**1) Condition Codes**

* **JMP <Label> -** Unconditional jump, jumps to the label without checking any condition.
* **JL <Register1> <Register2> <Label> -** Jumps to the label if register1 content is less than register2 content, else next instruction is executed.
* **JG <Register1> <Register2> <Label> -** Jumps to the label if register1 content is greater than register2 content, else next instruction is executed.
* **JGE <Register1> <Register2> <Label> -** Jumps to the label if register1 content is greater than or equal to register2 content, else next instruction is executed.
* **JLE <Register1> <Register2> <Label> -** Jumps to the label if register1 content is less than or equal to register2 content, else next instruction is executed.
* **JE <Register1> <Register2> <Label> -** Jumps to the label if register1 content is equal to register2 content, else next instruction is executed.

**2)**

* **For-Loop**

**Sample Output:**

================================================

Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. WhileLoop.txt

5. LEA.txt

Enter the file number to be executed

2

For Loop is executed 5 times and counter value is pushed to stack

Before Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x1 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x0 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x158 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x1 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x1 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x2 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x2 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x3 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x3 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

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| Ra: 0x4 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x4 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x5 | SP: 0xffff |

| PC = 0x168 | MDR = 0x5 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x5 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x5 | SP: 0xfffb |

| PC = 0x16c | MDR = 0x5 | MAR = 0x0 |

=====================================================

Top of the Stack: 0x5

* **Do-While Loop**

**Sample Output:**

================================================

Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. WhileLoop.txt

5. LEA.txt

Enter the file number to be executed

3

Do-While loop is executed 5 times and counter value is pushed to stack

Before Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x3 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x3 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x3 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x4 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x4 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x4 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x5 | SP: 0xffff |

| PC = 0x16c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x5 | SP: 0xfffb |

| PC = 0x170 | MDR = 0x0 | MAR = 0x0 |

=====================================================

Top of the Stack: 0x5

* **WHILE LOOP**

**Sample Output:**

================================================

Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. WhileLoop.txt

5. LEA.txt

Enter the file number to be executed

4

While loop is executed 5 times and counter value is pushed to stack

Before Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x5 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x1 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x3 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x3 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x3 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x4 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x4 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x4 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x160 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x0 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x5 | SP: 0xffff |

| PC = 0x16c | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x5 | Rb: 0x0 | Rc: 0x5 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x5 | SP: 0xfffb |

| PC = 0x170 | MDR = 0x0 | MAR = 0x0 |

=====================================================

Top of the Stack: 0x5

* **LEA instruction implemented**

LEA.txt (File Content)

LI Rb,0x5

LI Rc,0x2

LEA Ra,(Rb,Rc,2)

Sample Output:

================================================

Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. While.txt

5. LEA.txt

Enter the file number to be executed

5 (user enters input as 5)

Before Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x0 | Rb: 0x5 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x5 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x0 | Rb: 0x5 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x2 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x9 | Rb: 0x5 | Rc: 0x2 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x158 | MDR = 0x2 | MAR = 0x0 |

=====================================================

3) Binary Search implemented

* Works for both even and odd elements in array
* Search on an element > middle of the array

Sample Output:

================================================

Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. While.txt

5. LEA.txt

Enter the file number to be executed

1

Given Array Elements:

Array[0]: 0x11

Array[1]: 0x12

Array[2]: 0x13

Array[3]: 0x14

Array[4]: 0x15

Array[5]: 0x16

Element to be searched in the given array: 0x15

Before Execution

=====================================================

| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x100 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x106 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x158 | MDR = 0x2 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x15 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x15 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x206 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x15 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x103 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x15 | MAR = 0x0 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x14 | MAR = 0x103 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x14 | MAR = 0x103 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x14 | MAR = 0x103 |

=====================================================

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x180 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x20a | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x18c | MDR = 0x16 | MAR = 0x105 |

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Overflow Flag set to 1

After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x18c | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x190 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x16 | Rd: 0x105 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x16 | Rd: 0x208 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x16 | Rd: 0x104 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x15 | Rd: 0x104 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x15 | MAR = 0x104 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x15 | Rd: 0x104 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x19c | MDR = 0x15 | MAR = 0x104 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x15 | Rd: 0x104 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x100 | V0: 0x0 | SP: 0xffff |

| PC = 0x19c | MDR = 0x100 | MAR = 0x0 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x15 | Rd: 0x4 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x100 | V0: 0x0 | SP: 0xffff |

| PC = 0x1a0 | MDR = 0x100 | MAR = 0x0 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x15 | Rd: 0x4 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x100 | V0: 0x4 | SP: 0xffff |

| PC = 0x1a4 | MDR = 0x100 | MAR = 0x0 |

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After Execution

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| Ra: 0x104 | Rb: 0x104 | Rc: 0x15 | Rd: 0x4 | Re: 0x15 | Rf: 0x104 | Rg: 0x2 | Rh: 0x100 | V0: 0x4 | SP: 0xfffb |

| PC = 0x1a8 | MDR = 0x100 | MAR = 0x0 |

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Top of the Stack: 4 (Element 15 found at array Index 4)

* Search on an element < middle of the array

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Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. While.txt

5. LEA.txt

Enter the file number to be executed

1

Given Array Elements:

Array[0]: 0x11

Array[1]: 0x12

Array[2]: 0x13

Array[3]: 0x14

Array[4]: 0x15

Array[5]: 0x16

Element to be searched in the given array: 0x11

Before Execution

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| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x100 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x106 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x158 | MDR = 0x2 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x11 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x11 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x206 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x11 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x103 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x11 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x18c | MDR = 0x14 | MAR = 0x103 |

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Overflow Flag set to 1

After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x18c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x190 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x14 | Rd: 0x103 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x14 | Rd: 0x202 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x14 | Rd: 0x101 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x102 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x18c | MDR = 0x12 | MAR = 0x101 |

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Overflow Flag set to 1

After Execution

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| Ra: 0x100 | Rb: 0x102 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x18c | MDR = 0x12 | MAR = 0x101 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x100 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x190 | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x12 | Rd: 0x101 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x12 | Rd: 0x200 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x12 | Rd: 0x100 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x12 | MAR = 0x101 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x11 | Rd: 0x100 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x11 | MAR = 0x100 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x11 | Rd: 0x100 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x19c | MDR = 0x11 | MAR = 0x100 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x11 | Rd: 0x100 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x100 | V0: 0x0 | SP: 0xffff |

| PC = 0x19c | MDR = 0x100 | MAR = 0x0 |

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Overflow Flag set to 1

After Execution

=====================================================

| Ra: 0x100 | Rb: 0x100 | Rc: 0x11 | Rd: 0x0 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x100 | V0: 0x0 | SP: 0xffff |

| PC = 0x1a0 | MDR = 0x100 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x100 | Rc: 0x11 | Rd: 0x0 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x100 | V0: 0x0 | SP: 0xffff |

| PC = 0x1a4 | MDR = 0x100 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x100 | Rc: 0x11 | Rd: 0x0 | Re: 0x11 | Rf: 0x100 | Rg: 0x2 | Rh: 0x100 | V0: 0x0 | SP: 0xfffb |

| PC = 0x1a8 | MDR = 0x100 | MAR = 0x0 |

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Top of the Stack: 0 (Element 11 found at array at array index 0)

* Search on an element that is not in the array

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Files to be executed

1. BinarySearch.txt

2. ForLoop.txt

3. DoWhile.txt

4. While.txt

5. LEA.txt

Enter the file number to be executed

1

Given Array Elements:

Array[0]: 0x11

Array[1]: 0x12

Array[2]: 0x13

Array[3]: 0x14

Array[4]: 0x15

Array[5]: 0x16

Element to be searched in the given array: 0x20

Before Execution

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| Ra: 0x0 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x0 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x0 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x150 | MDR = 0x100 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x0 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x154 | MDR = 0x106 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x0 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x158 | MDR = 0x2 | MAR = 0x0 |

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After Execution

=====================================================

| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x15c | MDR = 0x20 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x0 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x20 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x206 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x20 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x0 | Rd: 0x103 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x20 | MAR = 0x0 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x0 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x100 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x180 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x103 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x20a | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x14 | Rd: 0x105 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x14 | MAR = 0x103 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x104 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x16 | MAR = 0x105 |

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After Execution

=====================================================

| Ra: 0x104 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x16 | MAR = 0x105 |

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After Execution

=====================================================

| Ra: 0x106 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x180 | MDR = 0x16 | MAR = 0x105 |

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After Execution

=====================================================

| Ra: 0x106 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x16 | Rd: 0x105 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x16 | Rd: 0x20c | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x168 | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x16 | Rd: 0x106 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x16c | MDR = 0x16 | MAR = 0x105 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x170 | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x178 | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x106 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x106 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x107 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x17c | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x107 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x107 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x180 | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x107 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x107 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x164 | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x107 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x107 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x1b0 | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x107 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x107 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xffff |

| PC = 0x1b0 | MDR = 0x0 | MAR = 0x106 |

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After Execution

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| Ra: 0x107 | Rb: 0x106 | Rc: 0x0 | Rd: 0x106 | Re: 0x20 | Rf: 0x107 | Rg: 0x2 | Rh: 0x0 | V0: 0x0 | SP: 0xfffb |

| PC = 0x1b4 | MDR = 0x0 | MAR = 0x106 |

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Top of the Stack: -1 (Element 20 not found returns -1)