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1. General Guidelines
   1. General Expectations

We consider this to be a “full stack” developer test to help us get to know you, your skillsets, and your experience level as well as possible. We hire team members ranging from entry-level to seasoned developers across various areas of the stack, so our goal with this process is simply to determine if we’re a good fit to work together.

You may be comfortable answering all of the questions and if so that’s great! If you feel like some are just not “your thing” that’s fine too. Not every role on our team needs to know *everything* on this test, so just do your best and focus on showing us who *you* are!

* 1. Timebox

This test is intended to be something you can complete in approximately 4 hours depending on skill level. Everyone works at a different pace, so it’s completely acceptable if you want to spend more time, but please don’t spend all day on it.

* 1. Timeline

Generally, we expect to receive your completed response for this test within a week of us sending it to you. If you feel you need more time or something comes up, please let us know.

Once our team receives your completed test, we will generally review and respond within two weeks. At that point, we will either schedule an interview (via phone or in-person) or let you know that we have determined we aren’t the best fit for each other.

* 1. Sending Your Completed Response

For essay questions, please type your written response in the space provided. Each question has at least a half-page allotted for consistency. This simplifies formatting but is not an expectation of how much space each individual question should or shouldn’t take, please take as much or little space as you need.

For the questions that require code as part of the response, please send your completed code as a separate code file and not embedded in the Word document. Hosting on a public GitHub repo is also acceptable. Please be sure to note either the filename or the URL in your written answer to the question.

If you are sending completed code through email and not via a URL for a public repository, please:

1. **Do not attach zip files** as they are blocked by our email filters.
2. **Append “.txt” to the filename** of each code file before attaching to the email. (E.g., “validation.js” becomes “validation.js.txt” so it isn’t filtered by our email rules.)
3. **List the filenames of all attachments** so we can verify nothing was blocked by our email filters.

Name your completed Word document in the format of:

**MetroNet Developer Test - Your Name (YYYY-mm-dd)**

Name any file attachments (for code samples) in the format of:

**MetroNet Developer Test - Your Name (YYYY-mm-dd) - Question Name**

(If a question requires multiple files, please name them accordingly.)

Unless otherwise specified, you may simply reply to the email in which we sent you the test and attach the file containing your completed response.

* 1. Language/Environment

We believe that good developers can learn multiple programming languages, so our goal is to test your general ability to code and reason through problems, not quiz you on a specific syntax or library. Unless otherwise specified, feel free to use whatever programming language you feel most comfortable with to complete this test.

* 1. Online Resources

We believe that searching for answers in Google, Stack Overflow, etc. is part of a developer’s daily workflow and knowing where to find an answer is often as important if not more important than knowing it.

If you use any online resources to help you complete an answer please indicate which ones and a short description of your thought process, including any information you feel relevant such as search terms, what syntax you wanted to verify, etc.

We reserve the right to verify your answers with online tools to check for plagiarism, so be sure not to just copy/paste something from Wikipedia.

* 1. Asking For Help

We believe that helping other team members and being willing to ask questions is an important part of a being a developer. If you get stuck or something doesn’t make sense, please reach out! Just email your hiring contact explaining what’s up and we’ll do our best to accommodate.

1. Requests & Debugging
2. 1. Debugging: Page Doesn’t Load

You’ve developed a **(known working)** web application that, when accessed, will dynamically retrieve a set of data from an SQL database and display it as HTML. When you visit the URL of the application, the page is blank. Describe your troubleshooting steps.

I will perform the troubleshooting in the following sequence:

1. I will open developer tools in browser and see if there is a valid request send through the network or not. If a request is sent to the network, I will check the response code and work accordingly. For an invalid request, I will use Postman to come up with a valid way of sending request and use it in code. If request is valid, I will check the response code and work accordingly. For example, if response code is 500, I will check the backend code/database and fix it.
2. If everything in network seems working fine, I will console the values and check them.
3. After finishing checking the network, I will check the UI by trying to display plain text output in browser.
4. Development
5. 1. Data Types

Describe the differences, similarities, and common development pitfalls between null, an empty string, the number 0, a string containing only the number 0, and Boolean false.

The explanation given below is based on JavaScript Language.

Null is something that has no value, this can be used for any nullable variables. Any type of default types like integer, string and Boolean can have this value.

Empty string is an initialized string variable, this can be used for string types only.

The number 0 is equivalent to null and Boolean false.

* 1. Code Quality

How would you describe "good code"? What role (if any) do comments, refactoring, and code reviews play?

There is not a rigid definition for a good code, everyone has their own opinions. Likewise, for me, a good code is a code that has proper comments which makes it comprehensible to those people other than others too. The function naming should reflect the task that a function carries out. For example, a function to retrieve student records from a file/database should be named as **getStudents.** I love keeping codes clean and refactored. Creating a static class to place functions that are widely used throughout the project, keeping business logic inside the class scope and using as few arguments as possible in function is my preferred style. I love Functional programming paradigm although I haven’t practiced it much. Code reviews are a must before sending them to testing team. Code reviews not only finds error in the code but helps to maintain a constant style of code throughout the project and organization. We used to have a lot of code review while I worked in Dolphindive Technology and I learned a lot about code refactoring and commenting from those reviews.

* 1. Code Structure

What criteria do you have for deciding when a single method/function does "too much" and needs to be broken down into multiple methods/functions?

Here are some criteria that I take into consideration to decide if a function needs to be broken down:

1. A function has many lines of code, it has a lot of arguments in it and the code in function is run in sequential fashion.
2. A function has many small independent tasks carried inside it and can be reused in other parts of project.
3. A function spans more than a normal IDE window and has a lot of lines that are expected to be error prone.
4. Past Projects
   1. Completed Project

Describe the project you have worked on that you are most proud of. What was your part in the project that worked out particularly well?

The project that I am very proud of is the recent project “Social Distance Monitoring using Deep Learning”. I did this project in order to fulfill the requirement for one of my graduate courses. The reason I feel proud in this project is that I indeed used the code to solve real world problems, which is my hobby. I worked with my partner in this project. Since I was already working in Deep Learning for my research, I took the lead and divided the tasks for me and my friend. The project was basically divided into 2 major portions: Detecting people and calculating distance between them. I was assigned with the first portion which I was very familiar with. It was not an easy task but, it worked as expected since I was much used to with this field and I was aware of the direction that leads to failure.

5. Additional Comments

1. 1. Is there anything else you think we should know or you’d like to share?

I would like to introduce myself as a fast learner. I can learn things in short time, get used to it and start making improvements. My professional career started with a big company where I had to work in multiple platforms each day. Debugging, developing, and maintaining were part of my routine. I was given a very short training which didn’t suffice for an entry level developer, but I gained pace within small amount of time. The environment that I worked was fast paced and had to handle multiple projects efficiently, which I did with perfection. I love to work independently as well as with a group of like-minded people helping each other grow together.

Though I don’t have much knowledge in networking, I have some inclination in this field too. I would love to gain some knowledge about networking, working in your prestigious institution. With my experience and skills, I believe, I can be a part of success of MetroNet. I also expect to grow each day to achieve current targets and set new ones.

Please contact me if you would like to know anything about me. I would be very happy to talk further.

6. Coding Samples

1. 1. Custom Sorting

**Task:** Write a function to sort a hand of cards.

**Input Parameters:** a list/vector/array of Card objects

**Return Parameter:** a list/vector/array of Card objects that are sorted

**Assumptions you don’t have to code:**

* Each card object has an attribute called **suit** that returns the suit of the card as a string: “Hearts”, “Spades”, “Clubs”, “Diamonds”
* Each card object has an attribute called **value** that returns a character representing their value: 2, 3, 4, 5, 6, 7, 8, 9, J, Q, K, A

**Requirements:**

* The cards should be sorted in **ascending** order unless you implement the bonus flag below. In that case, the default should be ascending unless overridden by the flag.
* **Bonus:** Add a flag to say whether to sort in ascending or descending order.

**Domain Knowledge:**

* Playing cards are ordered by **value** then by **suit**.
* For values, assume: 2 < 3 < 4 < 5 < 6 < 7 < 8 < 9 < J < Q < K < A
* For suits, assume: Hearts < Diamonds < Clubs < Spades

**Example of Sorted Cards:**

1. 3 of Clubs
2. 7 of Hearts
3. Ace of Hearts
4. Ace of Spades

**Context/Hints:**

* Try to treat this like you would any other real-world sorting problem you may encounter in normal business logic.
* Feel free to write additional helper functions or other functions associated with the Card object to help accomplish the task.

**Answer: sortCards.py**

* 1. Data Validation

**Task:** Write a simple script to validate a set of contact records and report on any errors.

**Given:**

* A list of 20 contact objects (full names, city, phone number, and email address)

**Step 1: List all contact records with the following output:**

* Full name
* Whether the phone and email fields are "valid":
  + Output "Valid" if both email and phone are valid.
  + Output "Email is invalid." if email is invalid and phone is valid.
  + Output "Phone is invalid." if phone is invalid and email is valid.
  + Output "Email and Phone are invalid." if both phone and email are invalid.

**Step 2: List each city and report the following output:**

* Name of city
* Number of validation errors

**Requirements:**

* Contacts should be sorted alphabetically in **ascending** order.
* Cities should be sorted by number of validation errors in **descending** order.

**Validation criteria:**

* Email field: has exactly one @ symbol with data on each side
* Phone field: is numeric with only digits, dashes, and spaces allowed

**Data Set:** Use the records in Contacts.json, which are based off of U.S. census data via Wikipedia’s list of [given names](https://en.wikipedia.org/wiki/List_of_most_popular_given_names) and [surnames](https://en.wikipedia.org/wiki/List_of_most_common_surnames_in_North_America).

**Answer: validateContacts.py**

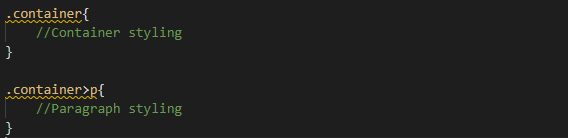
* 1. Simple Web Form

**Requirements:**

* Page title should be “Team Introduction”.
* Page should have a simple HTML form that requests two fields of input: your name and a fun fact about yourself.
* The form should have a button to introduce yourself.
* When the submit button is clicked, both input fields should be validated and an alert message shown if there is an error.
* If there are no errors when the form is submitted:
  1. The validated data should be logged to the browser’s developer console.
  2. The form should be hidden and replaced with a new box displaying the input (name and fun fact).
* The “introduction box” should have a link or button to reset the form and allow “introducing” a different team member.
* **Bonus:** Use SCSS or describe how you’d refactor your CSS if SCSS was available in the build environment.

**Answer: introduction.html, introduction.js, introduction.css**

SCSS is a very easy and comprehensive language to refactor css. For example, if we have a container and a paragraph inside it, to use it in css we have to do this way:



But with SCSS it is pretty much easier because of nesting. We can achieve the same this way in scss which will look clean and readable.

