School: .... Campus: ....

Academic Year: .... Subject Name: .... Subject Code: ....

Semester: .... Program: .... Branch: .... Specialization: ....

Date: ....

Applied and Action Learning

(Learning by Doing and Discovery)

Name of the Experiement :

* Coding Phase: Pseudo Code / Flow Chart / Algorithm

Algorithm:

```
1. Start
2. Install Node.js and npm
3. Install Truffle (npm install -g truffle)
4. Create a Truffle project (truffle init)
5. Compile and deploy a sample smart contract (truffle compile, truffle migrate)
6. Install Hardhat (npm install --save-dev hardhat)
7. Create a Hardhat project (npx hardhat)
8. Compile and deploy the same smart contract (npx hardhat compile, npx hardhat
run scripts/deploy.js)
9. Record outputs and screenshots
10. End
```

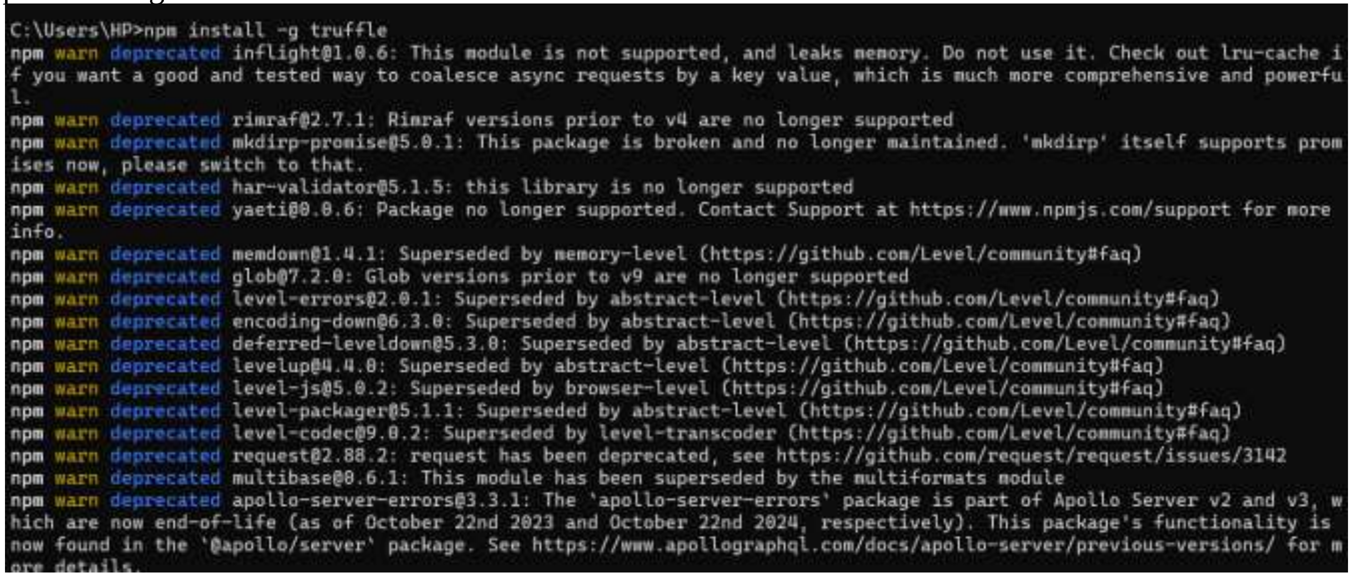
* Softwares used

1. npm (Node Package Manager)
2. Truffle Suite – Ethereum development framework
3. Hardhat – Ethereum development environment
4. VS Code – Code editor
5. Ganache

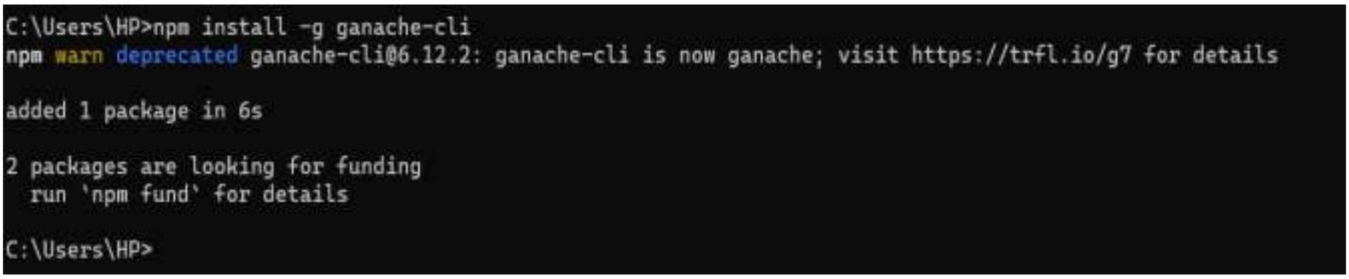
******As applicable according to the experiment.*
Two sheets per experiment (10-20) to be used.

* Testing Phase: Compilation of Code (error detection)

For installing truffle
npm install -g truffle

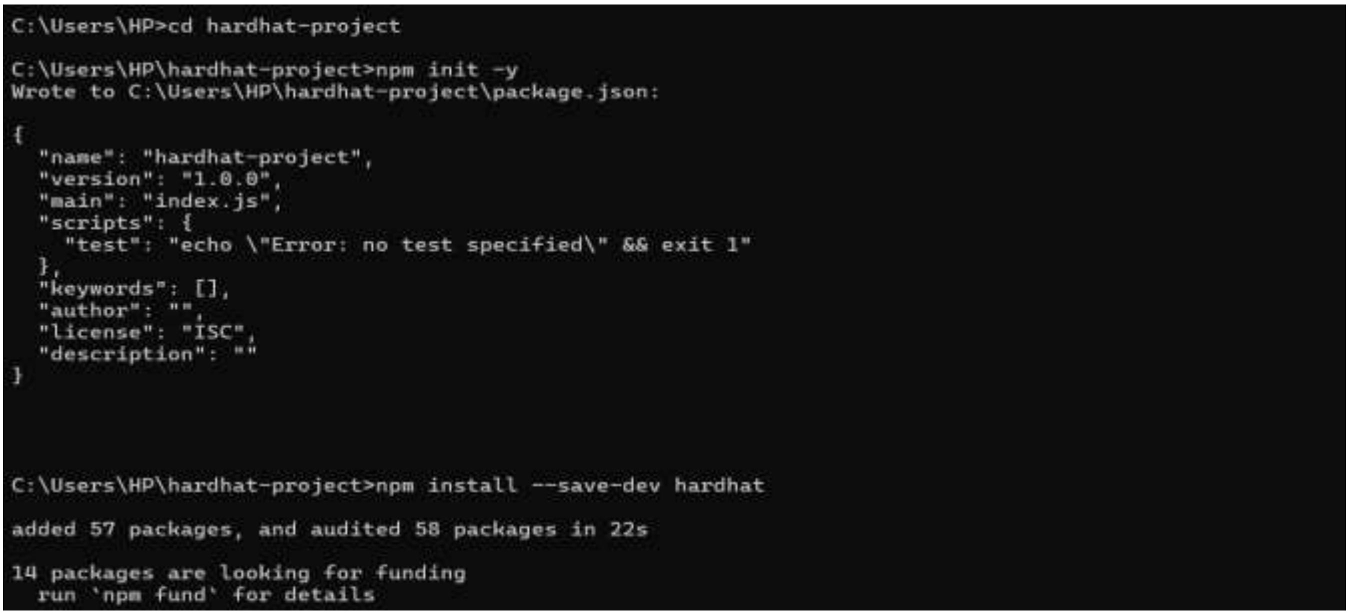


```
C:\Users\HP>npm install -g truffle
npm warn deprecated inflight@1.0.6: This module is not supported, and leaks memory. Do not use it. Check out lru-cache i
f you want a good and tested way to coalesce async requests by a key value, which is much more comprehensive and powerfu
l.
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated mkdirp-promise@5.0.1: This package is broken and no longer maintained. 'mkdirp' itself supports prom
ises now, please switch to that.
npm warn deprecated har-validator@5.1.5: this library is no longer supported
npm warn deprecated yaeti@0.0.6: Package no longer supported. Contact Support at https://www.npmjs.com/support for more
info.
npm warn deprecated memdown@1.4.1: Superseded by memory-level (https://github.com/Level/community#faq)
npm warn deprecated glob@7.2.0: Glob versions prior to v9 are no longer supported
npm warn deprecated level-errors@2.0.1: Superseded by abstract-level (https://github.com/Level/community#faq)
npm warn deprecated encoding-down@6.3.0: Superseded by abstract-level (https://github.com/Level/community#faq)
npm warn deprecated deferred-leveldown@5.3.0: Superseded by abstract-level (https://github.com/Level/community#faq)
npm warn deprecated levelup@4.4.0: Superseded by abstract-level (https://github.com/Level/community#faq)
npm warn deprecated level-js@5.0.2: Superseded by browser-level (https://github.com/Level/community#faq)
npm warn deprecated level-packager@5.1.1: Superseded by abstract-level (https://github.com/Level/community#faq)
npm warn deprecated level-codec@9.0.2: Superseded by level-transcoder (https://github.com/Level/community#faq)
npm warn deprecated request@2.88.2: request has been deprecated, see https://github.com/request/request/issues/3142
npm warn deprecated multibase@0.6.1: This module has been superseded by the multiformats module
npm warn deprecated apollo-server-errors@3.3.1: The 'apollo-server-errors' package is part of Apollo Server v2 and v3, w
hich are now end-of-life (as of October 22nd 2023 and October 22nd 2024, respectively). This package's functionality is
now found in the '@apollo/server' package. See https://www.apollographql.com/docs/apollo-server/previous-versions/ for m
ore details.
```

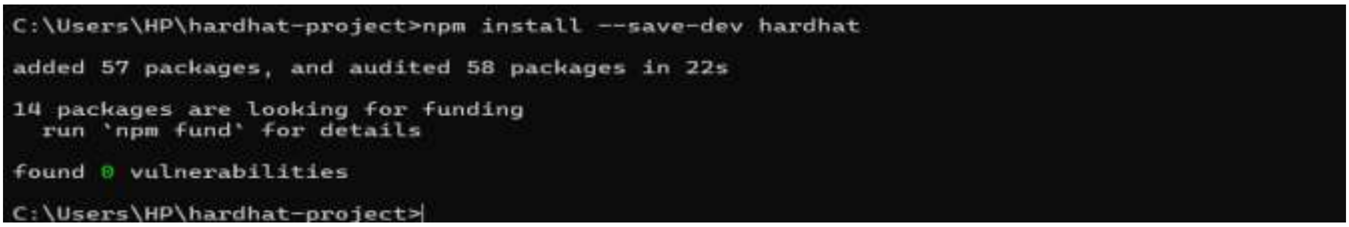


```
C:\Users\HP>npm install -g ganache-cli
npm warn deprecated ganache-cli@6.12.2: ganache-cli is now ganache; visit https://trfl.io/g7 for details

added 1 package in 6s

2 packages are looking for funding
  run `npm fund` for details

C:\Users\HP>
```

Install Hardhat:



```
C:\Users\HP>cd hardhat-project

C:\Users\HP\hardhat-project>npm init -y
Wrote to C:\Users\HP\hardhat-project\package.json:

{
  "name": "hardhat-project",
  "version": "1.0.0",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "description": ""
}




C:\Users\HP\hardhat-project>npm install --save-dev hardhat

added 57 packages, and audited 58 packages in 22s

14 packages are looking for funding
  run `npm fund` for details
```



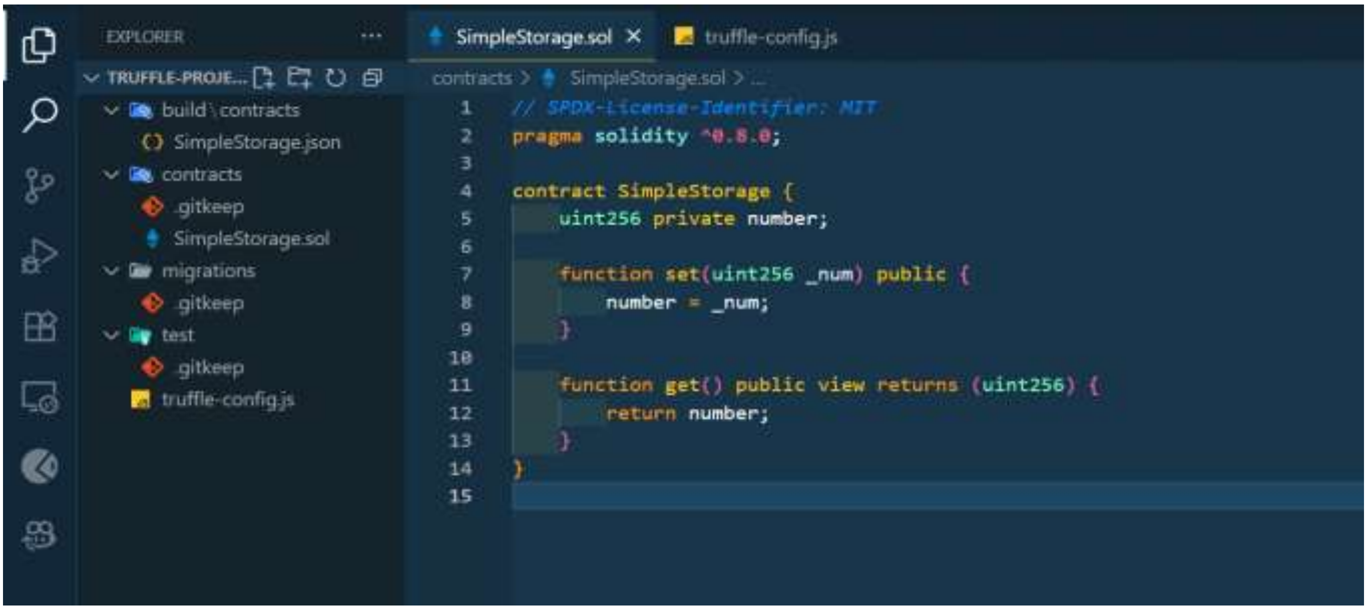
```
C:\Users\HP\hardhat-project>npm install --save-dev hardhat

added 57 packages, and audited 58 packages in 22s

14 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities

C:\Users\HP\hardhat-project>
```

*As applicable according to the experiment.
Two sheets per experiment (10-20) to be used.

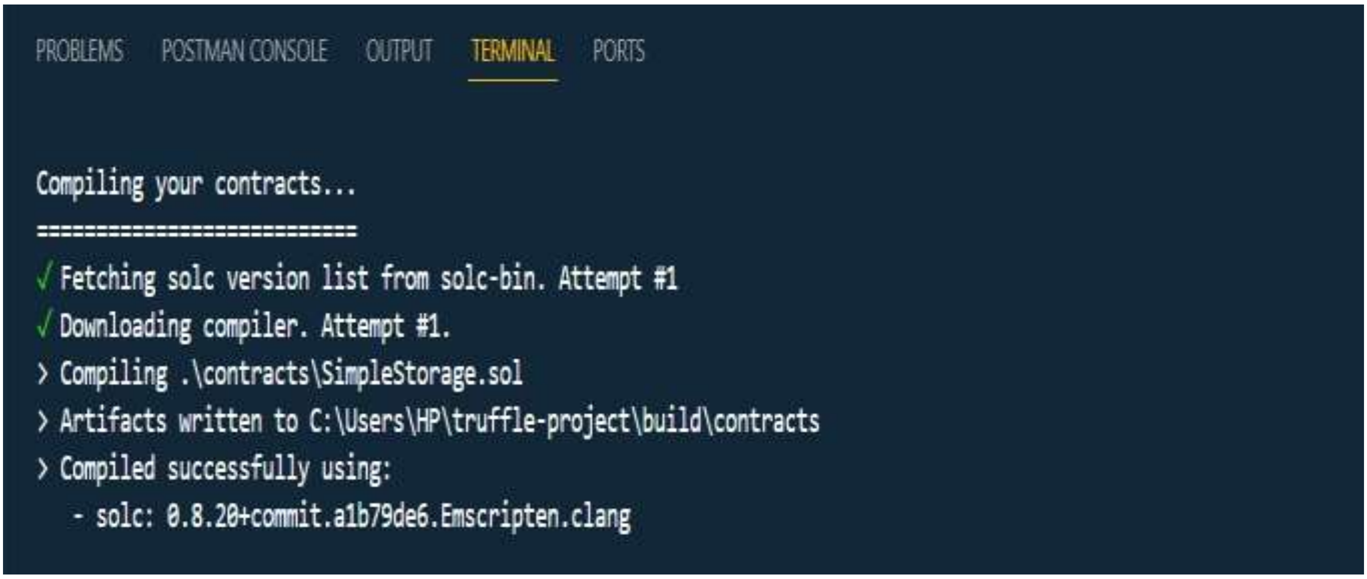
* Implementation Phase: Final Output (no error)

Truffle project deployment process

1. Install Ganache CLI (for local blockchain)
   npm install -g ganache-cli
2. Create a new Truffle project
   mkdir truffle-project
   cd truffle-project
   truffle init
3. Write smart contract (contracts/SimpleStorage.sol)
4. Configure network in truffle-config.js
5. Start local blockchain
   npx ganache-cli
6. Compile the contract
7. truffle compile
8. Deploy (migrate) the contract
9. truffle migrate --network development
10. Open Truffle console for check deploy successfully



```solidity
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract SimpleStorage {
    uint256 private number;

    function set(uint256 _num) public {
        number = _num;
    }

    function get() public view returns (uint256) {
        return number;
    }
}
```



```
Compiling your contracts...
===========================
✓ Fetching solc version list from solc-bin. Attempt #1
✓ Downloading compiler. Attempt #1.
> Compiling .\contracts\SimpleStorage.sol
> Artifacts written to C:\Users\HP\truffle-project\build\contracts
> Compiled successfully using:
   - solc: 0.8.20+commit.a1b79de6.Emscripten.clang
```

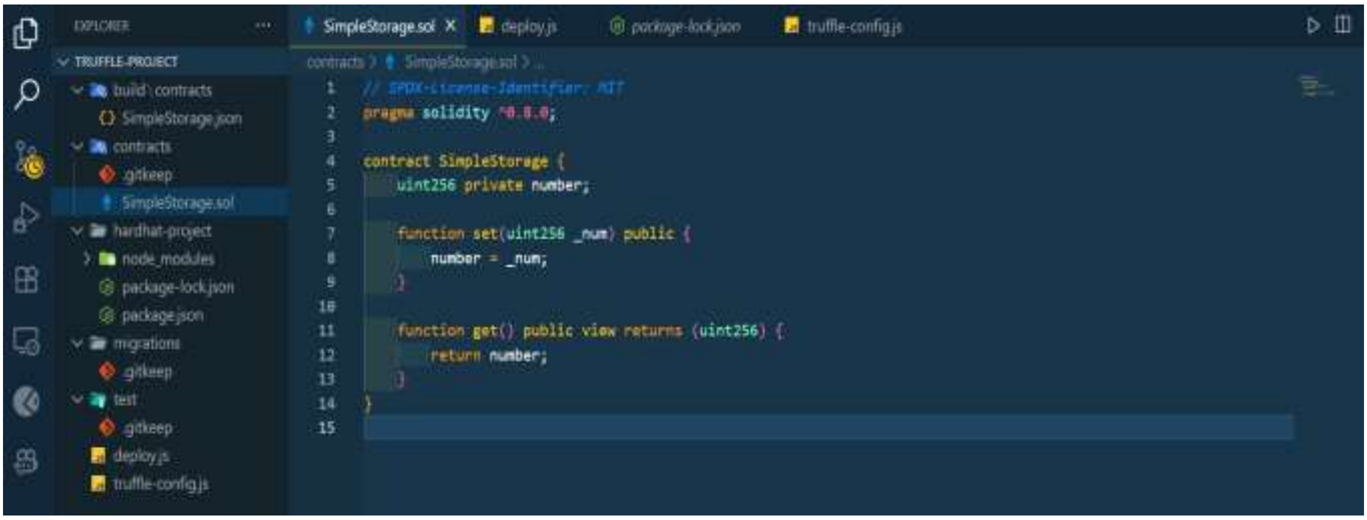
* Implementation Phase: Final Output (no error)

Steps to Deploy Smart Contract in Hardhat

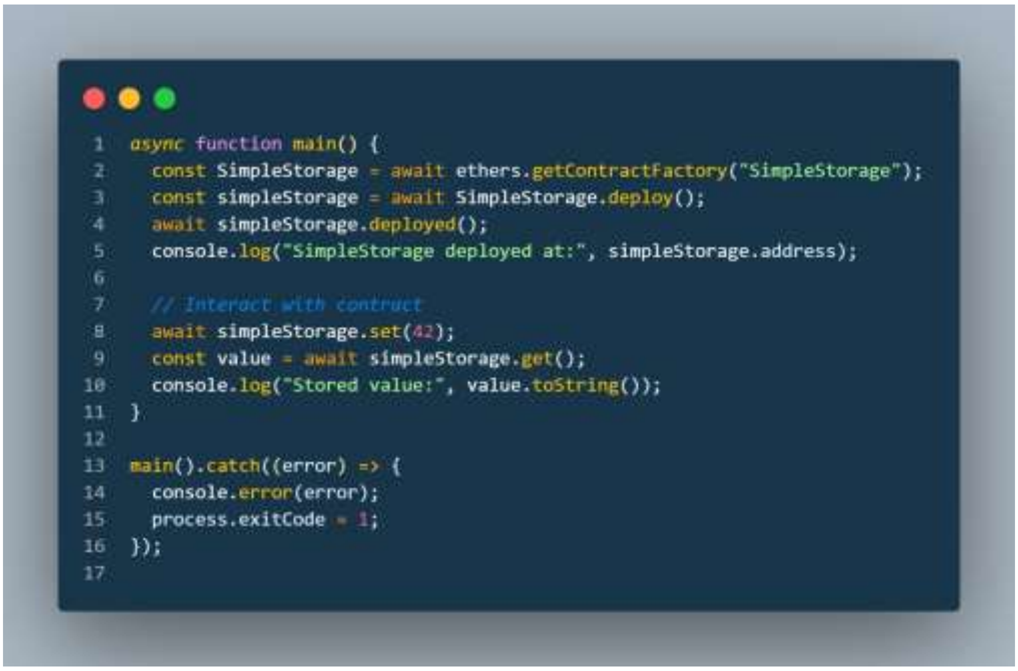
1. Create a new folder for project
   mkdir hardhat-project
   cd hardhat-project
2. Initialize npm
   npm init -y
4. Install Hardhat
   npm install --save-dev hardhat
   Setup Hardhat project
5. npx hardhat

Select “Create a JavaScript project”, press Enter for defaults.

6. Write smart contract (contracts/SimpleStorage.sol)
7. Add deployment script (scripts/deploy.js)
8. Compile the contract
9. npx hardhat compile
10. Start local Hardhat blockchain



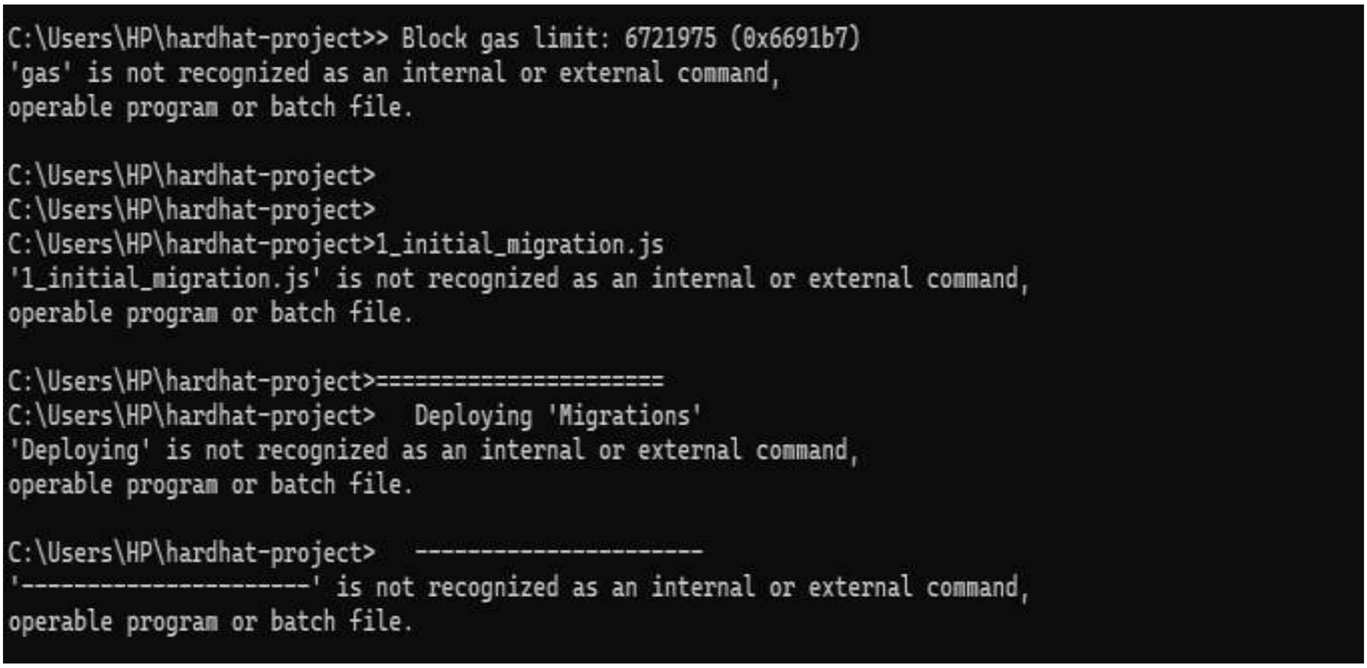
```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract SimpleStorage {
    uint256 private number;

    function set(uint256 _num) public {
        number = _num;
    }

    function get() public view returns (uint256) {
        return number;
    }
}
```



```
async function main() {
  const SimpleStorage = await ethers.getContractFactory("SimpleStorage");
  const simpleStorage = await SimpleStorage.deploy();
  await simpleStorage.deployed();
  console.log("SimpleStorage deployed at:", simpleStorage.address);

  // Interact with contract
  await simpleStorage.set(42);
  const value = await simpleStorage.get();
  console.log("Stored value:", value.toString());
}

main().catch((error) => {
  console.error(error);
  process.exitCode = 1;
});
```

*As applicable according to the experiment.
Two sheets per experiment (10-20) to be used.

* Implementation Phase: Final Output (no error)



```
C:\Users\HP\hardhat-project>> Block gas limit: 6721975 (0x6691b7)
'gas' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\HP\hardhat-project>
C:\Users\HP\hardhat-project>
C:\Users\HP\hardhat-project>1_initial_migration.js
'1_initial_migration.js' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\HP\hardhat-project>======================
C:\Users\HP\hardhat-project>   Deploying 'Migrations'
'Deploying' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\HP\hardhat-project>   ----------------------
'----------------------' is not recognized as an internal or external command,
operable program or batch file.
```

* Observations

1. Truffle provides a simple setup with migration scripts and is suitable for beginners, but it has slower compilation and limited debugging features.
2. Hardhat offers faster compilation, detailed error stack traces, and better debugging tools, making it more developer-friendly for production projects.
3. Both frameworks achieve the same goal of compiling, deploying, and testing smart contracts, but Hardhat is more modern and efficient, while Truffle is easier to start with.

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		

Signature of the Student:

Name :

Signature of the Faculty:

Regn. No. :

****As applicable according to the experiment.***
Two sheets per experiment (10-20) to be used.