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 : Solidity Patterns – Advanced Inheritance

Objective/Aim:

To understand and implement **advanced inheritance patterns in Solidity**, including multiple inheritance, method overriding, virtual functions, and resolving the diamond problem using Solidity's linearization rules (C3 linearization). Students will create a contract hierarchy, deploy it, and observe how inherited functions behave.

Apparatus/Software Used:

1. MetaMask Wallet
2. Brave Web Browser
3. Remix IDE – https://remix.ethereum.org
4. Ethereum Sepolia Testnet

Theory/Concept:

Solidity supports **multiple inheritance**, allowing contracts to inherit functionalities from several parent contracts.

Key concepts:

1. Virtual & Override Functions

- A function in a parent contract must be marked **virtual** to allow overriding.
- A child contract uses **override** to modify the behavior.

2. Multiple Inheritance

Solidity uses **C3 linearization (Diamond Problem resolution)** to determine the order of execution when multiple parents contain the same function.

3. Super Keyword

super.functionName() follows the linearized inheritance path.

4. Diamond Problem in Solidity

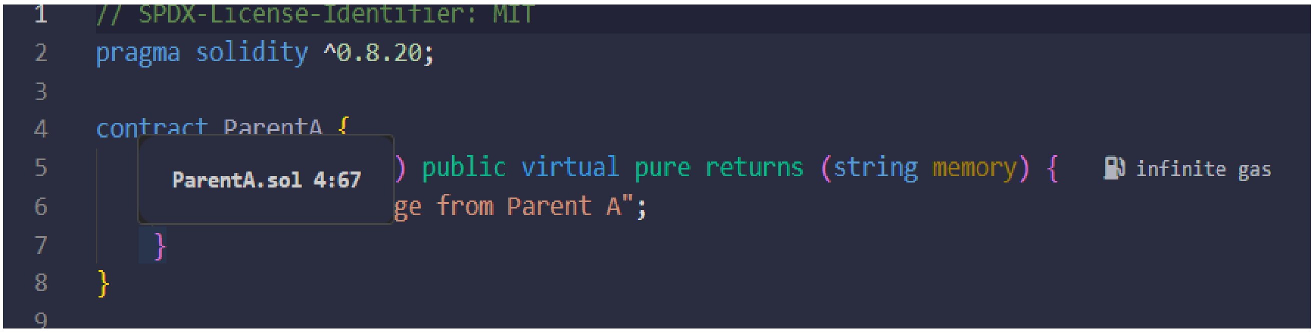
When two parents share the same function, Solidity resolves conflict by:

- Following inheritance order
- Using linearization to determine execution flow

Procedure:

1. Open Remix IDE

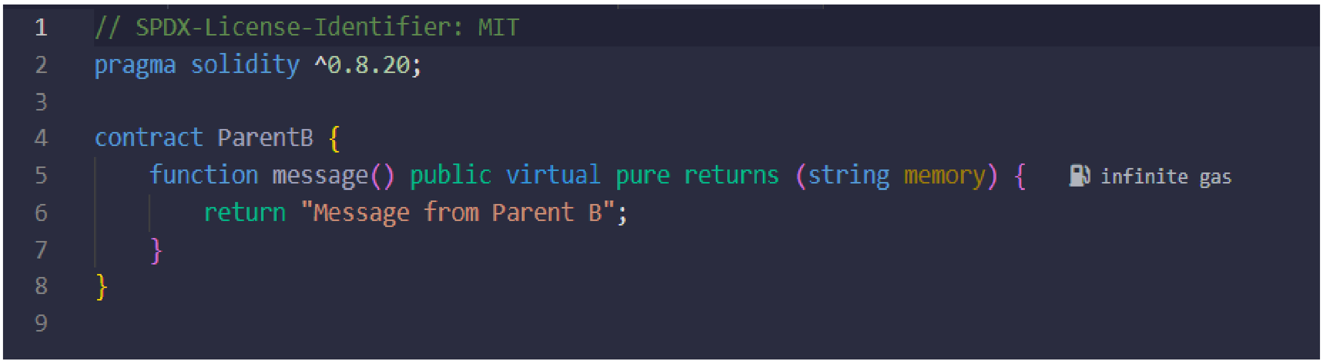
- Visit https://remix.ethereum.org
- Create three new Solidity files:
    - ParentA.sol
    - ParentB.sol
    - ChildContract.sol



```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.20;

contract ParentA {
                        ) public virtual pure returns (string memory) {
                        ge from Parent A";
    }
}

```

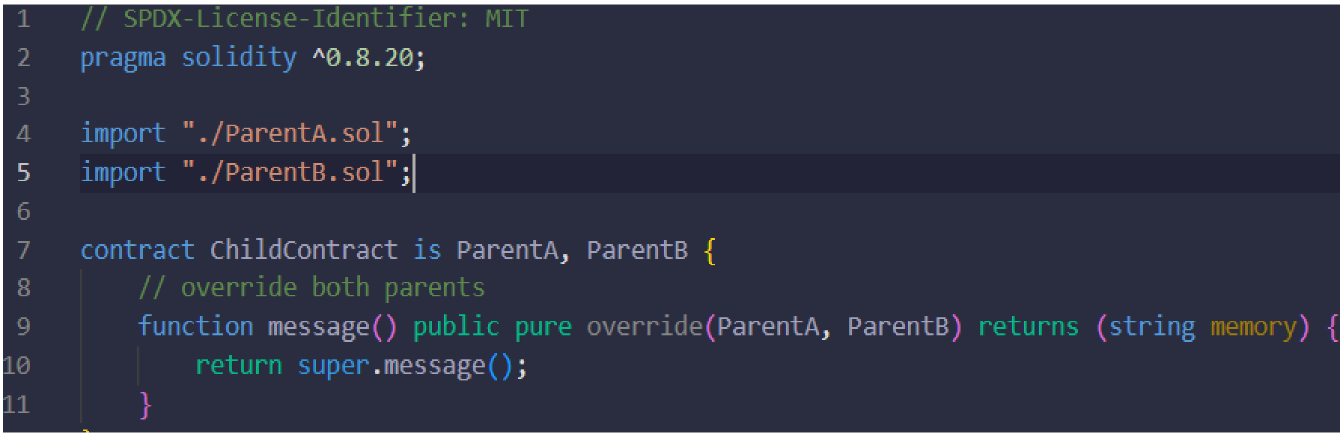


```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.20;

contract ParentB {
    function message() public virtual pure returns (string memory) {
        return "Message from Parent B";
    }
}

```

3.



```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.20;

import "./ParentA.sol";
import "./ParentB.sol";

contract ChildContract is ParentA, ParentB {
    // override both parents
    function message() public pure override(ParentA, ParentB) returns (string memory) {
        return super.message();
    }
```

4. Compile the Contracts

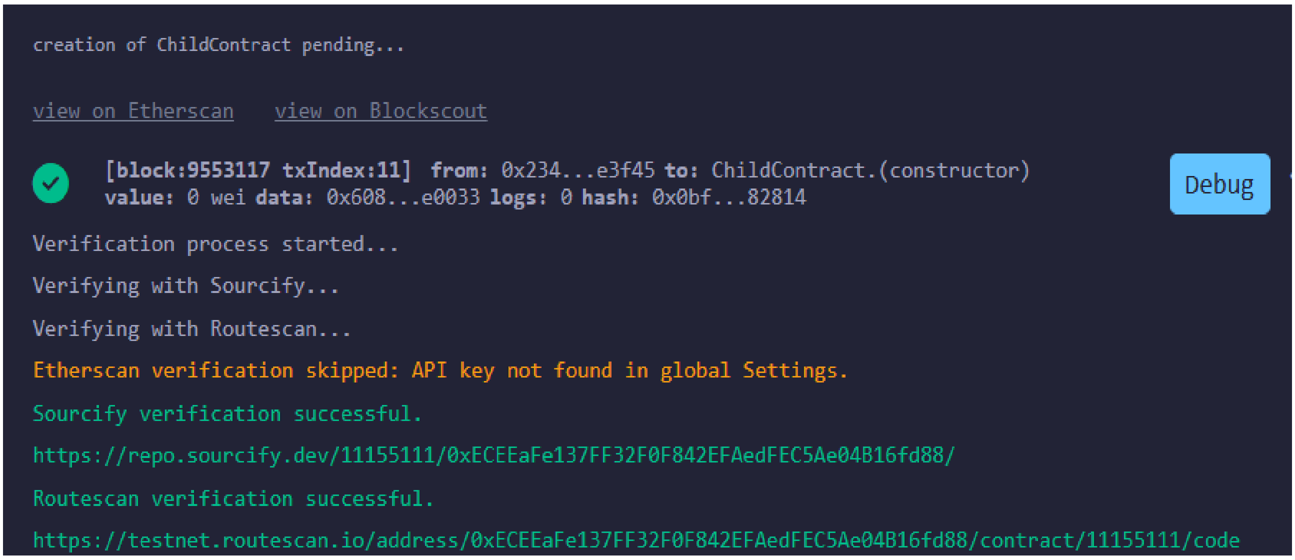
- Go to Solidity Compiler
- Select version 0.8.20
- Click Compile All

5. Deploy the Child Contract

1. Open Deploy & Run Transactions panel.
2. Select Injected Provider → MetaMask.
3. Switch MetaMask to Sepolia Testnet (same as file).
4. Deploy ChildContract.
5. Wait for MetaMask confirmation.

6. Call the Inherited Function

- Expand your deployed contract.
- Click message().
- Observe which parent’s version executes (based on linearization).



```
creation of ChildContract pending...

view on Etherscan   view on Blockscout

[block:9553117 txIndex:11]  from: 0x234...e3f45 to: ChildContract.(constructor)
value: 0 wei data: 0x608...e0033 logs: 0 hash: 0x0bf...82814

Verification process started...

Verifying with Sourcify...

Verifying with Routescan...

Etherscan verification skipped: API key not found in global Settings.

Sourcify verification successful.

https://repo.sourcify.dev/11155111/0xECEEaFe137FF32F0F842EFAedFEC5Ae04B16fd88/

Routescan verification successful.

https://testnet.routescan.io/address/0xECEEaFe137FF32F0F842EFAedFEC5Ae04B16fd88/contract/11155111/code
```

Observation

Parameter / Action	**Observation**
Parent Contracts Deployed	Successful
Child Contract Deployed	Successfully merged multiple parents
message() Output	Displays function according to Solidity’s linearization
Gas Consumption	Normal for simple inheritance
Inheritance Conflicts	Resolved using override and C3 linearization

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 :

Regn. No.

Signature of the Faculty: