App Scratch
Intro To Coding, Operators, Variables

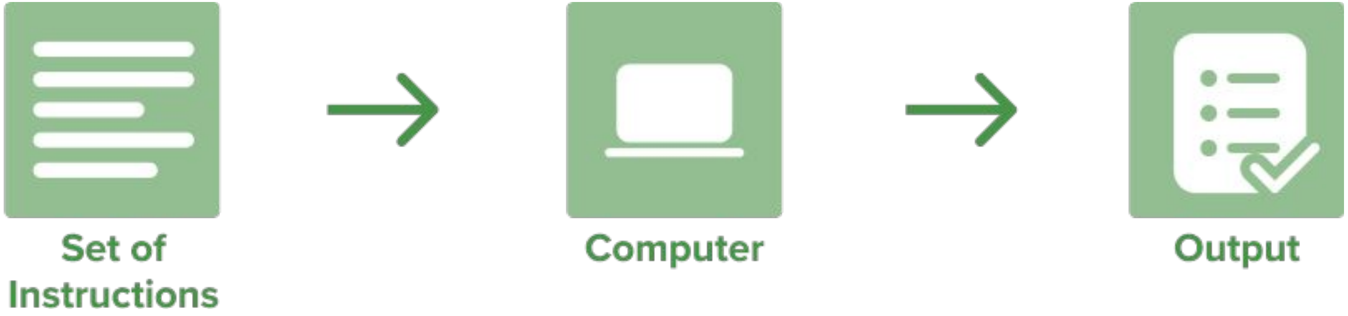
Relevel
by Unacademy

List of Concepts Involved

In this session, we are going to learn about basic concepts of programming using the scratch app and JavaScript. We will see detailed examples of below programming concepts.

- Programming concept
- Variable
- Operators
- Data types
- Comments

Programming



Programming follows a set of tasks/instructions to complete a job, and the computer executes those sets of instructions.

Introduction to Scratch

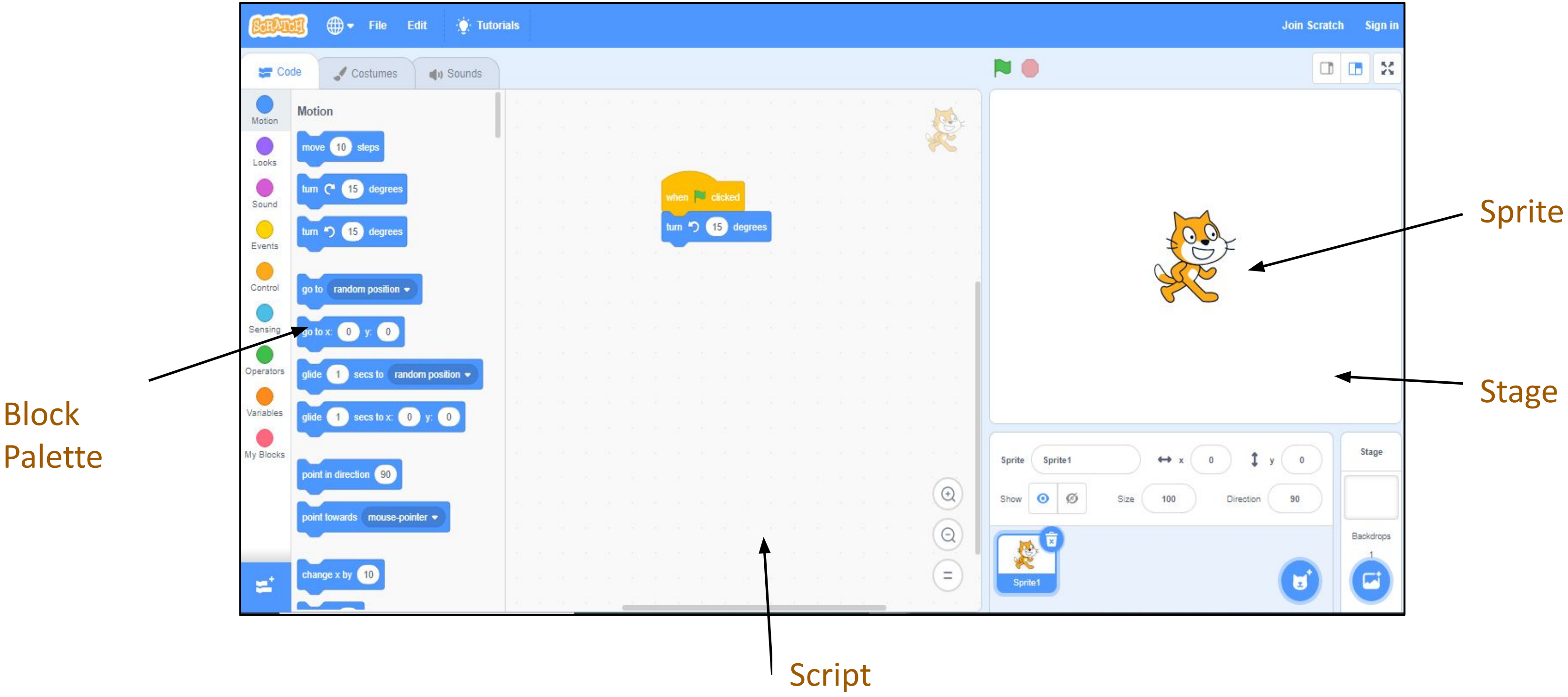
Scratch is a visual programming language that creates different interactive games, animations, etc.

Scratch is more focused on creativity, giving a platform to interactive ideas and working closely with the actual logic of code.

Scratch App URL -

https://scratch.mit.edu/projects/editor/?tutorial=getStarted

User Interface of Scratch



Sprite

Stage

Block Palette

Script

JavaScript

- JavaScript is a programming language that implements complex features on a web application. Using this language, we can dynamically create web pages and update them.
- JavaScript is a programming language that can implement complex features on web applications. Using this language, we can dynamically create web pages and update them.
- JavaScript (JS) is a lightweight, interpreted, or just-in-time compiled programming language with first-class functions. While it is most well-known as the scripting language for Web pages, many non-browser environments also use it, such as Node.js, Apache CouchDB and Adobe Acrobat.
- JavaScript is a prototype-based, multi-paradigm, single-threaded, dynamic language, supporting object-oriented, imperative, and declarative (e.g. functional programming) styles.

JavaScript

Layers of Web Page

There are 3 main layers in the web page.

- HTML(Structure Layer) -> Underlying HTML code of webpage categorized under Structure layer. This is the layer where all content gets stored.
- CSS(Style Layer) -> This layer shows how the webpage will look to the user. This will contain different styles like screen size, font size and so on.
- JavaScript(Behavioral Layer) -> This layer shows how a webpage will behave based on user actions.

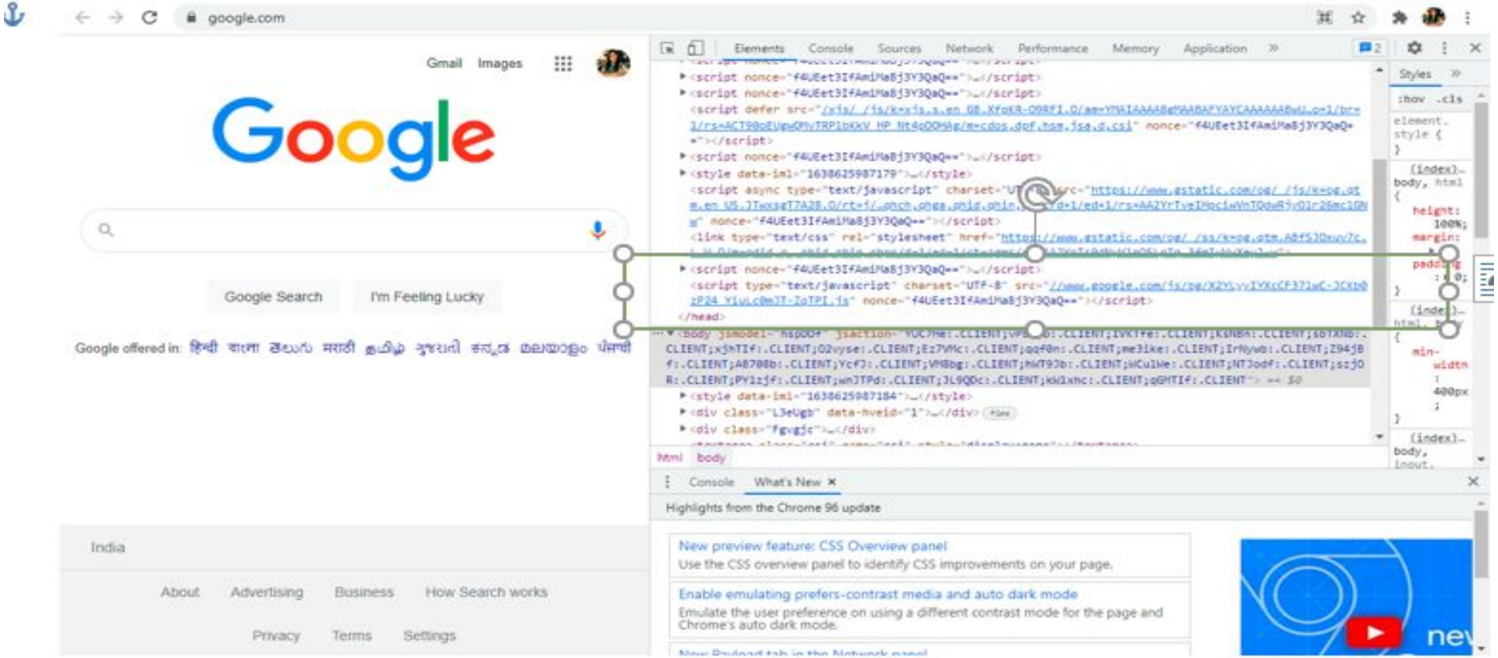
Applications of JavaScript -

- Mobile App dev
- Web App Dev
- Server Side Applications
- Game Dev

How to link our JS Code to the HTML doc?

- Discuss the <script> tag
  - There are two ways to include JS code in our HTML using the script tag.
    - We can directly add it to the HTML file between <script> [JS code here] </script>
    - We can link an external JS file by using the src attribute. (Recommended)
      - It helps in the reusability of code in more than one HTML file.
      - It allows easy code readability.
      - It is time-efficient as web browsers cache the external js files, which further reduces the page loading time.
      - It enables both web designers and coders to work with html and js files parallelly and separately, i.e., without facing any code conflicts.
      - The length of the code reduces as only we need to specify the location of the js file.
  - The script tag can be placed either inside the <head> tag or the <body> tag in a HTML doc.
    - When a script takes time to execute, place it at the bottom of the body. Otherwise, it may heavily impact the page load time.
  - Discuss how the script tag in the default codebase is loading an external JS file - index.js

JS Code on https://www.google.com



```
▶<script nonce="f4UEet3IfAmiMa8j3Y3QaQ==">…</script>
▶<script nonce="f4UEet3IfAmiMa8j3Y3QaQ==">…</script>
 <script defer src="/xjs/_/js/k=xjs.s.en_GB.XfoKR-O9RF1.O/am=YMAIAAAABgMAABAFYAYCAAAAAABwU.o=1/br=1/rs=ACT90oEUgwOMvTRP1bKKV_HP_Nt4oDOHAg/m=cdos,dpf,hsm,jsa,d,csi" nonce="f4UEet3IfAmiMa8j3Y3QaQ==""></script>
▶<script nonce="f4UEet3IfAmiMa8j3Y3QaQ==">…</script>
▶<style data-iml="1638625987179">…</style>
 <script async type="text/javascript" charset="UTF-8" src="https://www.gstatic.com/og/_/js/k=og.qtm.en_US.JTwxsgT7A28.O/rt=j/_ohch,ohga,ohid,ohin,…/d=1/ed=1/rs=AA2YrTveIMpciwVnTQdwRjvOIr26mc1GNw" nonce="f4UEet3IfAmiMa8j3Y3QaQ=="></script>
 <link type="text/css" rel="stylesheet" href="https://www.gstatic.com/og/_/ss/k=og.qtm.A8f5JOxuv7c.…">
▶<script nonce="f4UEet3IfAmiMa8j3Y3QaQ==">…</script>
 <script type="text/javascript" charset="UTF-8" src="//www.google.com/js/bg/X2YLyvIYXcCF371wC-JCXb0zP24_YiuLc0mJT-IoTPI.js" nonce="f4UEet3IfAmiMa8j3Y3QaQ=="></script>
</head>
…▼<body jsmodel="hspDDf" jsaction="YUC7He:.CLIENT;vPBs3b:.CLIENT;IVKTfe:.CLIENT;KsNBn:.CLIENT;sbTXNb:.CLIENT;xjhTIf:.CLIENT;O2vyse:.CLIENT;Ez7VMc:.CLIENT;qqf0n:.CLIENT;me3ike:.CLIENT;IrNywb:.CLIENT;Z94jBf:.CLIENT;A8708b:.CLIENT;YcfJ:.CLIENT;VM8bg:.CLIENT;hWT9Jb:.CLIENT;WCulWe:.CLIENT;NTJodf:.CLIENT;szjOR:.CLIENT;PY1zjf:.CLIENT;wnJTPd:.CLIENT;JL9QDc:.CLIENT;kWlxhc:.CLIENT;qGMTIf:.CLIENT"> == $0
  ▶<style data-iml="1638625987184">…</style>
  ▶<div class="L3eUgb" data-hveid="1">…</div> flex
  ▶<div class="fgvgjc">…</div>
```

```
element.style {
}
(index)…
body, html
{
  height: 100%;
  margin: 0;
  padding: 0;
}
(index)…
html:
{
  min-width: 400px;
}
(index)…
body,
input,
```

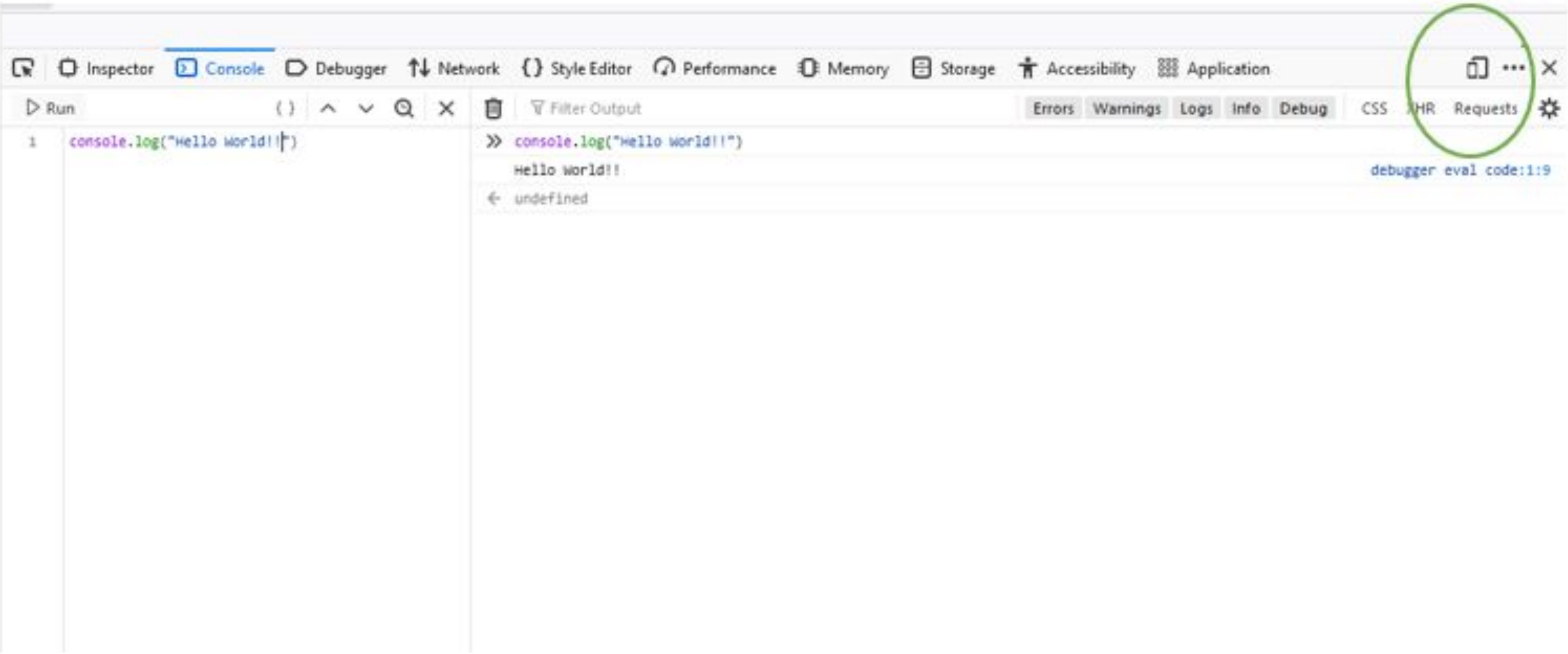
Highlights from the Chrome 96 update

New preview feature: CSS Overview panel
Use the CSS overview panel to identify CSS improvements on your page.

Enable emulating prefers-contrast media and auto dark mode
Emulate the user preference on using a different contrast mode for the page and Chrome's auto dark mode.

New Payload tab in the Network panel

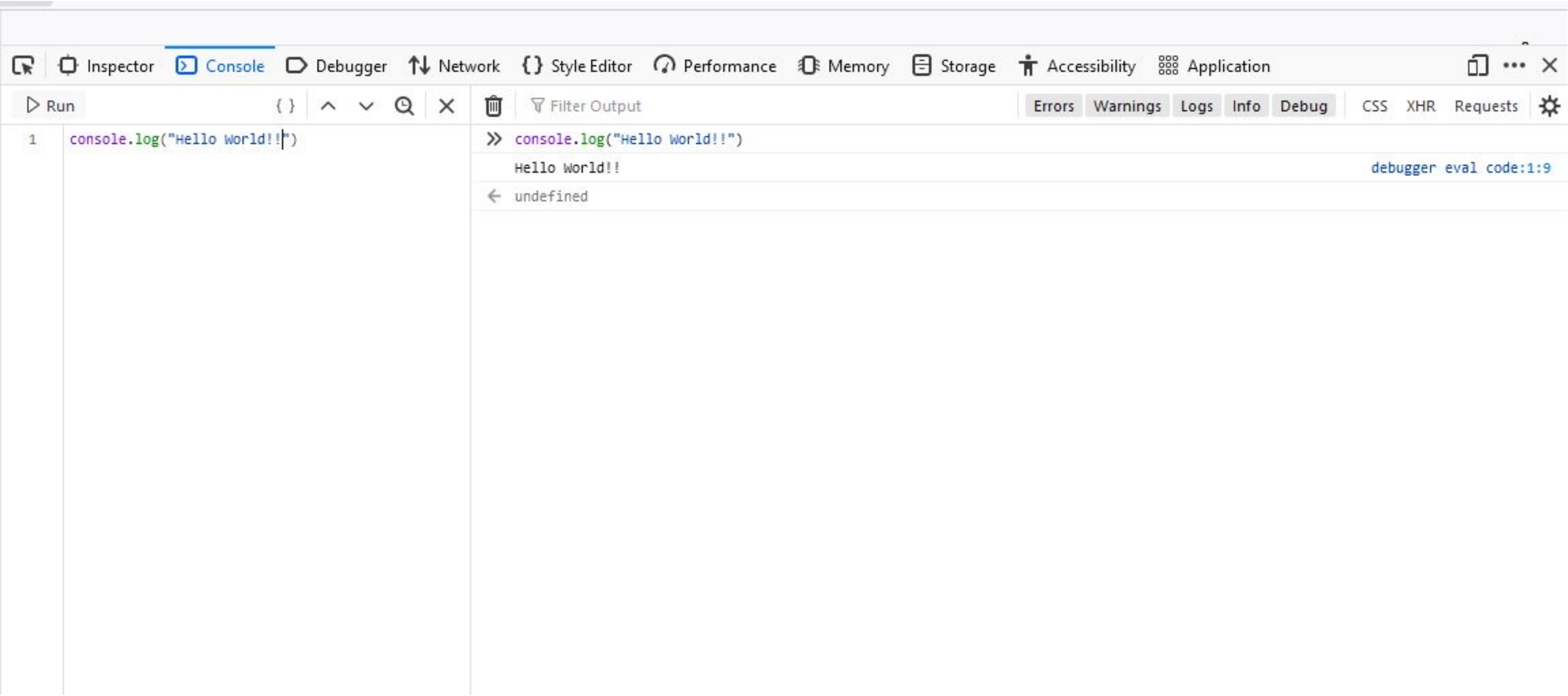
Firefox Mozilla Multi Line Console Editor



```
console.log("Hello World!!")
```

```
>> console.log("Hello World!!")
Hello World!!                                     debugger eval code:1:9
← undefined
```

Firefox Mozilla Multi Line Console Editor



```
console.log("Hello World!!")
```

```
>> console.log("Hello World!!")
   Hello World!!                         debugger eval code:1:9
<- undefined
```

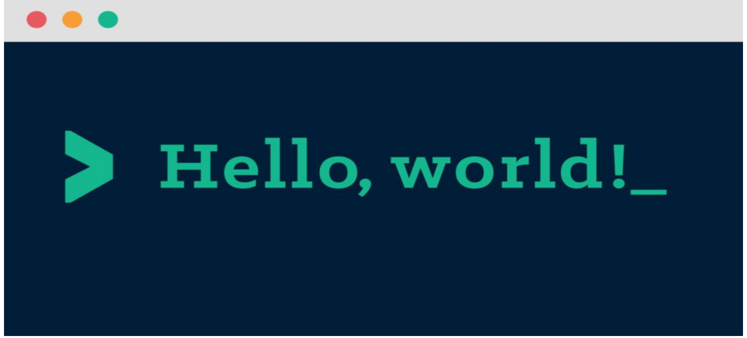
Hello World!! in JavaScript

Printing output on the console is a fundamental part of programming, which we always learn as beginners.

To print Hello World on the output console, we can use the below functions in JavaScript –

- document.write("Hello World ")
- console.log("Hello world");

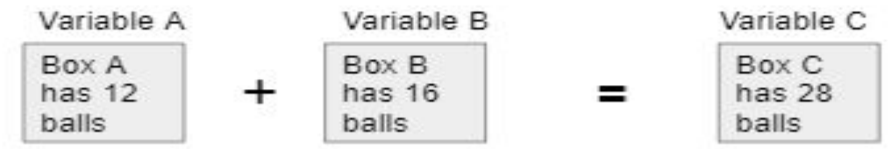
Both can be used to print "Hello World" on the console. It allows us to debug JS applications by outputting to the console easily.



```
> Hello, world!_
```

Variables

- Variables are one of the basic building blocks of programming.
- When we solve some math problems, we deal with numbers. If we want to write a program for solving the same math problem programmatically, we need to store those numbers somewhere. Variables provide us with a way to do that.



Variable A

Box A has 12 balls

+

Variable B

Box B has 16 balls

=

Variable C

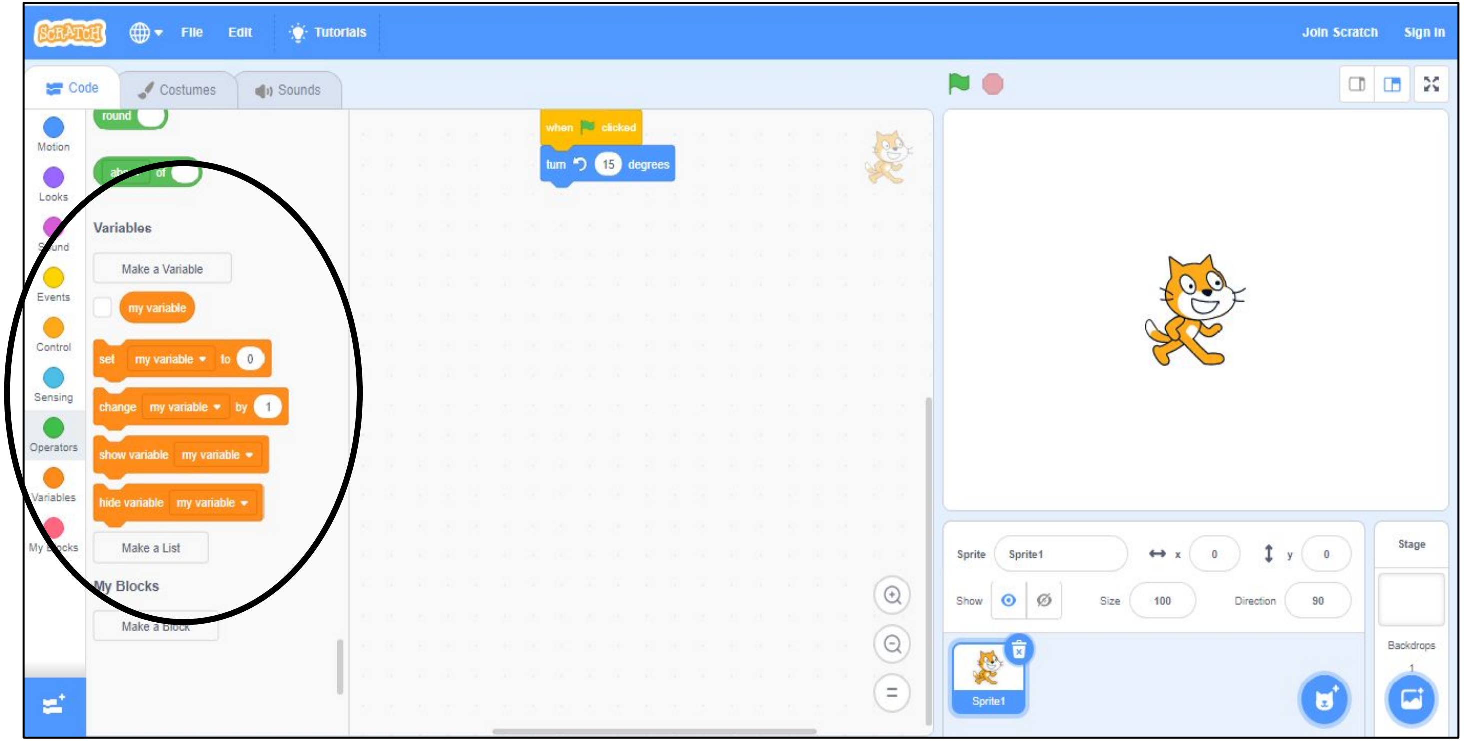
Box C has 28 balls

	var	const	let
What?	Globally scoped or function scoped. This means that scope of variables defined by this keyword can be either in complete program or it can inside complete function where we have defined it.	These variables cannot be redefined again or reassigned again. Once defined, there values will be constant	These variables scope remain under the block.

Syntax	var a;
	a=5;
		const a = 5;
		a = 6; //error: Assignment to constant variable
			{
			  var a = 2;
			  let b = 3;
			  console.log(a); // this will print 2
			  console.log(b); // this will print 3
			}
			console.log(a); // this will print 2
			console.log(b); //this will print undefined

How?	These can be declared without being initialized	These cannot be declared wihtout being initialized	These can be declared without being initialized

Variables


SCRATCH
File
Edit
Tutorials
Join Scratch
Sign in
Code
Costumes
Sounds
round
of
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Variables
Make a Variable
my variable
set my variable to 0
change my variable by 1
show variable my variable
hide variable my variable
Make a List
My Blocks
Make a Block
when clicked
turn 15 degrees
Sprite
Sprite1
x
0
y
0
Show
Size
100
Direction
90
Stage
Backdrops
1
Sprite1

Hoisting

During compile phase, JavaScript code is scanned in backend for different functions and variables defined. All those functions and variables are stored in memory.

Example 1

```
console.log(str);
var str = “Hello World”;
```

Above code will print output as undefined. It will be treated as below in backend due to hoisting.

```
var str;
console.log(str);
str = “Hello World”;
```

since str value is not initialized, it will print undefined as output.

Operators

We must understand what operators are and how we can use them
They work in a similar way as you may have studied in your mathematics subject.
There are different types of operators such as:

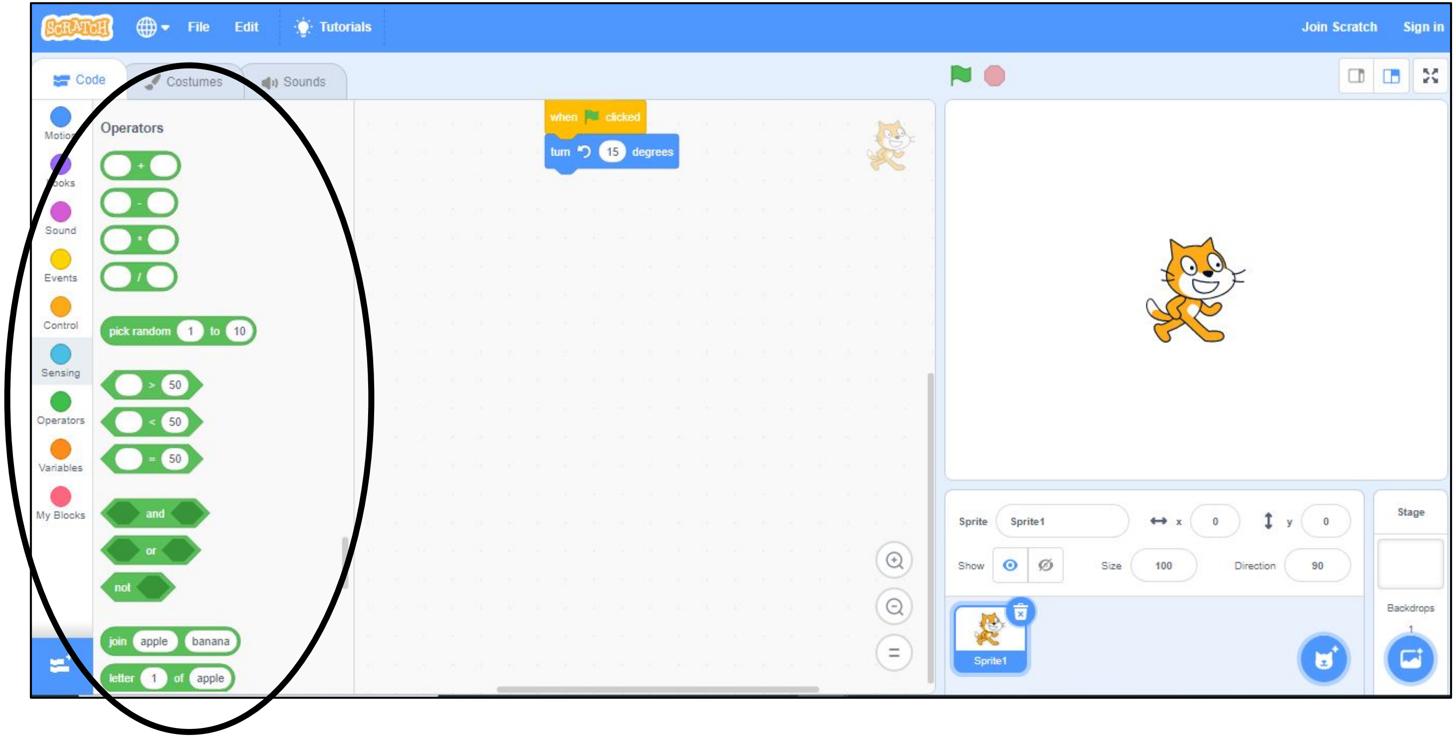
- Arithmetic (+, -, /, *, ++, --)
- Logical (ll , &&)
- Bitwise (l, &, ^, !)
- Comparison (>, <, <=, >=, ==)

Let's understand this using scratch app
Operations like addition, subtraction, multiplication, division, greater then, less then, and, or, modulus and many more can be easily performed using Operators block in scratch.

a + b – Here in place of a and b, user can give any numbers and addition operation will be performed. Similarly, we have a – b, a * b, a / b, etc

abs of n – This is used to find absolute of n number. Here we can select multiple operation from dropdown.

Operators


Scratch
File
Edit
Tutorials
Join Scratch
Sign in
Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Operators
+
-
*
/
pick random 1 to 10
> 50
< 50
= 50
and
or
not
join apple banana
letter 1 of apple
when clicked
turn 15 degrees
Sprite
Sprite1
x
0
y
0
Show
Size
100
Direction
90
Stage
Backdrops
1
Sprite1

Datatypes

Datatypes is defined as types or kinds of data to store variables. Data must be stored in specific format and hence we use datatypes to store them.
To find datatype, we can use the typeof() function in javascript.
Example -

```
console.log(typeof “Unacademy”)
Output -> string

console.log(typeof 3.14)
Output -> number
```

String –
String is collection of alphanumeric characters and symbols. To store different words, letters, sentences, we use string. In JavaScript, either we can single quote or double quotes to define it.
Example – var str = “Hello World”
Hello World datatype is string in above example.

Datatypes

Numbers

Numbers are collections of different digits. They can be integers or decimal numbers.
There are different types of numbers like integers, decimal numbers, exponential numbers, special numbers like Infinity, NaN and so on.

Lets try few examples in javascript

Example –

- var num = 123; //Integer

- var num = 212.13456
  console.log(num.toExponential(4)); //toExponential function is used to write exponential numbers.
  Output -> 2.13e+0

Datatypes

Numbers

- Special numbers like Infinity and NaN are kind of error values.
  NaN
  When any operation got failed or parsing failed, we get NaN as error
  Number('Hello')
  Output -> NaN
  In the above code, Number() is a function to get the number value of argument passed. Here we passed 'Hello' which is a string and cannot be parsed. hence we got NaN as output

  Infinity
  When number value is too large or it is divided by zero, we get Infinity as output
  a = 3/0
  console.log(a)
  Output -> Infinity

  a = 3/ -0
  console.log(a)
  Output -> -Infinity

Datatypes

Boolean –

Boolean can be two values, either true or false. Whenever we want to store a value whose value can be either true or false, we can use Booleans datatype to store it.

Example – let x = true;

Null and Undefined –

“Null” and “undefined” refers to null value or when we don’t assign any value to it. When we do not give value to a variable, it denotes undefined. When we give an empty value to the variable, it will be considered null.

Example –

```
var a = null;
var b;

console.log(a) // print null
console.log(b) // print undefined
```

Comments

Comments are code lines which are not executed by machine. Compiler will be skipped during execution of the program. We also use comments to make our code more readable and understandable

Single Line Comments –

In JavaScript, we use double slash to write comments.

Example –

var str = “hello world” // hello world is defined using variable str

In above code, we have used double slash to define comment. Statement after double slash will not be considered for execution.

Comments

Multi Line Comments

In JavaScript, we use /* and */ to write comments. Any lines between these 2 symbols will be considered as comment.

Example –

```
/*
Code below will define
hello world using str variable
and string datatype
*/
var str = “hello world” // hello world is defined using variable str
```

In above code, we have used /* and */ symbols to define multi line comment. Statement between them will not be considered for execution.

Assignment

1. Create a sample app on scratch that will have 3 variables and on user click the value of those variables should update as follows

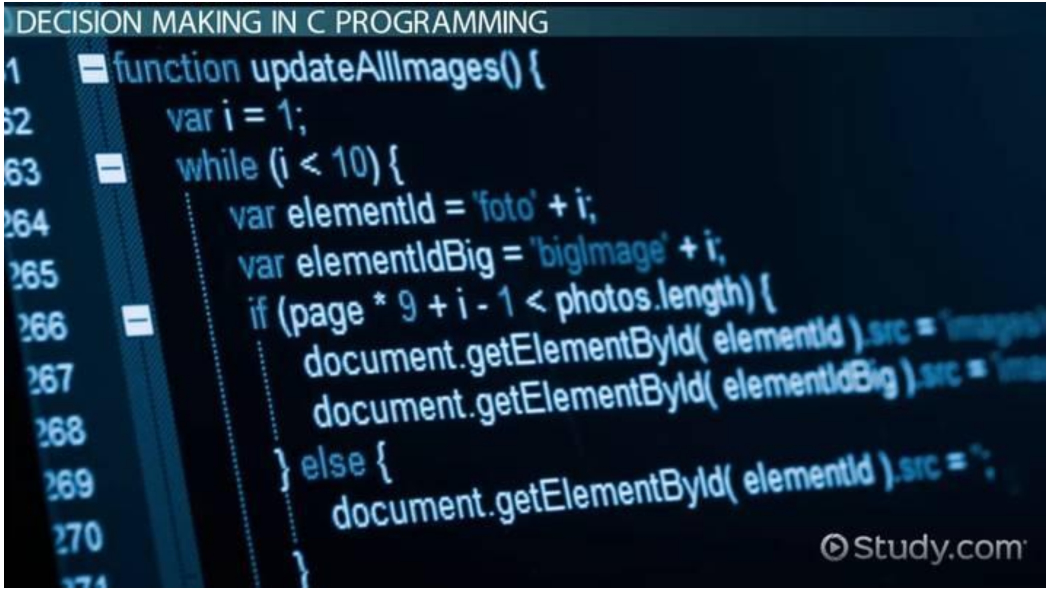
Variable1 - increase by factor of 2 i.e 1, 2, 4, 8, 16
Variable2 - increase by 5 i.e. 1, 6, 11, 16
Variable3 - increase by 1

And once any of those variables reaches 100, all variables should reset to value 1.

2. Create an app and use all the arithmetic operators in that app and display the output on the output panel (hint: refer to the `Looks` panel to display the output)

Upcoming Class Teaser

- Conditional Statements - if-else if-else; Switch cases; Loops; Functions; Timers



DECISION MAKING IN C PROGRAMMING

```
function updateAllImages() {
    var i = 1;
    while (i < 10) {
        var elementId = 'foto' + i;
        var elementIdBig = 'bigImage' + i;
        if (page * 9 + i - 1 < photos.length) {
            document.getElementById( elementId ).src = 'images/
            document.getElementById( elementIdBig ).src = 'ima
        } else {
            document.getElementById( elementId ).src = '';
        }
```

Study.com

Thank you!