

How to compile the code

0.confirm the file is now

1.Go to folder `src/`

2.Run command

3.After compiling, there will be lots of classes file shown above in current path

How to run the code

[Saving Your Time]:Test Yourself

Generate vm files one by one:

Generate vm files with one shell:

[Saving Your Time] :Test Result

Seven:✓

ConvertToBin✓

Square Dance✓

Average✓

Pong✓

ComplexArrays✓

Thank you for your time

Any Problem Appears I beg you to email

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First

How to compile the code

0.confirm the file is now

```
tree
```

```
(base) eamin@EamindeMacBook-Pro YimingChengProject11 % tree
```

```
.
├── README.md
├── Test
│   ├── Average
│   │   └── Main.jack
│   ├── ComplexArrays
│   │   └── Main.jack
│   ├── ConvertToBin
│   │   └── Main.jack
│   ├── Pong
│   └── Ball.jack
```

```
├── Ball.jack.bak
├── Bat.jack
├── Bat.jack.bak
├── Main.jack
├── Main.jack.bak
├── PongGame.jack
├── PongGame.jack.bak
├── Seven
│   └── Main.jack
├── Square
│   ├── Main.jack
│   ├── Square.jack
│   └── SquareGame.jack
└── src
    ├── JackCompiler.java
    └── test_in_one_file.sh
```

9 directories, 18 files

1.Go to folder `src/`

```
cd path to src
```

Make sure you can see

```
ls
```

```
(base) eamin@EamindeMacBook-Pro src % ls
JackCompiler.java      test_in_one_file.sh
```

2.Run command

```
javac JackCompiler.java
```

Make sure you can see

```
(base) eamin@EamindeMacBook-Pro src % javac JackCompiler.java
(base) eamin@EamindeMacBook-Pro src % ls
CompilationEngine$1.class      JackCompiler.java             JackTokenizer.class
SymbolTable.class             VMWriter.class
CompilationEngine.class        JackTokenizer$KEYWORD.class   Symbol$KIND.class
VMWriter$COMMAND.class        test_in_one_file.sh
JackCompiler.class             JackTokenizer$TYPE.class      Symbol.class
VMWriter$SEGMENT.class
```

3.After compiling, there will be lots of classes file shown above in current path

How to run the code

1.Command format is

a:

```
java JackCompiler XXX.jack
```

Analyzer will generate

`xxx.vm`:result of original jack file

in the same directory of `xxx.jack`.

b:

```
java Analyzer directory
```

Analyzer will generate

several `.vm` files according to the number of .jack files named by filename in the same directory.

[Saving Your Time]:Test Yourself

Generate vm files one by one:

make sure you are at `src`

Compile

```
cd src
```

```
javac JackCompiler.java
```

Processing directory `Average`

```
java JackCompiler ../Test/Average
```

Processing directory `ComplexArrays`

```
java JackCompiler ../Test/ComplexArrays
```

Processing directory `ConvertToBin`

```
java JackCompiler ../Test/ConvertToBin
```

Processing directory `Pong`

```
java JackCompiler ../Test/Pong
```

Processing directory `Seven`

```
java JackCompiler ../Test/Seven
```

Processing directory `Square`

```
java JackCompiler ../Test/Square
```

Generate vm files with one shell:

make sure you are at `src`

```
sudo ./test_in_one_file.sh
```

All vm are generated at once like follow:

```

(base) eamin@EamindeMacBook-Pro src % sudo ./test_in_one_file.sh
Password:
Compiling JackCompiler.java...
-----
Processing directory: Average
-----
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Average/Main.vm
-----
Processing directory: ComplexArrays
-----
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/ComplexArrays/Main.vm
-----
Processing directory: ConvertToBin
-----
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/ConvertToBin/Main.vm
-----
Processing directory: Pong
-----
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Pong/Ball.vm
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Pong/Main.vm
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Pong/PongGame.vm
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Pong/Bat.vm
-----
Processing directory: Seven
-----
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Seven/Main.vm
-----
Processing directory: Square
-----
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Square/Square.vm
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Square/SquareGame.vm
File created : /Users/eamin/Desktop/data/学习资料/芝加哥大学/2025_spring/System/MPCS-52011-2-1-Winter-2025-Introduction-to-Computer-Systems-2025-Jan-10_00-25-49-069/viewer/files/Hw/YimingChengProject11/src/./Test/Square/Main.vm
✓ All file processed.

```

Now you can see vm files:

```

(base) eamin@EamindeMacBook-Pro YimingChengProject11 % tree ../
.
├── README.md
├── Test
│   ├── Average
│   │   ├── Main.jack
│   │   └── Main.vm
│   ├── ComplexArrays
│   │   ├── Main.jack
│   │   └── Main.vm
│   ├── ConvertToBin
│   │   ├── Main.jack
│   │   └── Main.vm
│   ├── Pong
│   │   └── Ball.jack

```

```
├── Ball.jack.bak
│   ├── Ball.vm
│   ├── Bat.jack
│   ├── Bat.jack.bak
│   ├── Bat.vm
│   ├── Main.jack
│   ├── Main.jack.bak
│   ├── Main.vm
│   ├── PongGame.jack
│   ├── PongGame.jack.bak
│   └── PongGame.vm
├── Seven
│   ├── Main.jack
│   └── Main.vm
└── Square
    ├── Main.jack
    ├── Main.vm
    ├── Square.jack
    ├── Square.vm
    ├── SquareGame.jack
    └── SquareGame.vm
```

src

```
├── CompilationEngine$1.class
├── CompilationEngine.class
├── JackCompiler.class
├── JackCompiler.java
├── JackTokenizer$KEYWORD.class
├── JackTokenizer$TYPE.class
├── JackTokenizer.class
├── Symbol$KIND.class
├── Symbol.class
├── SymbolTable.class
├── VMWriter$COMMAND.class
├── VMWriter$SEGMENT.class
├── VMWriter.class
└── test_in_one_file.sh
```

9 directories, 41 files

[Saving Your Time] :Test Result

Seven: 

(7 is shown in the screen)

ConvertToBin

SO theortically

If Ram[8000]=23456

The result should be

Ram[8001] is LSB means the number is Writing From Ram[8016] to Ram[8001]

Convert Hack Number Types

Binary	0101101110100000
Decimal	23456
Unsigned	23456
Hex	0x5BA0
HACK ASM	@23456

Output: 

NAND2Tetris / VM Emulator / ConvertToBin / *.vm

VM Code

1 // Compiled Main.jack:
2 function Main.main 2
3 push constant 8001
4 push constant 16
5 push constant 1
6 neg
7 call Main.fillMemory 3
8 pop temp 0
9 push constant 8000
10 call Memory.peek 1
11 pop local 1
12 push local 1
13 call Main.convert 1
14 pop temp 0
15 push constant 0
16 return

SlowFast

Screen

Enable Keyboard

Key:

Char code: 0

RAM

Addr

d

RAM

8000

dec

SP:	0	264	7777	0
LCL:	1	0	8000	23456
ARG:	2	0	8001	0
THIS:	3	0	8002	0
THAT:	4	0	8003	0
TEMP0:	5	0	8004	0
TEMP1:	6	0	8005	0
TEMP2:	7	0	8006	1
TEMP3:	8	0	8007	0
TEMP4:	9	0	8008	1
TEMP5:	10	0	8009	1
TEMP6:	11	0	8010	1
TEMP7:	12	0	8011	0
R13:	13	0	8012	1
R14:	14	0	8013	1
R15:	15	0	8014	0
	16	0	8015	1
	17	0	8016	0
			8017	0

VM Structures

Stack: [0, 0, 0, 0, 0, 0, 0, 0]

Call-stack: Sys.init (built-in)

Square Dance

see detail in the `video_of_some_result/Square.mp4`

NAND2Tetris / VM Emulator

VM Code

⏮ ⏪ ⏩ ⏭

SlowFast

490 if-goto LABEL_26

491 push this 0

492 call Square.moveRight 1

493 pop temp 0

494 goto LABEL_27

495 label LABEL_26

496 label LABEL_27

497 push constant 5

498 call Sys.wait 1

499 pop temp 0

500 push constant 0

501 return

502

503 function Main.main 1

504 call SquareGame.new 0

505 pop local 0

506 push local 0

Screen

x0x1x2

Disable Keyboard

Key: Shift

Char code: 0

RAM	CL	Addr	↶	d ▾	RAM	Addr	↶	dec ▾
SP:		0		284	256			0
LCL:		1		283	257			0
ARG:		2		277	258			0
THIS:		3		2049	259			0
THAT:		4		0	260			0
TEMP0:		5		0	261			0
TEMP1:		6		0	262			0
TEMP2:		7		0	263			8
TEMP3:		8		0	264			0
TEMP4:		9		0	265			0
TEMP5:		10		0	266			0
TEMP6:		11		0	267			0

VM Structures

Stack: [5]

argument: [2049]

pointer: [2049, 0]





this: [2052, 3]

temp: [0, 0, 0, 0, 0, 0, 0, 0]

Call-stack:

Average

VM Code

Slow

Fast

1 function Main.main 4
2 push constant 18
3 call String.new 1
4 push constant 72
5 call String.appendChar 2
6 push constant 111
7 call String.appendChar 2
8 push constant 119
9 call String.appendChar 2
10 push constant 32
11 call String.appendChar 2
12 push constant 109
13 call String.appendChar 2
14 push constant 97
15 call String.appendChar 2
16 push constant 110

VM Structures
Stack: [0, 0, 0, 0, 0, 0, 0, 0]
Call-stack: Sys.init (built-in)

Screen




x0 x1 x2

How many numbers? 10
Enter the next number: 1
Enter the next number: 2
Enter the next number: 3
Enter the next number: 4
Enter the next number: 5
Enter the next number: 6
Enter the next number: 7
Enter the next number: 8
Enter the next number: 9
Enter the next number: 10
The average is: 5

Disable Keyboard

Key: Shift

Char code: 0

RAM		Addr		d	▼	RAM	Addr		dec	▼
SP:		0		264		256			0	
LCL:		1		0		257			0	
ARG:		2		0		258			0	
THIS:		3		0		259			0	
THAT:		4		0		260			0	
TEMP0:		5		0		261			0	
TEMP1:		6		0		262			0	

Pong

the program is too slow in [video_of_some_result/Pong.mp4](#)

NAND2Tetris / VM Emulator / Pong / *.vm

VM Code

⏮

⏪

⏸

⏩

⏭

SlowFast

281

push constant 0

282

return

283

function Ball.draw 0

284

push argument 0

285

pop pointer 0

286

push this 0

287

push this 1

288

push this 0

289

push constant 5

290

add

291

push this 1

292

push constant 5

293

add

294

call Screen.drawRectangle 4

295

pop temp 0

296

push constant 0

297

return

VM Structures

Stack: [297, 158, 297]

argument: [2063]

pointer: [2063, 0]

this:

[297, 158, 147, 222, 108, 284, 150, 1, 0]

Screen

x0

x1

x2

Score: 0

Disable Keyboard

Key: Shift

Char code: 0

RAM	<div>CL</div>	Addr	<div>↕</div>	d ▾	RAM	Addr	<div>↕</div>	dec ▾
SP:		0		308	256			0
LCL:		1		305	257			0
ARG:		2		299	258			0
THIS:		3		2063	259			0
THAT:		4		0	260			0
TEMP0:		5		0	261			0
TEMP1:		6		0	262			0
TEMP2:		7		0	263			8
TEMP3:		8		0	264			0

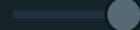
ComplexArrays✔



VM Code



Slow



Fast

```
1 function Main.main 3
2 push constant 10
3 call Array.new 1
4 pop local 0
5 push constant 5
6 call Array.new 1
7 pop local 1
8 push constant 1
9 call Array.new 1
10 pop local 2
11 push local 0
12 push constant 3
13 add
14 push constant 2
15 pop temp 0
16 pop pointer 1
```

VM Structures

Stack: [0, 0, 0, 0, 0, 0, 0, 0]

Call-stack: Sys.init (built-in)

Screen

x0 x1 x2

```
Test 1 - Required result: 5, Actual result: 5
Test 2 - Required result: 40, Actual result: 40
Test 3 - Required result: 0, Actual result: 0
Test 4 - Required result: 77, Actual result: 77
Test 5 - Required result: 110, Actual result: 110
```

Disable Keyboard

Key: Shift

Char code: 0

RAM	cl	Addr	d	dec	RAM	Addr	d	dec
SP:		0	264		256			0
LCL:		1	0		257			0
ARG:		2	0		258			0
THIS:		3	0		259			0
THAT:		4	0		260			0
TEMP0:		5	0		261			0
TEMP1:		6	0		262			0