Working With DevOps
1. DevOps

Understanding DevOps and other Software Development and Lifecycle practices.
“DevOps is the combination of cultural philosophies, practices, and tools that increases an organization’s ability to deliver applications and services at high velocity: evolving and improving products at a faster pace than organizations using traditional software development and infrastructure management processes.”

—Amazon Web Services
A Brief History: The Waterfall Model

- A Plan-Driven and Linear Approach
- All steps must be planned and scheduled in advance
- Each phase in the software development lifecycle should not start until the previous stage has been completed

Image Source: umsl.edu
A Brief History: Agile Development

- A Feedback Driven Cyclic Approach
- Emphasizes continuous feedback from end users
- Focus on short development cycles that deliver incremental updates
- Capitalizes on Continuous Integration and Continuous Deployment

Image Source: mlsdev.com
Waterfall vs Agile

THE WATERFALL PROCESS

‘This project has got so big, I’m not sure I’ll be able to deliver it!’

THE AGILE PROCESS

‘It’s so much better delivering this project in bite-sized sections’

Image Source: meddigital.com
A Brief History: Enterprise Management Systems

- Help teams manage IT infrastructure and applications
- Focus on optimizing the delivery of IT services
- Useful for managing and monitoring complex enterprise-scale applications

Image Source: thegeek.com
What is DevOps?

- Integrates all parties involved with software development and deployment into a single workflow
- Emphasizes that Developers and IT Operations work together
- Focuses on rapid delivery, high quality, and reliability
- Emphasizes the use of automation
- Extends Agile principles beyond code to the entire software development process
Key Features of DevOps

- Collaboration
- Automation
- Continuous Integration
- Continuous Testing
- Continuous Deployment
- Rapid Remediation

Image Source: medium.com
Industry Tools

Image Source: medium.com
Which of the following coding practices/methodologies places an emphasis on planning before starting coding?

a) Waterfall  
b) Agile  
c) Enterprise Management Systems  
d) DevOps  
e) all of the above
Clicker Quiz

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2. Using Github Actions

Configuring GitHub Actions with existing repos
What is GitHub Actions

- Executes code when changes are made to a GitHub repository
- Used to integrate CI/CD pipelines (also known as Workflows)
- Fully Automated
Using Github Actions

Enable Actions For Your Repository

Get started with GitHub Actions
Build, test, and deploy your code. Make code reviews, branch management, and issue triaging work the way you want. Select a workflow template to get started.

Skip this and set up a workflow yourself →

Workflows made for your repository
Simple workflow
By GitHub Actions
Start with a file with the minimum necessary structure.

Set up this workflow

- echo Hello, world!
- echo Add other actions to build, test, and deploy your project.
Add Default Action

Commit the main.yaml file
Viewing The Workflow Status

Actions Tab

Green Check Mark - Success
Commit Message
Making Changes

New Commit Status
New Commit Hash
Clicker Quiz

Where can you check the status of a workflow?

a) The Workflows Tab On GitHub
b) Next to the commit hash on GitHub
c) The git workflow status command
d) All of the above
Clicker Quiz

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2. CI/CD With GitHub

Adding CI/CD pipelines to a GitHub Repo
Adding A Program

Before we get started with CI/CD Pipelines, let’s first add a few files to our git TestRepo.

The first file we are adding is a simple Calculator class with only one method, add, which adds two integers.

```java
import java.util.*;
import java.io.*;

class Calculator {
    public static int add(int a, int b) {
        return a + b;
    }
}
```
Add a main.yaml File

The next file we need to add is the main.yml file.

The main.yml file is a YAML file that configures our CI/CD pipeline and is located in the ".github/workflows" directory.

In this main.yml file we specify a job "build" that compiles all of the java files.

```yaml
name: CI

on: [push, pull_request, workflow_dispatch]

jobs:
  build:
    runs-on: ubuntu-latest
    container: openjdk
    steps:
      - uses: actions/checkout@v2
      - name: Build Project
        run: |
          echo Hello World
          java -version
          javac -version
          javac *.java
```
Add a main.yaml File

- **on** specifies when the jobs are run. It is set to run jobs any time changes are pushed, a pull_request is merged, or it is run manually.
- **jobs** details the jobs to run:
  - **build** is the name of the job
  - **runs-on** specifies the OS
  - **container** details the docker image that will be used to run the code
  - **steps** are the actions taken in the job
  - **run** lists the commands to run on the CLI

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        run: |
            echo Hello World
            java -version
            javac -version
            javac *.java
```
Checking Our Pipelines

Status Of Our Pipeline
Click To View More Details
Viewing More Details

Commit Message
Status
Workflow File
Jobs
Viewing Job Logs

- Job Name
- Jobs Duration
- Jobs Status
- Jobs Tab
- Steps
- Step Logs
Modifying Our Program

Let’s modify our program to include a subtraction method. Instead of returning the difference however, let’s “make a mistake” and return the sum.

```java
import java.util.*;
import java.io.*;

class Calculator {
    public static int add(int a, int b) {
        return a + b;
    }
    public static int sub(int a, int b) {
        return a + b;
    }
}
```
Add Test Files

Let’s also include two test files TestAdd.java and TestSub.java that test our Calculator Class.
Adding Tests To main.yml File

Now that we have created our tests, we can add them to the main.yml.

We add two jobs, calcadd and calcsub that run each test.

The junit-4.10.jar file has also been added to our repository to allow us to run JUnit tests.

```yaml
... jobs:
  ...
  calcadd:
    runs-on: ubuntu-latest
    container: openjdk
    steps:
      - uses: actions/checkout@v2
      - name: Test Calculator Add
        run: |
          javac -cp "junit-4.10.jar:" *.java
          java -cp "junit-4.10.jar:"
          org.junit.runner.JUnitCore TestAdd

    calcsub:
      runs-on: ubuntu-latest
      container: openjdk
      steps:
        - uses: actions/checkout@v2
        - name: Test Calculator Sub
          run: |
            javac -cp "junit-4.10.jar:" *.java
            java -cp "junit-4.10.jar:"
            org.junit.runner.JUnitCore TestSub
```

main.yml
As Expected Our Build Has Failed
The calcadd job has passed
The calcsub job has failed
The calcsub job failed due to an assertion error
Which of the following are required for creating a job in the main.yml file?

a) A test file to run
b) A container for the underlying software
c) The branches that trigger jobs
d) None of the above are required
Clicker Quiz

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