

21AIE112 Elements of computing systems - II
(INCLASS ASSIGNMENT)

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Q1. Write a jack code for division of two numbers using division sign and inbuilt class.

CODE: Using Inbuilt Class

```
class Main {  
    function void main() {  
        var int a;  
        var int b;  
        let a = Keyboard.readInt("Enter the first number:  
");  
        let b = Keyboard.readInt("Enter the second number:  
");  
        do Output.printString("Divide: ");  
        do Output.printInt(Math.divide(a, b));  
        return;  
    }  
}
```

Compiler Code:

PROBLEMS 2 OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools> .\JackCompiler.bat .\Main.jack  
Compiling "C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.jack"
```

OUTPUT:

With completely divisible number

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

File View Run Help

Print Step Back Forward Stop Animate: Slow Fast No animation View: Screen Format: Decimal

Program

119	push	constant 101
120	call	String.appendChar 2
121	push	constant 58
122	call	String.appendChar 2
123	push	constant 32
124	call	String.appendChar 2
125	call	Output.println 1
126	pop	temp 0
127	push	local 0
128	push	local 1
129	call	Math.divide 2
130	call	Output.println 1
131	pop	temp 0
132	push	constant 0
133	return	

Static

0	0
1	0
2	0
3	0
4	0

Local

Argument

This

That

Temp

0	0
1	0

Enter the first number: 6
Enter the second number: 3
Divide: 2

Global Stack

256	0
257	0
258	0
259	0
260	0
261	0
262	0
263	0
264	0
265	0
266	0
267	0
268	0
269	0
270	0

RAM

SP:	0	256
LCL:	1	0
ARG:	2	0
THIS:	3	0
THAT:	4	0
Temp0:	5	0
Temp1:	6	0
Temp2:	7	0
Temp3:	8	0
Temp4:	9	0
Temp5:	10	0
Temp6:	11	0
Temp7:	12	0
R13:	13	0
R14:	14	0

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

File View Run Help

Print Step Back Forward Stop Animate: Slow Fast No animation View: Screen Format: Decimal

Program

119	push	constant 101
120	call	String.appendChar 2
121	push	constant 58
122	call	String.appendChar 2
123	push	constant 32
124	call	String.appendChar 2
125	call	Output.println 1
126	pop	temp 0
127	push	local 0
128	push	local 1
129	call	Math.divide 2
130	call	Output.println 1
131	pop	temp 0
132	push	constant 0
133	return	

Static

0	0
1	0
2	0
3	0
4	0

Local

0	0
1	0
2	0
3	0
4	0

Argument

0	0
1	0
2	0
3	0
4	0

This

That

Temp

0	0
1	0

Enter the first number: 5
Enter the second number: 2
Divide: 2

Global Stack

256	0
257	0
258	0
259	0
260	0
261	0
262	0
263	0
264	0
265	0
266	0
267	0
268	0
269	0
270	0

RAM

SP:	0	256
LCL:	1	0
ARG:	2	0
THIS:	3	0
THAT:	4	0
Temp0:	5	0
Temp1:	6	0
Temp2:	7	0
Temp3:	8	0
Temp4:	9	0
Temp5:	10	0
Temp6:	11	0
Temp7:	12	0
R13:	13	0
R14:	14	0

CODE: Using Divide Sign

```
class Main {  
    function void main() {  
        var int a;  
        var int b;  
        let a = Keyboard.readInt("Enter the first number: ");  
        let b = Keyboard.readInt("Enter the second number: ");  
        do Output.printString("Divide: ");  
        do Output.printInt(a/b);  
        return;  
    }  
}
```

Compiler Code:

PROBLEMS 2 OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools> .\JackCompiler.bat .\Main.jack  
Compiling "C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.jack"
```

OUTPUT:

With completely divisible number

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

File View Run Help

Animate: Slow Fast No animation View: Screen Format: Decimal

Program

119	push	constant 101
120	call	String.appendChar 2
121	push	constant 58
122	call	String.appendChar 2
123	push	constant 32
124	call	String.appendChar 2
125	call	Output.printlnString 1
126	pop	temp 0
127	push	local 0
128	push	local 1
129	call	Math.divide 2
130	call	Output.printlnInt 1
131	pop	temp 0
132	push	constant 0
133	return	

Static

0	0
1	0
2	0
3	0
4	0

Local

0	0
1	0
2	0
3	0
4	0

Argument

0	0
1	0
2	0
3	0
4	0

This

That

Temp

0	0
1	0

Stack

Call Stack

Global Stack

256	0
257	0
258	0
259	0
260	0
261	0
262	0
263	0
264	0
265	0
266	0
267	0
268	0
269	0
270	0

RAM

SP:	0	256
LCL:	1	0
ARG:	2	0
THIS:	3	0
THAT:	4	0
Temp0:	5	0
Temp1:	6	0
Temp2:	7	0
Temp3:	8	0
Temp4:	9	0
Temp5:	10	0
Temp6:	11	0
Temp7:	12	0
R13:	13	0
R14:	14	0

Enter the first number: 8
Enter the second number: 2
Divide: 4

Without completely divisible number

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

File View Run Help

Animate: Slow Fast No animation View: Screen Format: Decimal

Program

119	push	constant 101
120	call	String.appendChar 2
121	push	constant 58
122	call	String.appendChar 2
123	push	constant 32
124	call	String.appendChar 2
125	call	Output.printlnString 1
126	pop	temp 0
127	push	local 0
128	push	local 1
129	call	Math.divide 2
130	call	Output.printlnInt 1
131	pop	temp 0
132	push	constant 0
133	return	

Static

0	0
1	0
2	0
3	0
4	0

Local

0	0
1	0
2	0
3	0
4	0

Argument

0	0
1	0
2	0
3	0
4	0

This

That

Temp

0	0
1	0

Stack

Call Stack

Global Stack

256	0
257	0
258	0
259	0
260	0
261	0
262	0
263	0
264	0
265	0
266	0
267	0
268	0
269	0
270	0

RAM

SP:	0	256
LCL:	1	0
ARG:	2	0
THIS:	3	0
THAT:	4	0
Temp0:	5	0
Temp1:	6	0
Temp2:	7	0
Temp3:	8	0
Temp4:	9	0
Temp5:	10	0
Temp6:	11	0
Temp7:	12	0
R13:	13	0
R14:	14	0

Enter the first number: 7
Enter the second number: 2
Divide: 3

Q2. Write a jack code for division on your own without using division sign and inbuilt function.

CODE:

```
class Main {
    function void main() {
        var int a; //we created 4 integer variables namely a,b,c,neg
        var int b;
        var int c;
        var int neg;

        let a = Keyboard.readInt("Enter first number: "); //we read the
first number

        let b = Keyboard.readInt("Enter second number: "); //we read the
second number

        if (b = 0) {
            do Output.printString("Cannot divide by zero. Please enter a
non-zero number. ");
            //if the second number is 0, we print this message
            while(b=0) {
                let b = Keyboard.readInt("Enter second number: "); //we read
the second number again
            }
        }

        let neg = 0; //we created a variable named neg
        if (a < 0) {
            let neg = neg + 1; //if the first number is negative, we add 1
to the variable neg
            let a = -a; //we make the first number positive
        }

        if (b < 0) {
            let neg = neg + 1; //if the second number is negative, we add
1 to the variable neg
            let b = -b; //we make the second number positive
        }
    }
}
```

```

    let c = 0; //we created a variable named c
    while ((a > b) | (a = b)) {
        let a = a - b; //we subtract the first number from the second
number
        let c = c + 1; //we add 1 to the variable c
    }

    do Output.println("the Quotient is: ");

    if (neg = 1) {
        do Output.println(-c); //if neg variable is 1 then only we
print Quotient as negative
    } else {
        do Output.println(c); //if neg variable is 0 then only we
print Quotient as positive
    }
    return;
}
}

```

Compiler Code:

```

PROBLEMS 2 OUTPUT DEBUG CONSOLE TERMINAL
PS C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools> .\JackCompiler.bat .\Main.jack
Compiling "C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.jack"

```

OUTPUT: With completely divisible dividend

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

File View Run Help

Slow Fast No animation Animate: View: Screen Format: Decimal

Program

186	if-goto	Main.main\$IF_TRUE2
187	goto	Main.main\$IF_FALSE2
	label	Main.main\$IF_TRUE2
188	push	local 2
189	neg	
190	call	Output.printInt 1
191	pop	temp 0
192	goto	Main.main\$IF_END2
	label	Main.main\$IF_FALSE2
193	push	local 2
194	call	Output.printInt 1
195	pop	temp 0
	label	Main.main\$IF_END2
196	push	constant 0
197	return	

Static

0	0
1	0
2	0
3	0
4	0

Local

Argument

This

That

Temp

0	0
1	0

Enter first number: 66
Enter second number: 3
the Quotient is: 22

Global Stack

256	0
257	0
258	0
259	0
260	0
261	0
262	0
263	0
264	0
265	0
266	0
267	0
268	0
269	0
270	0

RAM

SP:	0	256
LCL:	1	0
ARG:	2	0
THIS:	3	0
THAT:	4	0
Temp0:	5	0
Temp1:	6	0
Temp2:	7	0
Temp3:	8	0
Temp4:	9	0
Temp5:	10	0
Temp6:	11	0
Temp7:	12	0
R13:	13	0
R14:	14	0

Stack

Call Stack

OUTPUT: Without completely divisible dividend

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

File View Run Help

Slow Fast No animation Animate: View: Screen Format: Decimal

Program

186	if-goto	Main.main\$IF_TRUE2
187	goto	Main.main\$IF_FALSE2
	label	Main.main\$IF_TRUE2
188	push	local 2
189	neg	
190	call	Output.printInt 1
191	pop	temp 0
192	goto	Main.main\$IF_END2
	label	Main.main\$IF_FALSE2
193	push	local 2
194	call	Output.printInt 1
195	pop	temp 0
	label	Main.main\$IF_END2
196	push	constant 0
197	return	

Static

0	0
1	0
2	0
3	0
4	0

Local

0	0
1	0
2	0
3	0
4	0

Argument

0	0
1	0
2	0
3	0
4	0

This

That

Temp

0	0
1	0

Enter first number: 55
Enter second number: 2
the Quotient is: 27

Global Stack

256	0
257	0
258	0
259	0
260	0
261	0
262	0
263	0
264	0
265	0
266	0
267	0
268	0
269	0
270	0

RAM

SP:	0	256
LCL:	1	0
ARG:	2	0
THIS:	3	0
THAT:	4	0
Temp0:	5	0
Temp1:	6	0
Temp2:	7	0
Temp3:	8	0
Temp4:	9	0
Temp5:	10	0
Temp6:	11	0
Temp7:	12	0
R13:	13	0
R14:	14	0

Stack

Call Stack

OUTPUT: With second number as ZERO

Virtual Machine Emulator (2.5) - C:\Users\HP\Desktop\Amrita\AMRITA APPS\nand2tetris\nand2tetris\tools\Main.vm

FileViewRunHelp

Slow

Fast

No animation

Animate:

View:

Screen

Format:

Decimal

Program

349if-gotoMain.main\$IF_TRUE3

350gotoMain.main\$IF_FALSE3

labelMain.main\$IF_TRUE3

351pushlocal 2

352neg

353callOutput.printInt 1

354poptemp 0

355gotoMain.main\$IF_END3

labelMain.main\$IF_FALSE3

356pushlocal 2

357callOutput.printInt 1

358poptemp 0

labelMain.main\$IF_END3

359pushconstant 0

360return

Stack

Call Stack

Static

00

10

20

30

40

Local

00

10

20

30

40

Argument

00

10

20

30

40

This

That

Temp

00

10

Global Stack

2560

2570

2580

2590

2600

2610

2620

2630

2640

2650

2660

2670

2680

2690

2700

RAM

SP:0256

LCL:10

ARG:20

THIS:30

THAT:40

Temp0:50

Temp1:60

Temp2:70

Temp3:80

Temp4:90

Temp5:100

Temp6:110

Temp7:120

R13:130

R14:140

Enter first number: 9

Enter second number: 0

Cannot divide by zero. Please enter a non-zero number. Enter sec

ond number: #

THANK YOU

