T3A1 Workbook

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- For the code snippet provided below, write comments for each line of code to explain its functionality. In your comments you must demonstrates your ability to recognise and identify functions, ranges and classes

Provide an overview and description of a standard source control process for a large project

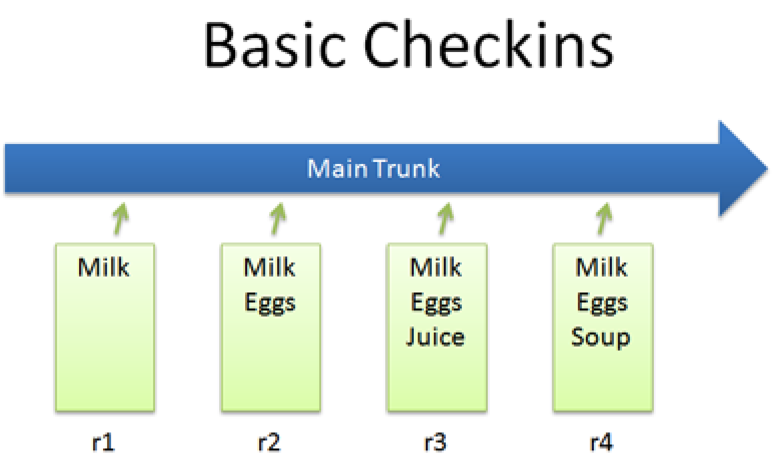
Let say you want to check source code or files from start to finish, Version Control or Source control is a tool most projects used. It functions as a time machine in which you can go back from history to present.

#	Functions of Version Control(Source Control)
Backup and Restore	All your work will be saved, edited and can be restored in the beginning up to the recent changes.
Synchronization	People working in the project can collaborate with source codes and will let them update to the current one.
Short-term undo	If we made any errors and don't know how to fixed it, we can just disregard the changes and go back to the last known working state.
Long-term undo	If theres already a lot of source code written and let say they have tag with versions, We can go over it and check the logs for that tag.
Track Changes	Any changes we made, let say adding, removing, updating or deleting files, we can comment message for that certain change or changes making it easy for yourself or others when you go back and had a look on how your work had developed overtime.
Track Ownership	All the changes that you've made will be reflected under however made those revisions so everyone working on that file will know whoever is responsible.
Sandboxing	Basically, you can test whatever you want to change before committing and deploying your changes.
Branching and merging	This provides us an option for our code to be modular. We can segregate major changes, test it before we merge it back to the working state.

#	Basic Setup
Repository (repo)	This will be your online database thats stores your code.
Server	This will be your local machine which stores the repository.
Client	This will be your computer connecting to the repository.
Working Set/Working Copy	This will be your local files where you made changes.
Trunk/Main	This will be the main line for your code in the repository.

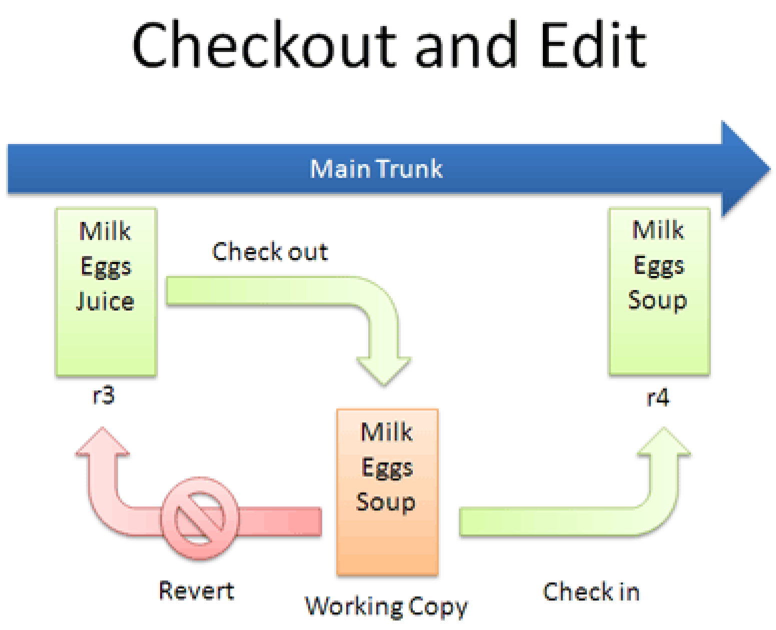
Examples:

Checkins



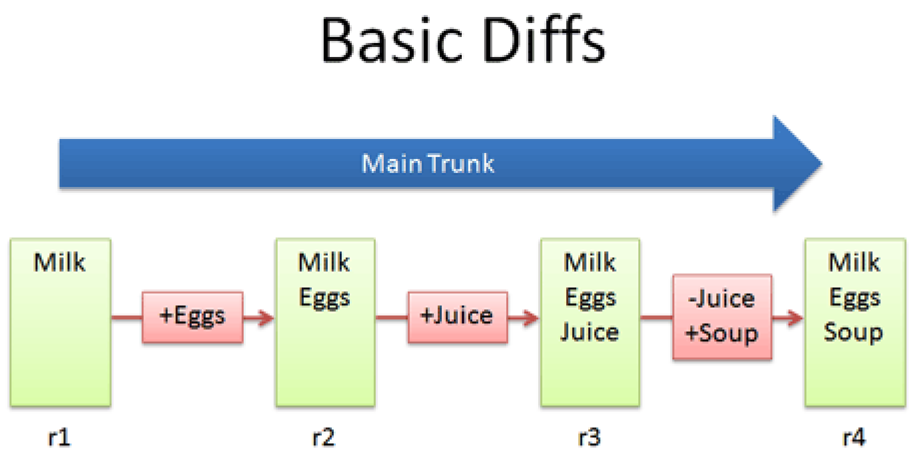
*** In this example, each time we made a change or add something to a code, it provides references

Checkouts And Editing



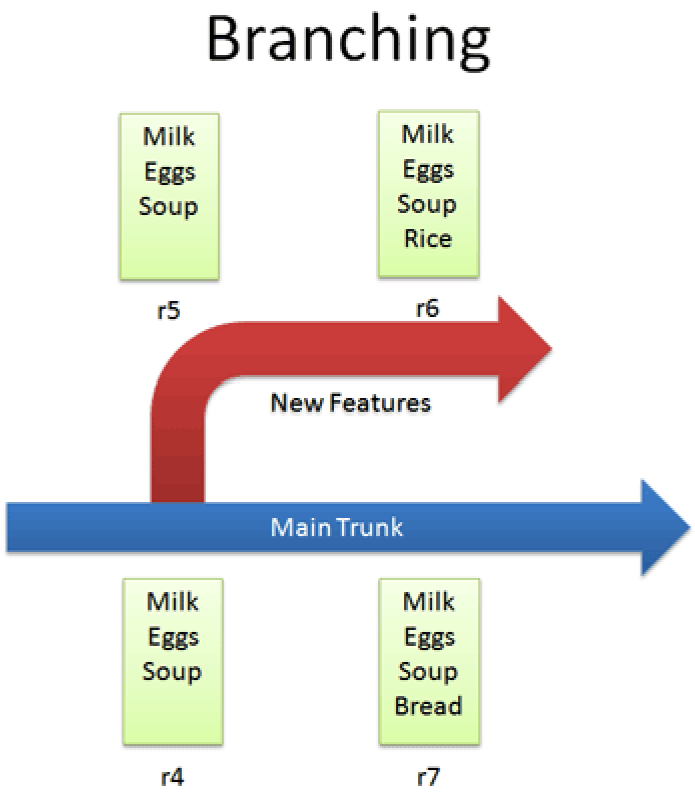
*** In this example, everthing time you check in youl be given the recent version of the code and can go back to previous ones.

Difference



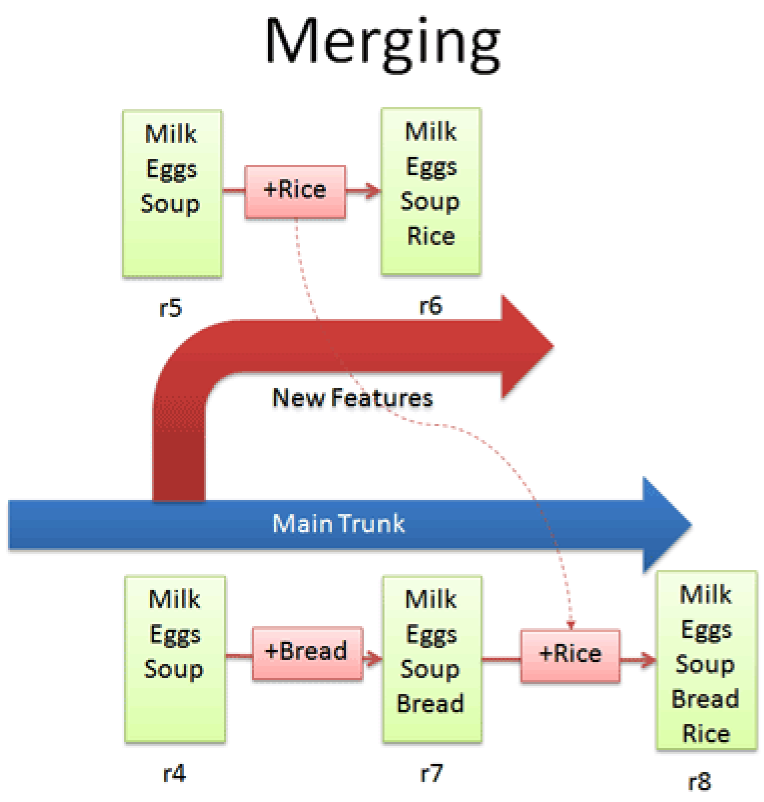
*** In this example, we can see the difference between every stages weve made.

Branching



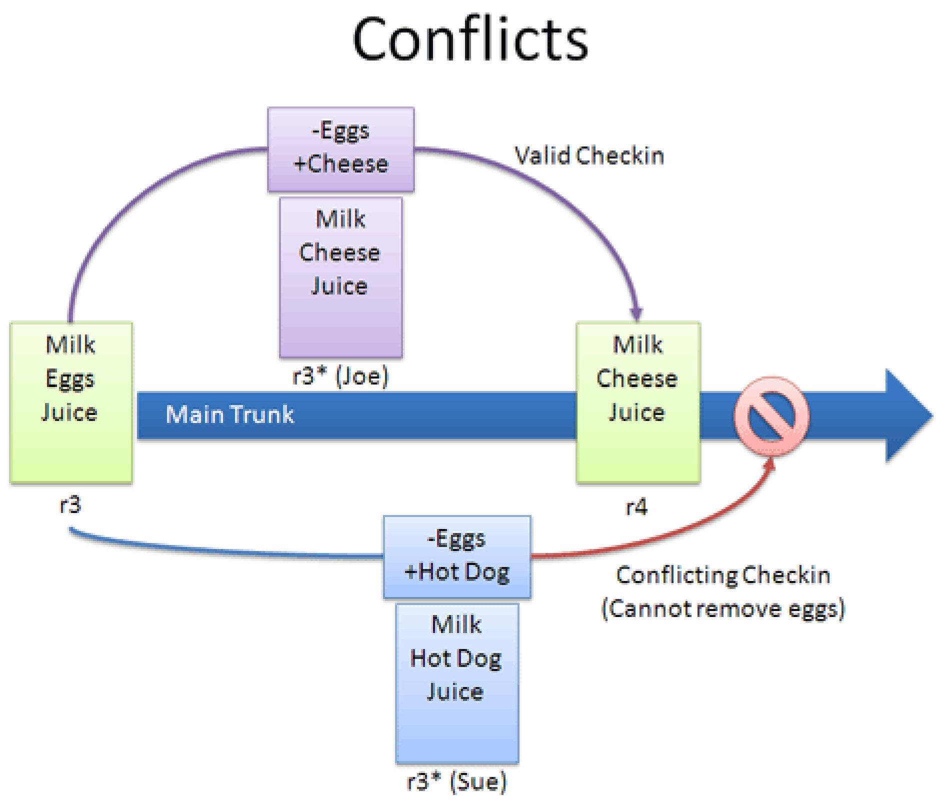
*** In this example, we can sandbox any changes we want to implement before adding it to the working state.

Merging



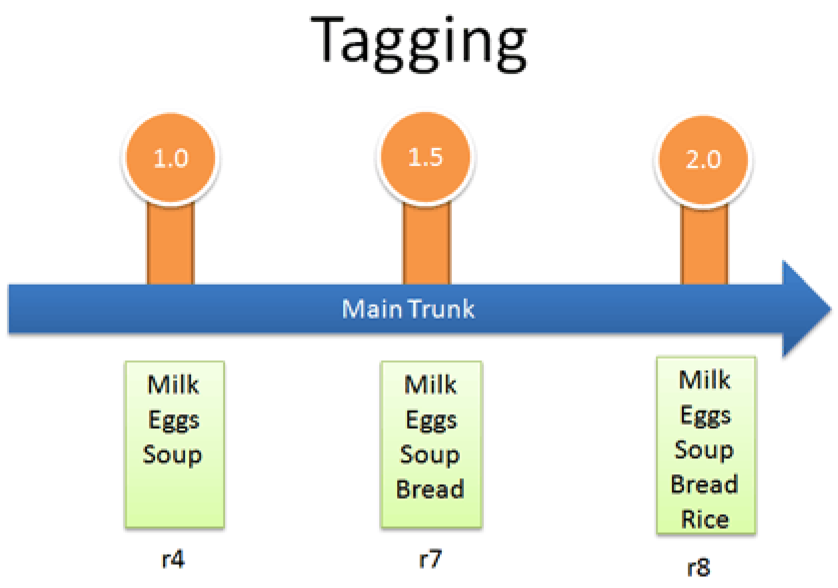
*** In this, example after making those changes in the branch, we added those changes in the main one.

Conflict



*** In this example, we can see two those changes which is different and gives conflict on which is right or wrong before merging to the main state

Tagging



*** In this example, we can tag changes so that it will be easier to reference.

What are the most important aspects of quality software

The following are aspects in measuring the quality of a software:

Aspect of Quality Software	Description
Reliability	A reliable software should be consistent and plenty software testing is imperative prior to deployment to minimise errors. There is no such thing as a zero-bug software however a reliable software should have very few faults and these faults should be fixed in a timely manner.
Understandability	A software developer must exercise clear, highly organised and logical structured code. It is difficult to manage a software if it is poorly written. It also affects the effectivity and efficiency during bug-fixing and testing if code is not done in an organised way.
Modifiability	Similar to understandability, if a software is well-organised, it is easy to make modifications. It should be flexible and any changes to be done should be also be easy to deploy when done.
Usability	One of the purposes of a software development is to meet specific needs of a client. This can be achieved when a software is effective, and it can only be effective if the user is comfortable using the software after a short training.
Testability	Testability – Quality of a software depends on testability. If the errors are found and corrected prior deployment, the software becomes reliable. Testing saves time, effort and costs.
Portability	A software should be able to work in multiple environments and can be transferred to another environment and still work properly with small changes.

Aspect of Quality Software	Description
Efficiency	An efficient software should use very little physical resources as can possibly get but still perform a function as required.

Outline a standard high level structure for a MERN stack application and explain the components

MERN stack is one of the JavaScript web app stacks that is being used in creating web applications. Its main purpose is to create effective, efficient, fast and flexible web applications by putting together these four components – MongoDB, Express, React and Node.js.

Components	Description
MongoDB	Compared to other database, MongoDB is a document database which is non relational (NOSQL) and doesn't use schema formats like tables and columns. The data format of the document is query through Javascript Object Notation (JSON).
Express	A back-end or server side framework. Its considered web application framework for Node. It simplifies the task of writing server side codes. Known for its speed and minimalist structure, which features many available plugins which will make your code DRY.
React	It is one of javaScript libraries for client side interface. It was created by Facebook. Its library is used for creating views in HTML. React views are declarative which automate the creation of repetitive HTML or DOM elements.

Components	Description
Node.js	A cross-platform JavaScript runtime environment which is built on Chrome's V8 JavaScript engine. It is designed to run Javascript code with multiple files.

A team is about to engage in a project, developing a website for a small business. What knowledge and skills would they need in order to develop the project

#	Skills / Knowledge to develop a Website
Programming	there are plenty of programming languages available and they are created for different purposes. HTML, CSS and JavaScript are the three most popular. HTML is short for Hypertext Markup Language, it is used in creating pages in web browser. Contents and links that can be viewed in the web pages are done using HTML. CSS means Cascading Style Sheets, this allows programmer to create style on pages. Colours, fonts and layout that we view in web pages are done using CSS. JavaScript on the other hand is ....
Learning	Web developers should not only know how about programming languages but also knowledgeable about the project. It is important that the programmer is aware of the purpose why there is a project and able to meet expectations.
Testing	Testing during the development phase and prior to delivering the final product are equally both important. This is to save time, money and make sure everything is working fine to satisfy customer requirements.
Basic Knowledge of Design	A developer should have basic understanding in graphic design or using graphic tools. This assists the developer into building the website as to what the customer desires.
SEO	It is important for a developer to have understanding on how search engines work. As the team is developing a website for a small business, it is vital for the business to have online presence and increase customers.
Understanding Common Security Attacks and How to Prevent Them	Protecting website from Cybersecurity attacks are essential. Any website developer should have a basic understanding of different types and how to prevent as such. These could pose serious threats to businesses if not considered at time of web development.
Image Resizing and Effects	A website developer should be familiar in using Photoshop or related graphics editor. In this day and age, customers are more inclined into visually minded web pages.
Resoluteness	Resoluteness is a character of a person rather than a skill. It takes an adequate of determination to learn from mistakes, fixing the problem and finishing a task.

#	Skills / Knowledge to develop a Website
Confidence	A website developer should stay focused on his task and believe in one's self that it can be done.
Frustration Tolerance and Patience	When working on a project, there are plenty of testing that needs to be done. It is important that the developer does not give up when faced with trials.
Time Management and Detailed Planning	It very important for the team to do lots of planning when working on a project. A project management software or applications can be used to delegate tasks, managing hours and tracking progress.

With reference to one of your own projects, discuss what knowledge or skills were required to complete your project, and to overcome challenges

In relation to my last rails project (marketplace app), listed below were the knowledge or skills required and challenges encountered;

Knowledge / Skills	Description
Programming	As part of the requirement, we need to create the application using Ruby on Rails. Upon learning Ruby on the first term, it helps to learn the basics for the MVC framework such as Ruby on Rails. Also learning HTML and CSS in term 1 contributes in designing and styling the Client-side of the application.
Learning	Before or as you build the project, you will encounter some ideas that you want to implement in the application. Most of the time, these will include a lot of reading documentations and even watching tutorials on how it works. Some of these concept were not taught in school so you need to do a lot of research.
Testing	As we build along the project, we make sure that we test the application after every feature we implement. This include testing on both development and production. By doing that, it helps us narrow down the source of errors or bugs if theres any.
Design	By learning HTML and CSS on the first term, we managed to implement some knowledge and techniques to our design. The use of wireframes and mood boards helps us layout the basic design and build up as we go along. Learning CSS libraries such as Bootstrap and Bulma contributes well for the overall user experience.
Time Management and Planning	Whether you're in school learning or at work for a company, we need to stay on top of your schedule and your projects This can mean getting to know productivity apps like task lists or calendars or, especially if you're in a large organization. We've used project tracking tools like Trello to keep track on the development of the project. Whatever the tools, mastering the art of prioritizing and tracking your work will be essential.

Challenges Encountered	How we overcome
Time Limitation	Delivering a project in a very short period of time was challenging. Judgment and emotions affect decision making when working under pressure. Using Trello and Canban methodology, we were able to manage our time and tasks.
User-friendly Design	End users of the project does not have understandings of how the website was done or what programming languages were used. They are more concerned of what the web pages will look like, how appealing it is and how easy it is to navigate. Usability can be perspective. We asked our educators and associates to test the website and get some feedback.

With reference to one of your own projects, evaluate how effective your knowledge and skills were for this project, and suggest changes or improvements for future projects of a similar nature

If given chance to redo everything, il will consider;

Steps	Changes
Reevaluate	Using my knowledge in software development, learning new skills and plenty of testing, I was able to finish the project. In future projects, it will be great to work in teams so we can collaborate, share the load and increase efficiency.
Figure out the failures	Creating a project and learning new things can be quite exciting. During planning, I was inclined to add plenty of features not realising how complicated it can be and that it took much of my time trying to figure out how to do it. In future projects, I would still want to add a feature or two that I know the end user will appreciate, to challenge myself but also make sure that it can be done within the time-frame.

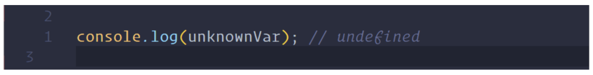
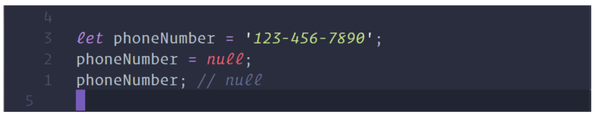
I could say that with reference to my projects they were satisfactory for me and probably for others and the skills and knowledge that I acquired while studying equipped me on how to proceed.

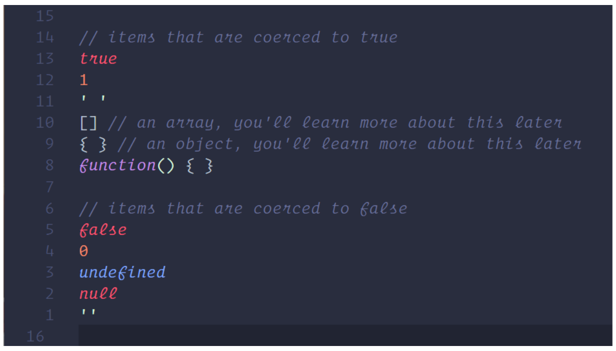
Explain control flow, using an example from the JavaScript programming language

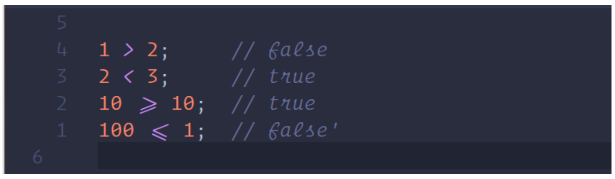
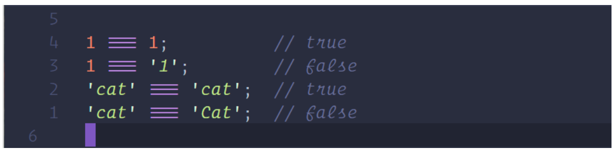
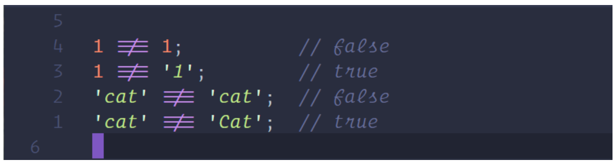
Most of our code involves control flow in which often times we want our program to act differently based on the information supplied to it. In Javascript it uses control flow like any other languages, we just need to understand and be able to use different operators and how to use them.

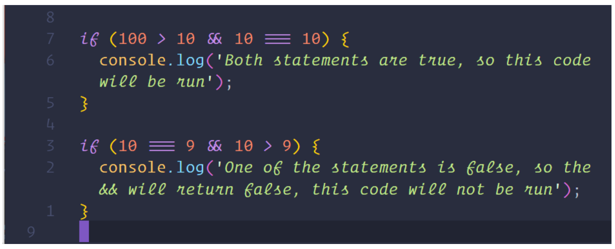
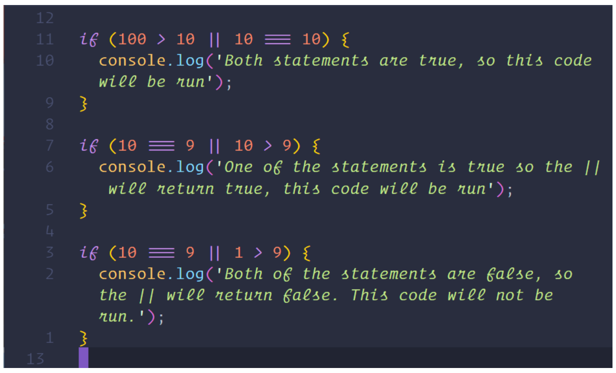
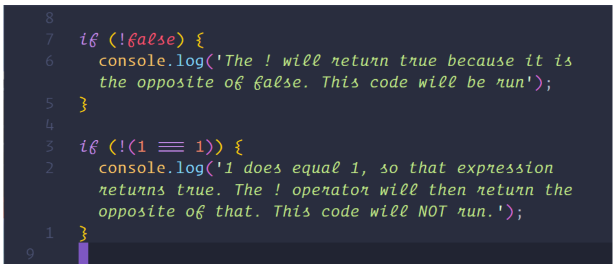
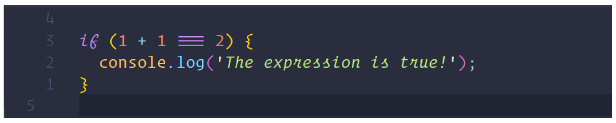
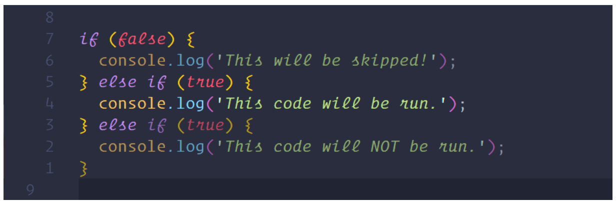
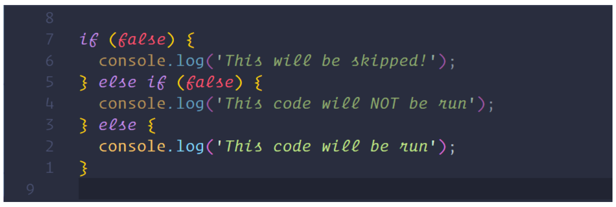
Operators	Description	Example

Operators	Description	Example

Undefined and Null	Whenever you are looking for something that does not exist like a variable which has no value yet then you'll get undefined. Null is an object that we can use to tell others that the item exists, but there is no value at the moment.	 `console.log(unknownVar); // undefined`
		  `let phoneNumber = '123-456-7890';`
		`phoneNumber = null;`
		`phoneNumber; // null`

Truthiness	It gives us a true or false value when we use an if or other statements otherwise Javascript will perform type coercion and will transform it to Boolean value which will be truthy or falsey.	 `// items that are coerced to true`
		`true`
		`1`
		`' '`
		`[] // an array, you'll learn more about this later`
		`{ } // an object, you'll learn more about this later`
		`function() { }`
		
		`// items that are coerced to false`
		`false`
		`0`
		`undefined`
		`null`
		`''`

Comparison Operators	The triple equal sign(===) compares everything about two items which includes its type and value. The not equal which is represented by adding exclamation symbol (!==) does the opposite of equality operator.	 `1 > 2;      // false`
		`2 < 3;      // true`
		`10 >= 10;   // true`
		`100 <= 1;   // false'`
		  `1 === 1;           // true`
		`1 === '1';         // false`
		`'cat' === 'cat';   // true`
		`'cat' === 'Cat';   // false`
		  `1 !== 1;           // false`
		`1 !== '1';         // true`
		`'cat' !== 'cat';   // false`
		`'cat' !== 'Cat';   // true`

Operators	Description	Example
Logical Operators	The AND which is composed with two ampersands && assesses the two articulations and returns valid if the two articulations are valid. Otherwise, if one or both of them is false it will return false. The OR is composed with two vertical bar checks on the off chance that one of the articulations is valid. It will return valid in the event that one or both of the articulations is valid. It will return false if BOTH articulations are false. Lastly, the NOT operator returns the opposite Boolean value you've passed to it.	  
If Operator	If operators check if the statement we pass is true then proceed to executing some functions otherwise skips the code and do something else.	
If,Else if, Else	These statements must be used with if and must come after it. These statements are going to be evaluated if the initial if returns false. we are able to consider the else if as another if statement that has been chained and we can have as many else if statements we want. The else statement will always come at the tip of an if-else if chain, and can act as a default. If none of the expressions returned true, the else code block is going to be run regardless of what. If any of the previous if alternatively if expressions are true, the else statement code block won't be run.	 

```
if (100 > 10 && 10 === 10) {
  console.log('Both statements are true, so this code will be run');
}

if (10 === 9 && 10 > 9) {
  console.log('One of the statements is false, so the && will return false, this code will not be run');
}
```

```
if (100 > 10 || 10 === 10) {
  console.log('Both statements are true, so this code will be run');
}

if (10 === 9 || 10 > 9) {
  console.log('One of the statements is true so the || will return true, this code will be run');
}

if (10 === 9 || 1 > 9) {
  console.log('Both of the statements are false, so the || will return false. This code will not be run.');
}
```

```
if (!false) {
  console.log('The ! will return true because it is the opposite of false. This code will be run');
}

if (!(1 === 1)) {
  console.log('1 does equal 1, so that expression returns true. The ! operator will then return the opposite of that. This code will NOT run.');
}
```

```
if (1 + 1 === 2) {
  console.log('The expression is true!');
}
```

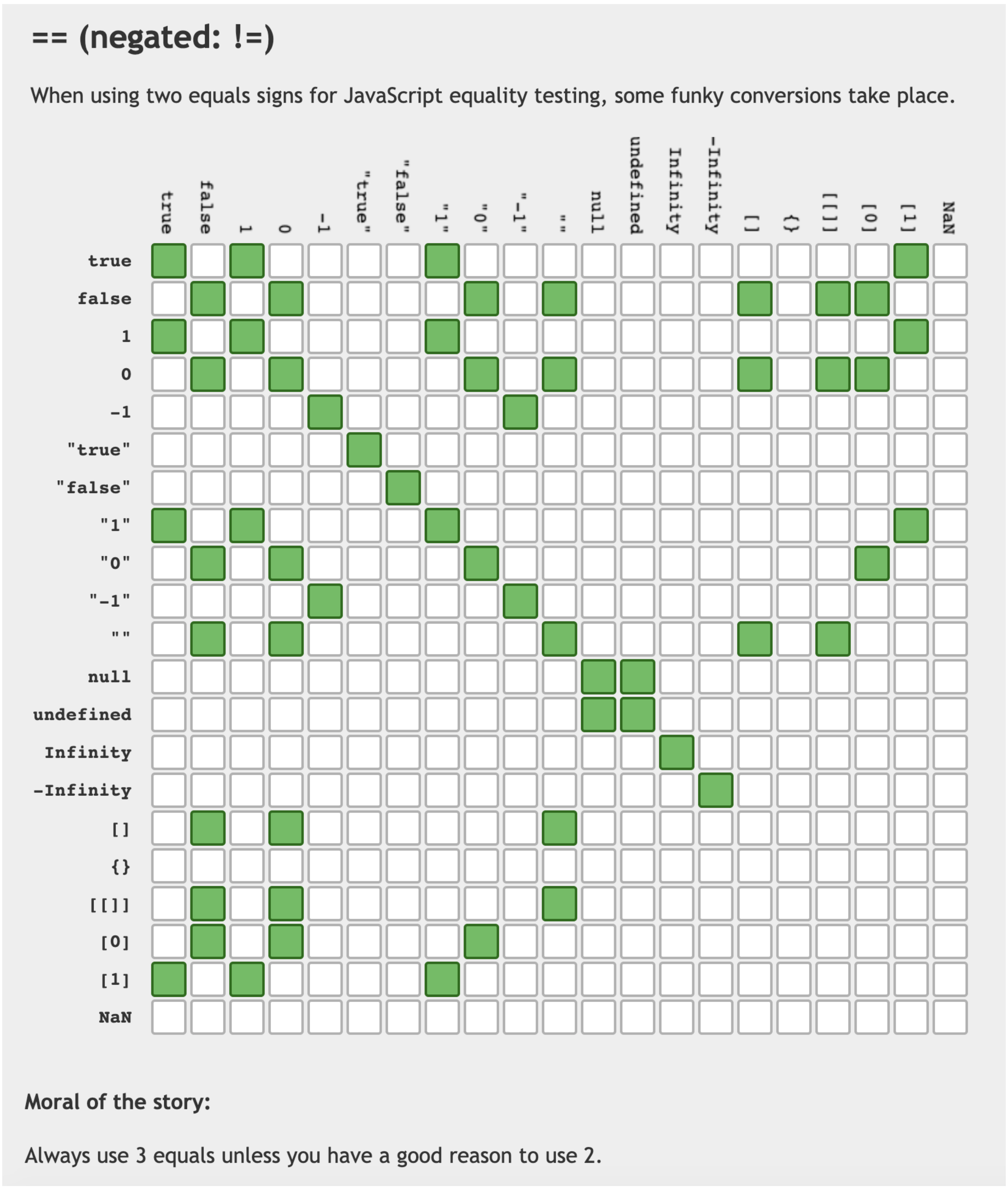
```
if (false) {
  console.log('This will be skipped!');
} else if (true) {
  console.log('This code will be run.');
} else if (true) {
  console.log('This code will NOT be run.');
}
```

```
if (false) {
  console.log('This will be skipped!');
} else if (false) {
  console.log('This code will NOT be run');
} else {
  console.log('This code will be run');
}
```

Explain type coercion, using examples from the JavaScript programming language

Type Coercion

Type Coercion is that the process of converting type of value from one type to a different like string to boolean, object to boolean, and so on. Any type, be it primitive or an object, could be a valid subject for type coercion.



== (negated: !=)

When using two equals signs for JavaScript equality testing, some funky conversions take place.

	true	false	1	0	-1	"true"	"false"	"1"	"0"	"-1"	""	null	undefined	Infinity	-Infinity	[]	{}	[[]]	[0]	[1]	NaN
true	🟩		🟩					🟩												🟩	
false		🟩		🟩					🟩		🟩					🟩		🟩	🟩		
1	🟩		🟩					🟩												🟩	
0		🟩		🟩					🟩		🟩					🟩		🟩	🟩		
-1					🟩					🟩											
"true"						🟩															
"false"							🟩														
"1"	🟩		🟩					🟩												🟩	
"0"		🟩		🟩					🟩										🟩		
"-1"					🟩					🟩											
""		🟩		🟩							🟩					🟩		🟩			
null												🟩	🟩								
undefined												🟩	🟩								
Infinity														🟩							
-Infinity															🟩						
[]		🟩		🟩							🟩										
{}																					
[[]]		🟩		🟩							🟩										
[0]		🟩		🟩					🟩												
[1]	🟩		🟩					🟩													
NaN																					

Moral of the story:

Always use 3 equals unless you have a good reason to use 2.

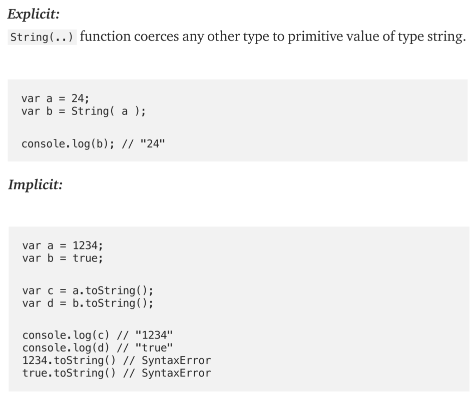
Types of Coercion	Description	Example

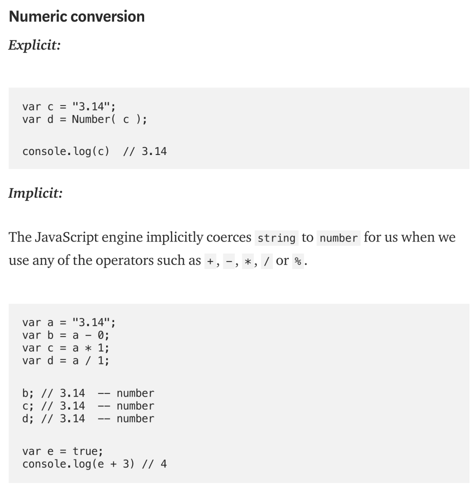
Types of Coercion	Description	Example

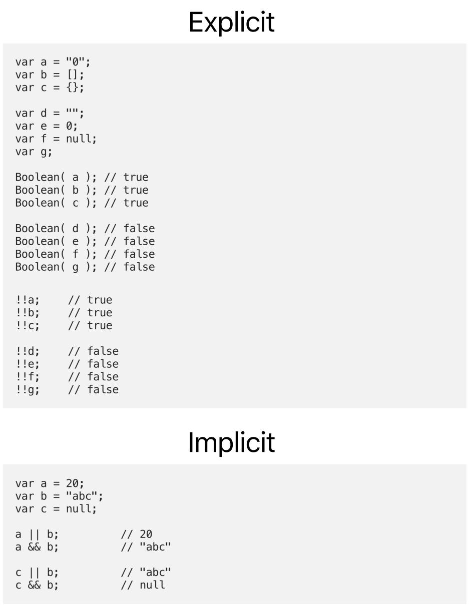
Explicit or 'Type casting'	This happens when the programmer explicitly converts the kind of value to the required type.	`var a = "42";`
		
		`var b = Number( a );`
		
		`a;                              // "42"`
		`b;                              // 42 -- the number`

Implicit	They are the sort of conversions that are hidden. JavaScript being the weakly-typed language, values are often converted between differing types of 'implicitly'.	`var a = "42";`
		
		`var b = a * 1;   // "42" implicitly coerced to 42 here`
		
		`a;                           // "42"`
		`b;                           // 42 -- the number!`

Types of Conversion	Description	Example

String conversion	The toString() may also be accustomed convert any type to string, however, as explicit because it might sound from the code, it's much underlying nature. the explanation being it can not be directly used on primitive values like numbers or Boolean true. So, a kind variable being an object wrapper will invoke the toString() method.	
		Explicit:
		`String(..)` function coerces any other type to primitive value of type string.
		`var a = 24;`
		`var b = String( a );`
		
		`console.log(b); // "24"`
		Implicit:
		`var a = 1234;`
		`var b = true;`
		
		`var c = a.toString();`
		`var d = b.toString();`
		
		`console.log(c) // "1234"`
		`console.log(d) // "true"`
		`1234.toString() // SyntaxError`
		`true.toString() // SyntaxError`

Numeric conversion	The Number(..) function coerces to the other type value to a primitive number value. in a different way of explicit coercion is by using unary operator + where it explicitly coerces its operand (i) to number value.	
		Numeric conversion
		Explicit:
		`var c = "3.14";`
		`var d = Number( c );`
		
		`console.log(c)  // 3.14`
		Implicit:
		The JavaScript engine implicitly coerces `string` to `number` for us when we use any of the operators such as `+`, `-`, `*`, `/` or `%`.
		`var a = "3.14";`
		`var b = a - 0;`
		`var c = a * 1;`
		`var d = a / 1;`
		
		`b; // 3.14  -- number`
		`c; // 3.14  -- number`
		`d; // 3.14  -- number`
		
		`var e = true;`
		`console.log(e + 3) // 4`

Types of Conversion	Description	Example
Boolean conversion	To explicitly convert the value to a boolean type Boolean(..) function is used. a bit like the unary + operator coerces a worth to variety the unary !== operator explicitly coerces a worth to a boolean. '!' operator explicitly inverses the truthy to falsy and the other way around. Any value utilized in these contexts that's not already a boolean will first be implicitly coerced to a boolean. Both Or and And operators perform a boolean test on the primary operand (a or c). For the OR operator, if the test is true, the OR expression ends up in the value of the primary operand (a or c). If the test is fake, the OR expression ends up in the value of the second operand (b). Inversely, for the && operator, if the test is true, the && expression ends up in the value of the second operand (b). If the test not true, the AND expression ends up in the value of the primary operand (a or c). This test returns the primary falsy value.	

Explicit

```
var a = "0";
var b = [];
var c = {};

var d = "";
var e = 0;
var f = null;
var g;

Boolean( a ); // true
Boolean( b ); // true
Boolean( c ); // true

Boolean( d ); // false
Boolean( e ); // false
Boolean( f ); // false
Boolean( g ); // false


!!a;    // true
!!b;    // true
!!c;    // true

!!d;    // false
!!e;    // false
!!f;    // false
!!g;    // false
```

Implicit

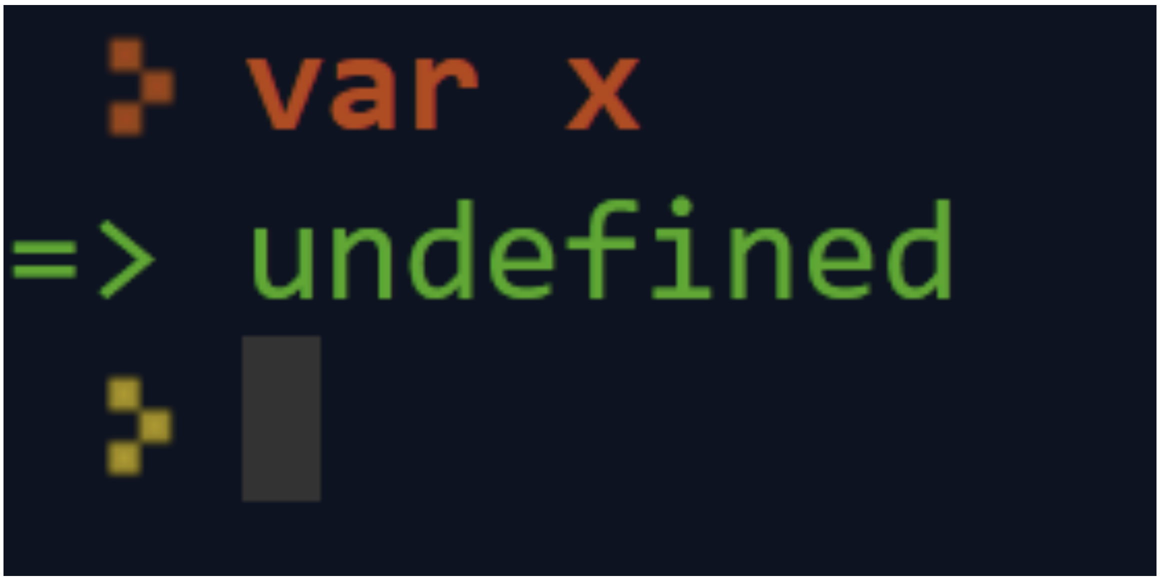
```
var a = 20;
var b = "abc";
var c = null;

a || b;         // 20
a && b;         // "abc"

c || b;         // "abc"
c && b;         // null
```

Explain data types, using examples from the JavaScript programming language

Data Types	Description
Number	The numbers in Javascript were '+Infinity', ' -Infinity', 'NaN' (Not a number). Infinity is the numeric value that represents a positive number that approaches infinity and -Infinity is the numeric value that represents a negative number that approaches infinity while NaN is the numeric value that represents a non-number, standing for not variety `var num7 = 5 / 0;   // will return Infinity` `var num8 = -5 / 0;  // will return -Infinity` `var x = 20 / "Shark";   // x will be NaN`
String	String represents some textual data and its values were enclosed in quotation marks often times may be single or double quotation. `var singleQuotes = 'This is a string in single quotes.';` `var doubleQuotes = "This is a string in double quotes.";`

Data Types	Description
Boolean	It represents a logical entity that may have one among two values true or false. `var myBool = 5 > 8; // false`
Undefined	The undefined value is assigned to a newly created variable that isn't assigned with any value.  `var x` `=> undefined`
Null	Null shows a end point to a non-existent entity or some invalid address in memory. `let value = null;` `console.log(value);` `// null`
Symbol	The Symbol() function makes a value of type symbol. `let sym1 = Symbol()` `let sym2 = Symbol('foo')` `let sym3 = Symbol('foo')`
Object	Objects are often represented with curly braces which represent an instance that one can access. `let user = new Object(); // "object constructor" syntax` `let user = {};  // "object literal" syntax` `let user = {     // an object` `name: "John",  // by key "name" store value "John"` `age: 30        // by key "age" store value 30` `};`

Explain how arrays can be manipulated in JavaScript, using examples from the JavaScript programming language

Array Manipulation	Description	Example

Array Manipulation	Description	Example
Iterating Array	The **for** loop is one amongst the foremost basic which takes a starting index and so loops through to the ending index which must be an integer.	`const array = [1,2,3];` `for (let i = 0; i < array.length; i++){` `  console.log(i);` `}`
	while loops whenever a condition stays true.	`const array = [1,2,3];let i = 0;` `while(i < array.length){` `  console.log(i);` `}`
	do...while loop will always run the first iteration.	`const array = [1,2,3];let i = 0;` `do{` `  console.log(i);` `}` `while(i < array.length)`
	forEach will iterate through every entry of the array which takes a callback function where you can execute code.	`const array = [1,2,3];` `  array.forEach(a =>{  console.log(a);` `})`
Find Element in Array	**Array.find** will return the element in the array with the given condition.	`const array = [1,2,3];` `const num = array.find(a => a == 2); // returns 2`
	Array.findIndex will return the index of the element in the array with the given condition.	`const array = [1,2,3];` `const num = array.findIndex(a => a == 2); // returns 1`
Check if Element Exists in Array	**Array.includes** checks if an item exists in an array.	`const array = [1,2,3];` `const includesTwo = array.includes(2); // returns true`
	Array.some checks if some items meet the condition given. It takes a callback function which returns a boolean for the condition.	`const array = [1,2,3];` `const includesTwo = array.some(a => a == 2); // returns true` `const includesFive = array.some(a => a == 5); // returns false`
	Array.every checks if every item meet the condition given. It takes a callback function which returns a boolean for the condition.	`const array = [1,2,3];` `const everyElementIsTwo = array.every(a => a == 2); // returns false` `const everyElementIsNumber = array.every(a => typeof a == 'number');` `// returns true since every item in the array is a number`
Check If an Object Is an Array	**Array.isArray** checks if an object given is an array. It is a convenient way to check if an element is an array.	`const array = [1,2,3];const notArray = {};` `let objIsArray = Array.isArray(array); // true` `objIsArray = Array.isArray(notArray); // false`

Array Manipulation	Description	Example

Remove Duplicates in Array	**Set** is a object that cannot have duplicate entries. You can create a new **Set** from an array then convert it back to an array.	`const array = [1,2,2,3];`
		`const arrayWithDups = Array.from(new Set(array)); //returns new array without duplicates, [1,2,3]`

	Array.slice(startIndex, endIndex) Returns a new array from startIndex to endIndex — 1.	`const arr = [1,2,3,4,5];`
		`const newArr = arr.slice(0,2);`
		`console.log(newArr); // returns [1,2]`

	Array.splice(index, numberOfItems) Remove array item in place with the given index, and then numberOfItems after it.	`const arr = [1,2,3,4,5];`
		`arr.splice(0,2);`
		`console.log(arr); // returns [3, 4, 5] since we specified that we remove item located at index 0 and 2 items after that.`

	Array.sort sorts array in place according to the condition you return in **sortFunction**.	`const sortFunction = (a, b) {`
		`  if (a < b) {`
		`    return -1;`
		`  }`
		`  if (a > b) {`
		`    return 1;`
		`  }`
		`  // a must be equal to b`
		`  return 0;`
		`}`

	Array.fill will add or replace the element with the element specified from *startIndex* to *endIndex*.	`let array = [1, 2, 3, 4, 5];`
		
		`console.log(array.fill(0, 2, 4));`
		`// array is now [1, 2, 0, 0, 0]`
		
		`console.log(array.fill(5, 1));`
		`// array is now [1, 5, 5, 5, 5]`
		
		`console.log(array.fill(6));`
		`// array is now [6, 6, 6, 6, 6]`

	Array.flat function does not do a good job of recursively flatten arrays. The depth is limited and it does not flatten all kinds of nested array structures.	`let arr1 = [1, 2, [3, 4], 5];`
		`let arr2 = [1, 2, [3, 4], [5, [6,[7,]]]];`
		
		`const flatten = (items) => {`
		`  const flat = [];`
		
		`  items.forEach(item => {`
		`    if (Array.isArray(item)) {`
		`      flat.push(...flatten(item));`
		`    } else {`
		`      flat.push(item);`
		`    }`
		`  });`
		
		`  return flat;`
		`}`
		
		`console.log(flatten(arr1));`
		`console.log(flatten(arr2));`

	Array.join will return a string by concatenating the entries after they are converted to string with separator between each entry.	`const arr = [1,2,3];`
		`console.log(arr.join(',')) // get '1,2,3'`
		
		`const arr = ['1',2,3];`
		`console.log(arr.join(',')) // get '1,2,3'`

	Array.indexOf will return the first index of the *elementToFind* in the array.	`const arr = [1,2,3];`
		`console.log(arr.indexOf(1)); // returns 0`
		
		`const arr2 = [1,1,2,3];`
		`console.log(arr2.indexOf(1)) // still 0`

Array Manipulation	Description	Example

	Array.lastIndexOf will return the last index of the elementToFind in the array.	`const arr = [1,2,3];`
		`console.log(arr.indexOf(1)); // returns 0`
		
		`const arr2 = [1,1,2,3];`
		`console.log(arr2.indexOf(1)) // returns 1`
		
		`const arr3 = [3,1,2,3]`
		`console.log(arr3.lastIndexOf(3, 2)) // returns 0, start searching backwards from index 2`

	Array.push adds a new element to an array.	`let arr = [1,2,3];`
		`arr.push(4);`
		`console.log(arr) // [1,2,3,4]`

	Array.pop removes the last element of the array.	`let arr = [1,2,3,4];`
		`arr.pop();`
		`console.log(arr) // [1,2,3]`

	Array.map returns a new array which transforms the existing array’s element by calling the mapFunction . mapFunction takes one argument, which is the array element.	`let arr = [1,2,3,4];`
		`const newArr = arr.map(a=>a*2)`
		`console.log(newArr) // [2,4,6,8]`

	Array.reduce combines elements of an array to return a value by calling the reduceFunction on all the elements to combine them. reduceFunction takes 2 arguments, which is the current and next element in the array.	`const arr = [1,2,3,4];`
		`const sum = arr.reduce((a,b)=>a+b);`
		`console.log(sum); // returns 10`

	Array.reverse returns a new array with the existing array’s elements in reverse order.	`const arr = [1,2,3,4];`
		`console.log(arr.reverse()) // [4,3,2,1]`

Explain how objects can be manipulated in JavaScript, using examples from the JavaScript programming language

Object Manipulation	Description	Example

Accessing Object Properties	We are able to access object properties in two other ways. one among them is bracket notation and another is that the dot notation.	`const user = {`
		`  name: "Talha",`
		`  age: 26,`
		`  marks: {`
		`    math: 20,`
		`    eng:30`
		`  }`
		`};`
		`console.log(user["marks"]["math"]) //20`
		`console.log(user.marks.math) //20`

Object Manipulation	Description	Example

Get Values from an Object	Object.values() returns an array of the values of an object	`const user1 = {`
		`  age: 26,`
		`  mobile: 8801967402131,`
		`  name: "Talha"`
		`}`
		`const user = Object.values(user1);`
		`console.log(user) //[26, 8801967402131, "Talha"]`

Get Keys from an Object	Object.keys() gives back an array of the keys of an its object.	`const user1 = {`
		`  age: 26,`
		`  mobile: 8801967402131,`
		`  name: "Talha"`
		`}`
		`const user = Object.keys(user1);`
		`console.log(user) //["age", "mobile", "name"]`

Object To Array Entries	Object.entries() creates an array that contains arrays of key/value pairs of an object.	`const user1 = {`
		`  age: 26,`
		`  mobile: 8801967402131,`
		`  name: "Talha"`
		`}`
		`const user = Object.entries(user1);`
		`console.log(user)`
		`//[["age", 26], ["mobile", 8801967402131], ["name", "Talha"]]`

Merging Object with Spread	Merging two objects which returns a brand new object.	`const user1 = {`
		`  age: 26,`
		`  mobile: 8801967402131,`
		`  name: "Talha"`
		`}`
		`const newObj = {`
		`  ...user1,`
		`  location: 'sylhet'`
		`}`
		`console.log(newObj)`
		
		`//`
		`newObj = {`
		`  age: 26,`
		`  location: "Dhaka",`
		`  mobile: 8801967402131,`
		`  name: "Talha"`
		`}`

Combining Two Object	Object.assign() is comparable to the spread operator. It allows for objects to be combined together.	`const user1 = {`
		`  birtYear: 1993,`
		`  name: "Talha"`
		`}`
		
		`const user1NewVal = {`
		`  age: 26,`
		`}`
		
		`const combineObj = Object.assign(user1, user1NewVal)`
		`console.log(combineObj)`
		
		`//`
		`{`
		`  age: 26,`
		`  birtYear: 1993,`
		`  name: "Talha"`
		`}`

Freezing An Object	Object.freeze() prevents from modifying existing properties or adding new properties and values within the object. It's often what people think const does, however const allows you to change an object.	`const user1 = {`
		`  age: 26,`
		`  mobile: 1993,`
		`  name: "Talha"`
		`}`
		`Object.freeze(user1);`
		`user1.name = 'Abu';`
		`console.log(user1.name) //"Talha"`

Object Manipulation	Description	Example
Object Frozen or Not	The Object.isFrozen() determines if an object is frozen. Return Boolean value.	`const user1 = {` `age: 26,` `mobile: 1993,` `name: "Talha"` `}` `console.log(Object.isFrozen(user1)) // false` `Object.freeze(user1)` `console.log(Object.isFrozen(user1)) // ture`
Sealing an Object	Object.seal() seals an object, preventing new properties from being added thereto and marking all existing properties as non-configurable. Values of present properties can still be changed as long as they're writable.	`const user1 = {` `mobile: 1993,` `name: "Talha"` `}` `Object.seal(user1);` `user1.age = 'ABU';` `console.log(user1.name) //"ABU"` `user1.age = 26;` `console.log(user1.age) //undefined`
Object Sealed or Not	The Object.isSealed() method finds out if an object is sealed.	`const user1 = {` `mobile: 1993,` `name: "Talha"` `}` `console.log(Object.isSealed(user1)) //false` `Object.seal(user1);` `console.log(Object.isSealed(user1)) // ture`
Localization	Object.toLocaleString() method returns a string representing the article. This method is supposed to be overridden by derived objects for locale-specific purposes.	`const date1 = new Date(Date.UTC(2018, 11, 20, 3, 0, 0));` `console.log(date1.toLocaleString('bn'))` `//"৫/১২/২০১৮ ৯:০০:০০ AM"`

Explain how JSON can be manipulated in JavaScript, using examples from the JavaScript programming language

JSON Manipulation	Description	Example

JSON Manipulation	Description	Example

JSON.parse()	To parse is to divide a sentence into grammatical parts and identify the parts and their relations to every other. In Software coding, a string is traditionally a sequence of characters. after we receive data from the API server, the information is often a string. We parse the information using JSON.parse() which turns the information into a JavaScript object. Before parsing it, it's just a string, some text and you can't access the information encoded in it. After parsing it, it becomes a JavaScript Object and you'll be able to access the information.	`const jsonString = '{"name": "Peter"}'; // this is a string`
		`const object = JSON.parse(jsonString); // we convert it to an object`
		
		`console.log(object.name);`
		`// prints Peter because we can access the data`
		
		`console.log(jsonString.name);`
		`// prints undefined – we can't access the data from a string`

JSON.stringify()	JSON.stringify() turns an object to a JSON string. When sending data to a back-end server, the information has got to be a string that converts an object into a string by using the function. It can take 2 additional arguments in which the first one being a replacer function and the second parameter is a string or number value to use as an area within the returned string.	`const object = {`
		`    id: 1,`
		`    name: 'Peter',`
		`    email: 'peter@bluekiri.com'`
		`};`
		
		`function replacer(key, value) {`
		`    if (key === 'email') {`
		`        return undefined;`
		`    }`
		`    return value; // will return everything except the email`
		`}`
		
		`const jsonString = JSON.stringify(object, replacer);`
		`console.log(jsonString)`
		`// "{"id":1,"name":"Peter"}"`

For the code snippet provided below, write comments for each line of code to explain its functionality. In your comments you must demonstrates your ability to recognise and identify functions, ranges and classes.

```
class Car {// Initialise a class named ‘Car’
  constructor(brand) {// Initialize of a constructor method with an
argument of ‘brand’.  The constructors forms the properties of the class.
The constructor is called every Car class is initialized
    this.carname = brand;// the parameter ‘brand’ from constructor is
called to by ‘this.carname’.  ‘this’ is refering to the specific instance
of the class
  }//end of constructor method.
  present() {// Initialize  class  name ‘present’
    return 'I have a ' + this.carname; // will return the join string of
‘I have a’ and the value of ‘this.carname’.
  } //end of ‘present’ function
} // end of ‘Car’ class.

class Model extends Car {//Initialize a class named ‘Model’ which inherits
from the class ‘Car’.
  constructor(brand, mod) { // Initialize a constructor which takes
parameter ‘brand’ and ‘mod’. In which ‘brand’ is inherited from the ‘Car’
class.
    super(brand); // the key super indicates that 'brand is inherited from
Car class
    this.model = mod; //the parameter ‘mod’ is referred to by ‘this.model’
comes from the constructor in Model class is equated to the model variable
‘.
  } //end of constructor method
  show() { // Initializeof a class function ‘show’
    return this.present() + ', it was made in ' + this.model; // return of
a joined string of the value from the inherited class method of present
and the value of ‘this.model’.
  } // end of the class method
} // end of the class ‘Model’

let makes = ['Ford', 'Holden', 'Toyota']; // creates an array assigned to
variable ‘makes’ with string type values of "Ford", "Holden", "Toyota".
let models = Array.from(new Array(40), (x, i) => i + 1980); // creates of
an array of 40 elements with values from 1980 plus 39 so 2019 in which ‘x’
is the value of the element and ‘i’ is the iterator.  ‘i’ plus to 1980 to
form the value for the ‘x’ element of the new array.

function randomIntFromInterval(min, max) { // initialize  a function
taking  ‘min’ and ‘max’ as parameter.
  return Math.floor(Math.random() * (max - min + 1) + min); //
‘Math.random()’  returns a random value between 1 and 0 then multiplied by
the ‘Math.random()’,  will then return  a value based on ‘Math.random()’.
‘Math.floor()’ will return a rounded-down integer of the value from
‘Math.random()*(max-min+1)+min’.
} // end of randomIntFromInterval function

for (model of models) { //Initialized a for-loop from the ‘models’ array
with ‘model’ as the iterator
  make = makes[randomIntFromInterval(0, makes.length - 1)]; // stores
random string from the makes array  to the make variable.
  model = models[randomIntFromInterval(0, makes.length - 1)]; // stores a
value of either 1980, 1981, 1982 in the model variable using the
‘randomIntFromInterval’ function with values of 0 for ‘min’ and 3 for max
.

  mycar = new Model(make, model); // creating a new instance of the
‘Model’ object and stored in my car variable with make and model as
parameters
  console.log(mycar.show()); // printing the show method from from the
model object stored in variable ‘mycar’.
} // end of for loop
```

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