we want it to start out of sight off the left side of the stage.
- Notice the  block below the start script.
- Attach it to the start script and press the start button.
- Change the glide time and see how that affects the animation.

Going Loopy: Part 1

- The car only moves across the stage once and then stops.
- We want the car to keep circling back to the beginning and going across the stage repeatedly.
- How do we do that?
- When you want to repeat something, you need loops.
- Switch over the to Control Blocks and see if there's something that would let us repeat instructions.
- Drag  into your scripts area.
- This block has a number input slot at the top and a C-shaped input area where we can drop other blocks into.
- Change the 10 to a 5.

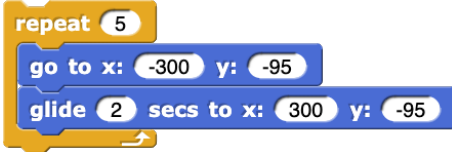

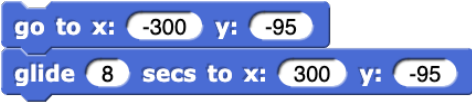

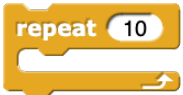

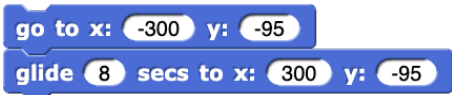

Going Loopy: Part 2

- Detach   from  by grabbing onto .
- Drop these two blocks into the C-shaped area of .
- Change the glide time to 2.
- Attach this script to the start block to get the following script:



- Test your script


Going Loopy: Forever

- Detach  from 
- Remove  from 
- Discard  by dragging and dropping it back onto the palette
- Drag and drop  into the scripts area
- Add  inside it
- Attach the new loop to  to get the following:






- Test your script


Stopping The Game: Part 1

- The game should end whenever the car and Frogger touch
- We can add a sensor script to Frogger to detect whenever Frogger runs into the car.
- Is there a category of blocks that can help us?
- Yes! “Sensing”!
- First click on Frogger in the Sprite Corral.
- Next, click on the Sensing category button.
- Add the first block  to your scripts area.
- This block has a hexagonal shape which means that it asks a yes-or-no question.
- Click on its menu and select “Pink Car 1”.

Stopping The Game: Part 2

- The sensor block can't do anything on its own.
- It needs a controller.
- Click on the Control category button.
- What is it that we're asking our script to do (in English)?
- "If Frogger is touching the car, stop the program."
- Which block could help us to get the computer to do that?
- The mighty  !
- Notice the input slot is shaped just like  .
- Insert the sensor block into the if block input slot, then look over the control blocks once more.
- What will enable us to stop our program?
- Drag and drop  inside the if block.


Stopping The Game: Finale

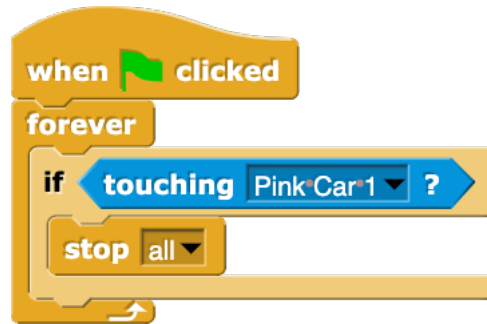
- We need to "turn on" the sensor by attaching it to a hat block.
- We can give it its own  .
- This new script should look like this:



- Test it by starting the program and getting the car to hit Frogger.
- Did it work?

Stopping The Game: Finale (Part 2)

- When we start the game, the sensor only runs once then quits.
- We want it to run forever, as long as the game is running.
- We've seen this before! 
- Add this to your script to get the following script:



- Test it

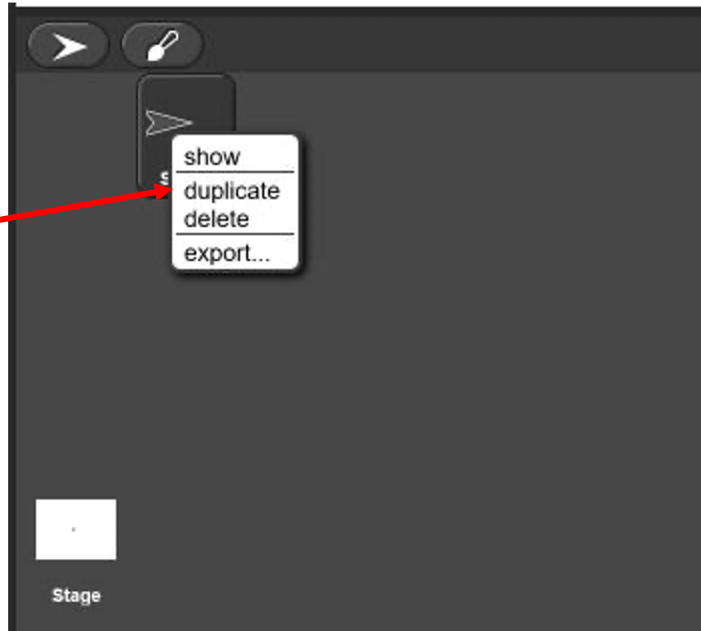
Frogger: Exercises

- Add more cars.
 - different rows: change the Y-coordinate
 - same rows: delay starting each car by different times
- Make Frogger appear to jump by using costume changes.
- Change the background by editing the stage costume.
- Keep score (add points as you successfully jump higher).
- Add more lives.
- Change the stage to show “Game Over” or “You Win!”.
- A full version of the game will later be found under
 - File --> Open... --> Examples --> full_frogger.xml

APPENDIX

Duplicating Sprites

1. Right Click on the Sprite Icon
2. Select **duplicate**



Duplicating a sprite copies all existing scripts (and costumes) to the new sprite.

Subsequent changes to the original sprite do NOT get copied to the new sprite.

Drawing with Sprites

pen down

pen up

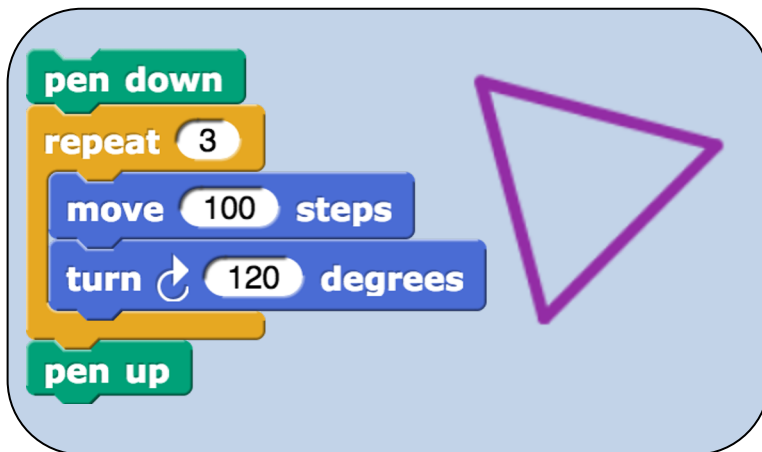
set pen size to 1

set pen color to 

clear

What does this block do?

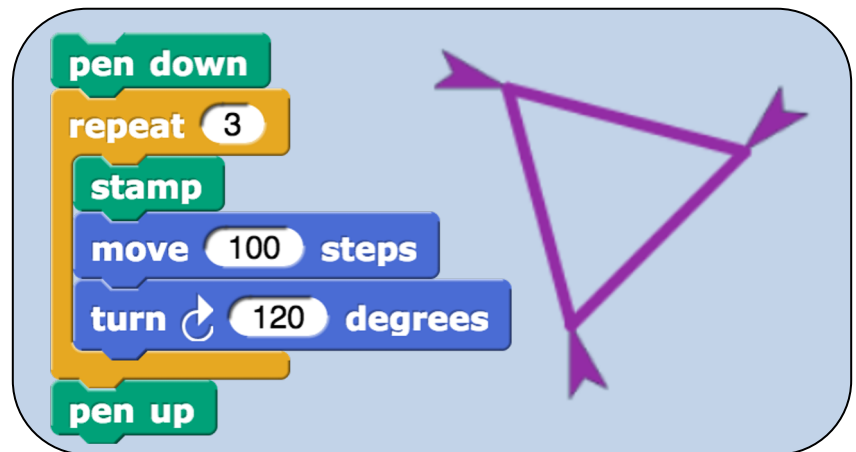
stamp



A Scratch code block with the following structure:

- pen down
- repeat 3
 - move 100 steps
 - turn 120 degrees
- pen up

The block is shown next to a purple outline of an equilateral triangle.



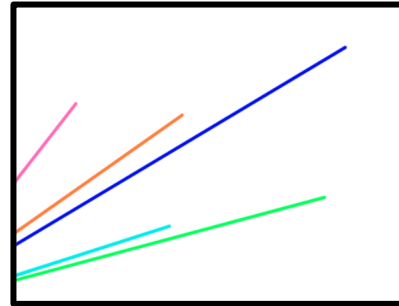
A Scratch code block with the following structure:

- pen down
- repeat 3
 - stamp
 - move 100 steps
 - turn 120 degrees
- pen up

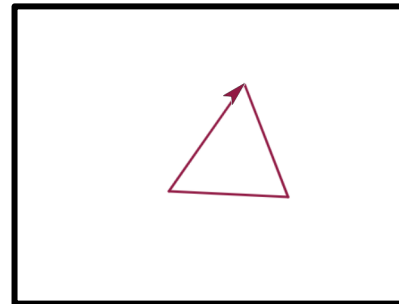
The block is shown next to a purple outline of an equilateral triangle with arrows at each vertex, indicating the direction of movement.

Following the Mouse

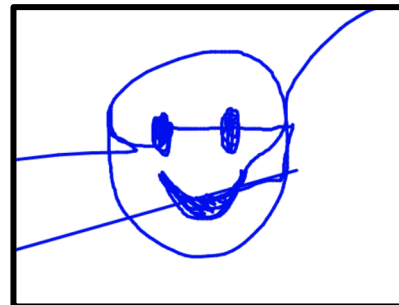
go to mouse-pointer ▾



wait 3 secs
go to mouse-pointer ▾

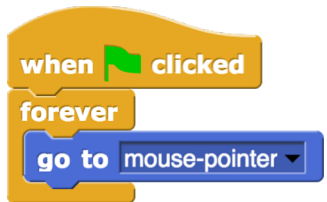


forever
go to mouse-pointer ▾



Hat Blocks

Start scripts with the start button:



Turn the pen on and off with key presses:



Program an erase button:

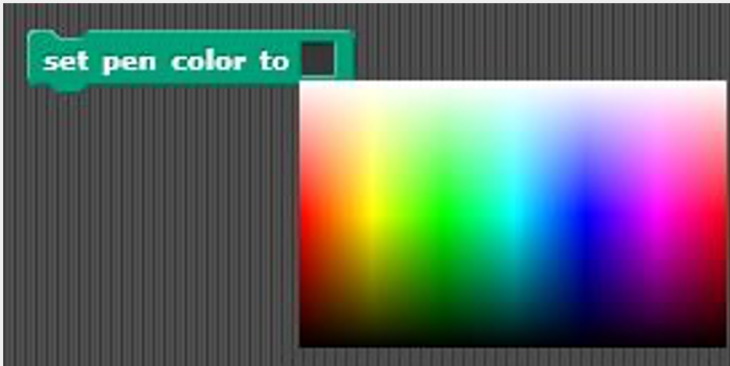


Exercises

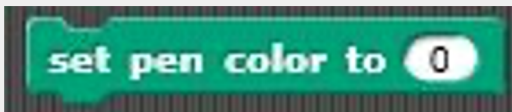
- Whiteboard extensions ...
 - Change pen color using key presses
 - Change pen size using key presses
- Scripts to draw stuff → Change title to ...
 - Square, pentagons, hexagons, octagons, or even write your initials
 - A house
- Game: Stay on the stage
 - Program sprite to move forward continuously at a certain speed (slow, medium, fast)
 - Use the left and right arrow keys to keep the sprite from leaving the stage
 - Program ends if the sprite touches the edge of the stage

Whiteboard Extension (Solution)

Change pen color using key presses



You can also use



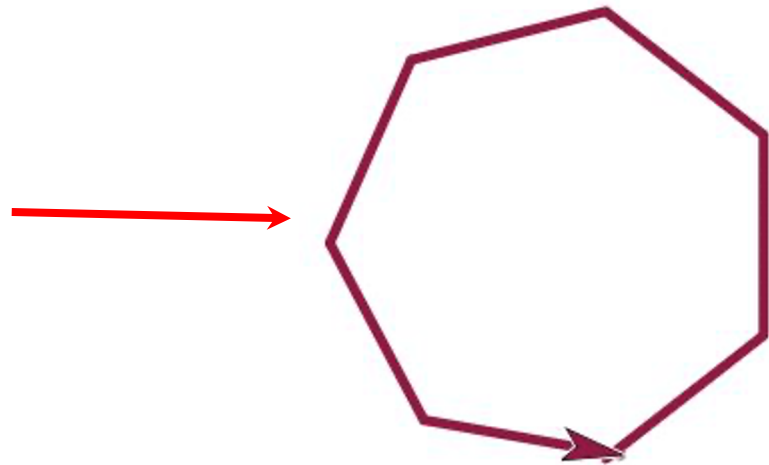
by inputting a different number value

Change pen size using key presses



Scripts to Draw

```
when green flag clicked
clear
set pen color to red
set pen size to 5
go to x: 0 y: -100
point in direction 52
pen down
move 100 steps
repeat 6
  turn 52 degrees
  move 100 steps
```



Drawing a House (Solution)

```
when green flag clicked
  set size to 30 %
  clear
  pen up
  go to x: -100 y: -100
  set pen color to red
  set pen size to 7
  pen down
  wait until key up arrow pressed?
  point in direction 0
  move 150 steps
  wait until key right arrow pressed?
  point in direction 90
  move 150 steps
  wait until key down arrow pressed?
  point in direction 180
  move 150 steps
  wait until key left arrow pressed?
  point in direction -90
  move 150 steps
  pen up
```

```
set pen color to black
go to x: -100 y: 50
pen down
wait until key up arrow pressed?
turn 130 degrees
move 110 steps
wait until key down arrow pressed?
turn 95 degrees
move 110 steps
pen up
go to x: -50 y: -100
set pen color to cyan
pen down
wait until key up arrow pressed?
point in direction 0
move 80 steps
wait until key right arrow pressed?
point in direction 90
move 40 steps
wait until key down arrow pressed?
point in direction 180
move 80 steps
```

