

## Question 1

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Source control (or version control) refers to tracking and managing changes to code. This ensures that developers are always working on the right version of source code. The codebase is usually stored in a SCM (Source Control Management) system which will help to track and manage code that is uploaded/pushed from multiple sources/developers. The SCM system will help to track code changes, historical changes/revision, different versions of the codebase at different points in the development process and enable collaboration between multiple developers – each with their own versions of the codebase which can later be merged together after detectable conflicts are resolved. Developers will typically work on their own forks and branches and commit their code for review by senior developers.

## Question 2

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Amongst what would be an endless list of aspects that encompasses “quality software”, here is a list of 5 general aspects that would be of high priority when it comes to quality software.

- Testing

Making sure that the application (and/or individual components/functions of the application) works as expected involves the use of a testing framework such as Jest. This ensures that function output and behaviour is as expected during and after the development process. User testing would also help to catch bugs, logic errors and facilitate User Interface adjustments based on user feedback and product alpha/beta testing.

- Scalability

The application needs to be engineered to be capable of growing to support the size of its increasing userbase. The foundation architecture of the application may have an effect in this outcome. Is it a Monolith application? ... or does the application use microservices? - perhaps both server side and client side. Database architecture is also an important consideration in terms of scalability. A document-based database (such as Mondo DB) is considered to be more easily and quickly deployable and scalable than a table/relational-based database. Mongo DB requires less planning and it is not as rigid in the way that table/relational-based database are to implement.

- Maintainability

The application needs to be easily maintainable by its engineers. The code base needs to be refactorable and re-implemented without causing significant interruption to users. This may perhaps come down to how the application was architecturally implemented. This is also one of many reasons that microservice architecture is generally used with larger applications, as Microservices allow parts of an application to be totally offline without effecting the rest of the application or its users. Another factor would be workflow, source control process and internal company procedures.

- Performance

As the userbase increases and/or new features implemented, the application needs to have been engineered for maximum speed, no matter how large the userbase. Server processing power will also play a major role here, as well as server bandwidth and also whether the application has been deployed using CDN technology (depending if global access is required).

- Security

Any software application needs to be secure against cyber-attacks and service disruption, information theft and identity theft. Keeping application dependency package versions current and up to date helps in maintaining security vulnerabilities. Also, maintaining server operating systems and security utilities can help to prevent malware and spyware script injections into hosted software applications.

## Question 3

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A MERN stack application is comprised of four main technologies – Mongo, Express, React and Node.

MongoDB Mongo is a document-orientated “NoSQL” database program. It is used to store information in documents (in JSON format) – as opposed to a traditional SQL database which uses relational tables.

Node & Express Node is a JavaScript environment with libraries that make it easier to write software. Express extends Node specifically to make it easier to create web servers. Therefore, Express is a server-side framework which is used for building web/mobile applications and API's.

React React is a JavaScript library/framework for building client-side user interfaces. This is the part of the application that is rendered in the user web browser and is how the user interacts with the application.

As stated, the user (client) interacts with the application via the user interface which is rendered to the users screen via the React framework. When the user/client triggers certain events, React will send or request data to/from the applications Server/Backend (Node/Express) API/s which are listening for incoming requests. The Server will then send a response/s back to the client – perhaps querying and saving data to the Mongo database first.

## Question 4

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Firstly, the dev team (or project manager or business analyst) would need to meet with the client in order to assess the business requirements of the website or web application.

This would help determine what technologies need to be used to develop a website or application so that it would meet the businesses requirements - now and also perhaps into the future (referring to future scalability).

Depending on what the website or web application requirements are – a static website could easily be done with HTML, CSS and JavaScript, perhaps even using a Framework/Library such as React.

If a web application is required, full knowledge of MERN stack or similar server-side / client-side application design would be required. The team would need to produce technical documentation such as ERD charts, User-flow diagrams as well as UI and UX designs wireframes and low or high-fidelity designs.

Working as a team, a Source Control Process and Source Control Management solution would need to be implemented so as to keep the development process and codebase managed.

Also, depending on the size/scope of the project, the team would also need to determine what development methodology to be suitable for the project. A smaller project might benefit more from 'Rapid Application Development' methodology as opposed to a 'DevOps Deployment' methodology.

## Question 5

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A project that I worked on earlier in the course was a web application built with Ruby On Rails. Of course, the biggest aspect of this project was learning the Object Orientated language 'Ruby'. Being my first programming language also it was hard to find resources compare to Javascript and Python

Apart from Ruby, learning Rails was also quite an undertaking and a challenge. Having only ever worked with HTML and CSS, I really found the concepts of object-oriented programming and MVC difficult and making sense of how it all fit into the Rails Framework.

I believe that It was a great experience to deal with backend databases such as Postgres, AWS, and ERD.

## Question 6

One of the very first projects that I worked on during the Fast-track was the Personal Portfolio website. This was primarily a personal website which was written using only HTML and CSS.

I found that I excelled during this project. I received a lot of affirmations that the way I was coding HTML and CSS was indeed how it was supposed to be done by professional developers. I found this to be very rewarding after spending time learning by myself.

One improvement I have made – and definitely something I have changed – is that I now code SCSS and strict HTML5. I find this to be much more efficient than using older HTML syntax and plain CSS. Also now I always do mobile first when I make a frame work.

Another improvement I have made is the addition of using more JavaScript in the client browser for small things that I previously had tried to do with CSS. I have been able to make my static websites much more visually dynamic.

## Question 7

'Control flow' is the order in which the computer executes statements in a script. A script in JavaScript may include several/many control structures such as conditionals, loops and functions.

The below If/Else Statement can change the flow of an application based on if a condition that is passed into the statement is determined to be true or false:

```
function isEven (num) {  
  if (num % 2 === 0) {  
    return true;  
  } else {  
    return false;  
  }  
}
```

## Question 8

Type coercion is the process of converting value from one type to another (such as string to number, object to boolean, and so on). There are two different types of 'Type Coercion' – Explicit and Implicit.

'Explicit' Type Coercion is when type coercion is done on purpose by writing the appropriate code. The following example will coerce the number 123 into a string (using the JavaScript built-in String function):

```
const explicit = String(123)  
console.log(explicit);
```

'Implicit' Type Coercion is when data types are converted automatically, so it is called double edge sword; it's a great source of frustration and defects, but also a useful mechanism that allows us to write less code without losing the readability. In the following example, the Number 123 will be coerced into a String that reads as "123".

```
const implicit = 123 + ''  
console.log(implicit);
```

Thus, there is one operator that does not trigger implicit type coercion is `===`, which is called the strict equality operator.

## Question 9

The 'data type' of JavaScript refers to the "type" of data to be expressed. There are several different types of data in JavaScript.

'Primitive' data types include type 'String', 'Number', 'Boolean', 'Null' and 'Undefined'. These data types are referred to as 'Primitive' because their values can contain only a single type (i.e.: a 'String' OR a 'Number', but NOT both combined).

The follow examples are 'primitive' types of data. Each individual data type can only be assigned to one variable:

```
let string = 'foo';  
let number = 42;  
let boolean = false;  
let x = null;  
let y = undefined;
```

A more complex data type in JavaScript would be an 'Object'. Objects are used to store collections of data and more complex entities. An example of a more complex entity might be an Object containing other data structures like an Array and even an Object containing other Objects.

The following example is an Object which contains 5 Key/Value pairs, one of which the value is another Object:

```
const kyu = {
  name: 'kyu',
  age: 37,
  gender: 'male',
  single: false,
  spouse: {sammi}
}
```

## Question 10

Arrays are data structures that can store, access, manipulate/variable, and delete data. To accomplish this in JavaScript, the array needs to be iterated through while using the appropriate array method for the desired outcome.

```
let fruits = ['apple', 'banana', 'orange', 'pear', 'watermelon'];

// Example 1 - (mutates the original array) Add another fruit to the array :
fruits.push('Kiwi');
console.log(fruits);

// Example 2 - (mutates the original array) Delete 'Kiwi' from the array:
fruits.pop();
console.log(fruits);

// Example 3 - executes a provided function once for each array element:
fruits.forEach(printArray = (fruit) => {
  console.log(fruit);
});

// Example 4 - (does not mutate the original array) Creates a new array from the original array:
const newFruitsArray = fruits.map(fruit => {
  return fruit
});
console.log(newFruitsArray);
```

## Question 11

The below Object is referred to as an 'Object Literal'. This example of a single Object is a data structure made up of key: value pairs. It has 3 properties – make, model, and year:

```
const myCar = {
  make: 'Hyundai',
  model: 'IX 30',
  year: 2014
};
```

To access the keys/values in this Object and log it to console using string interpolation, I would write the following code:

```
const make = myCar.make
const model = myCar.model
const year = myCar.year

// other way

const make = myCar['make']
const model = myCar['model']
const year = myCar['year']

console.log(`I bought a ${make} ${model} in ${year}`);
```

To create more instances of an Object, a Constructor function is required. Using ES6 syntax, I would do this using the Class function to create more instances of the

'Captains' object:

```
class Cars {
  constructor(make, model, year) {
    this.make = make;
    this.model = model;
    this.year = year;
  }
}

const kyu = new Cars('hyundai', 'IX 35', '2014');
console.log(kyu);

const sammi = new Cars('audi', 'A3', '2017');
console.log(sammi);
```

## Question 12

JSON (JavaScript Object Notation), is a format in which data can be stored in an organized, easy-to-access manner.

The `JSON.stringify()` function converts a JavaScript Object into a JSON string. This is useful for when the data needs to be available via API to be accessible by other servers/clients.

In the below example, the “`JSON.stringify()`” function is used on a JavaScript Object to convert it to a JSON string, then stored in a variable:

```
const employee = {
  name: "kyu",
  age: 37,
  address: {
    street: "15 fuster street",
    city: "Brisbane"
  },
  interests: ["game", "exercise"]
}

const data = JSON.stringify(employee)
console.log(data);
```

To access data provided in JSON format via an API - or a file that has been “required” into a document, the `JSON.parse()` function is used. In effect, this is the reverse process, in that a JSON String is now being converted into a JSON Object.

In this example, the JSON String (stored in the variable 'data') is now being parsed back into an Object:

```
const newEmployee = JSON.parse(data);
console.log(newEmployee);
```

## Reference

### Q1

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