Department of Computer Engineering
Academic Term: Jan-May 23-24

Class: B.E Computer Sem -VII **Subject:**

Blockchain Technology Lab**Subject**

Code : CSDL7022

Practical No:	7
Title:	Creating Smart Contract in Ganache using Remix IDE
Date of Performance:	08/09/23
Date of Submission:	08/09/23
Roll No:	9427
Name of the Student:	Atharva Prashant Pawar

Evaluation:

Sr. No	**Rubric**	**Grade**
1	**Time Line (2)**	
2	**Output (3)**	
3	**Code optimization (2)**	
4	**Post lab (3)**	

Signature of the Teacher :

Experiment No. 7

Blockchain platform Ganache.

Aim: Creating Smart Contract in Ganache using Remix IDE

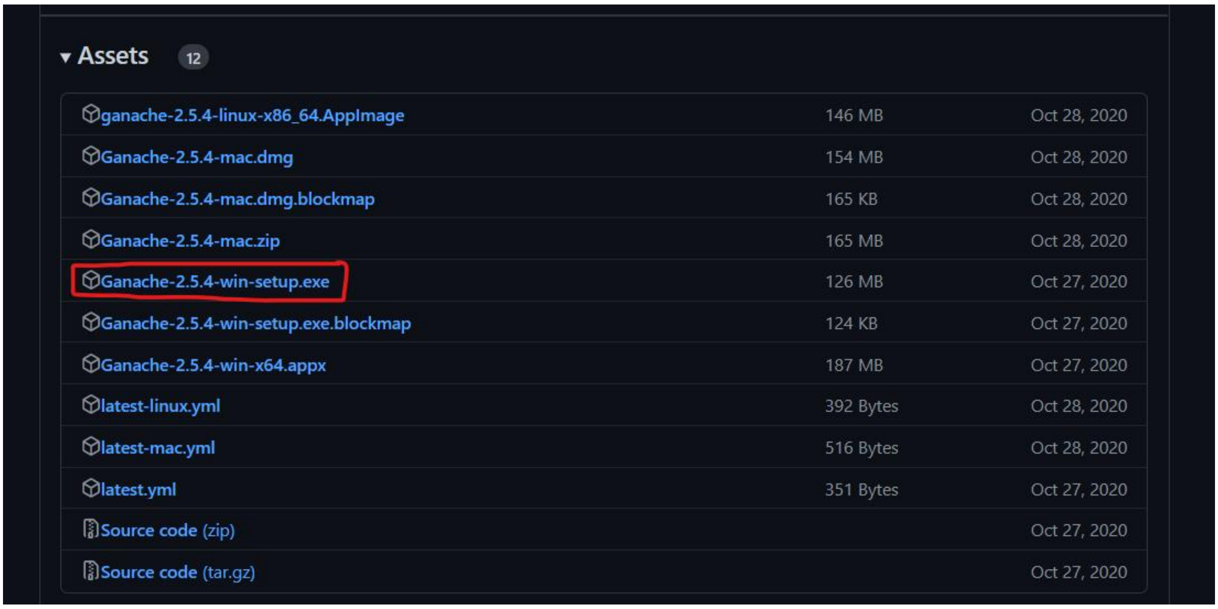
Theory:

Step 1:

Installation ganache

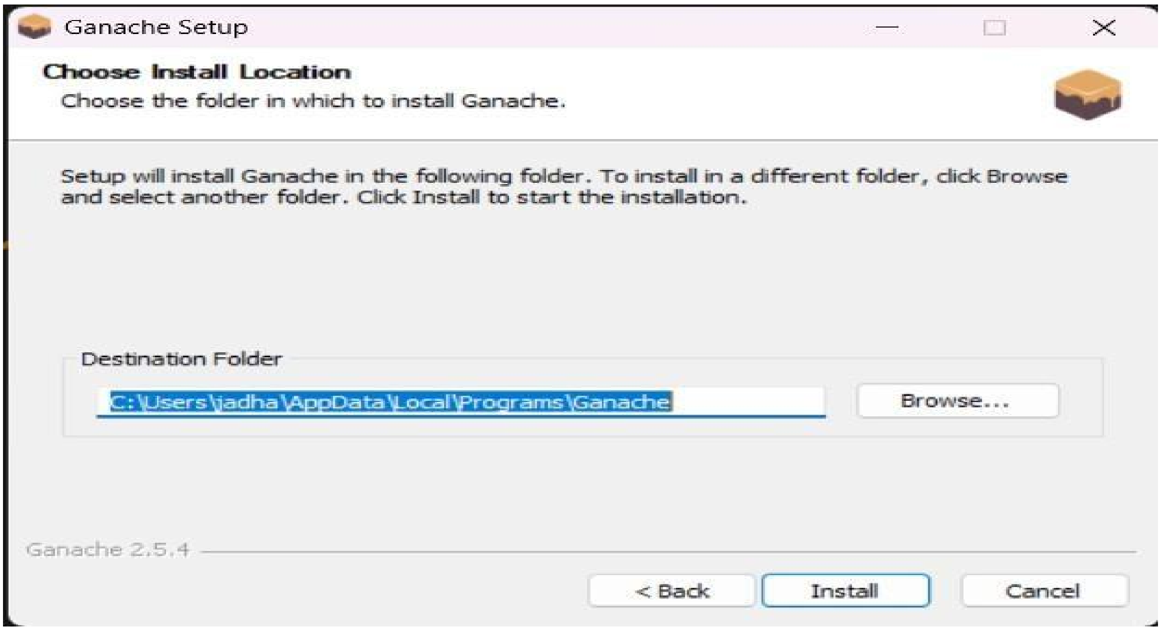
Download and Install ganache from https://github.com/trufflesuite/ganache-ui/releases

This is for Windows OS, you can choose the download file as per your System OSCompatibility.



▾ Assets 12

ganache-2.5.4-linux-x86_64.AppImage	146 MB	Oct 28, 2020
Ganache-2.5.4-mac.dmg	154 MB	Oct 28, 2020
Ganache-2.5.4-mac.dmg.blockmap	165 KB	Oct 28, 2020
Ganache-2.5.4-mac.zip	165 MB	Oct 28, 2020
Ganache-2.5.4-win-setup.exe	126 MB	Oct 27, 2020
Ganache-2.5.4-win-setup.exe.blockmap	124 KB	Oct 27, 2020
Ganache-2.5.4-win-x64.appx	187 MB	Oct 27, 2020
latest-linux.yml	392 Bytes	Oct 28, 2020
latest-mac.yml	516 Bytes	Oct 28, 2020
latest.yml	351 Bytes	Oct 27, 2020
Source code (zip)		Oct 27, 2020
Source code (tar.gz)		Oct 27, 2020



Ganache Setup

Choose Install Location

Choose the folder in which to install Ganache.

Setup will install Ganache in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

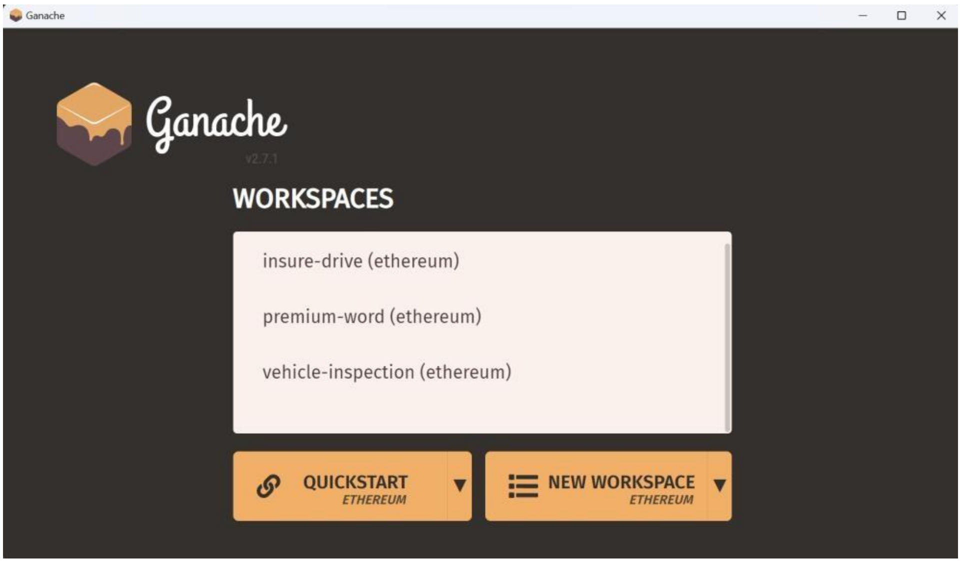
Destination Folder

C:\Users\jadha\AppData\Local\Programs\Ganache

Step 2:

After installing, open Ganache and you will see this window.

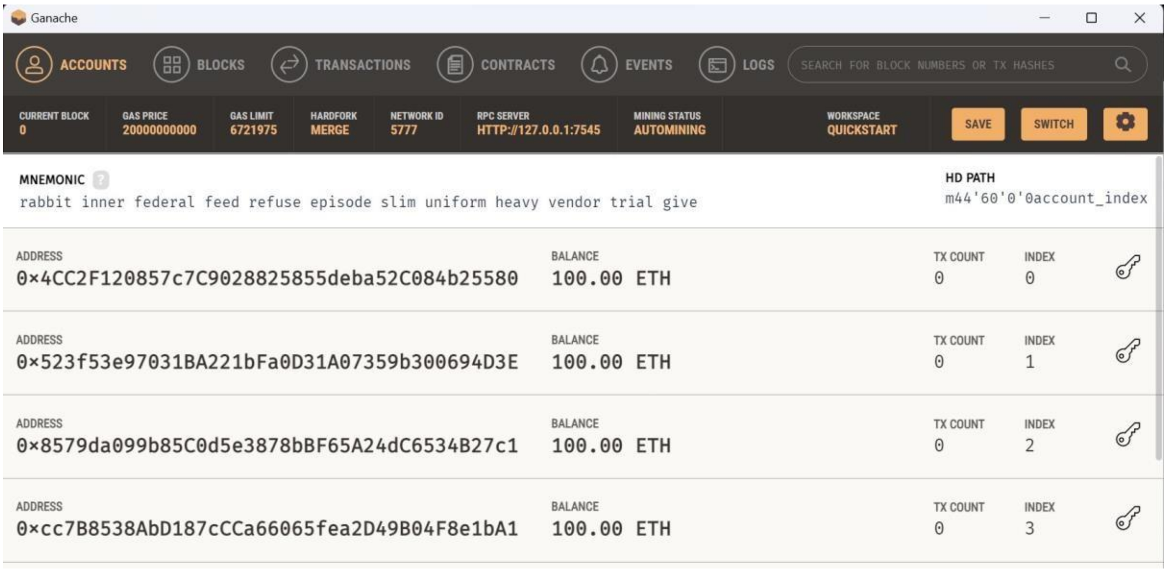
Create Workspace by clicking on QuickStart



insure-drive (ethereum)

premium-word (ethereum)

vehicle-inspection (ethereum)



CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE
0	20000000000	6721975	MERGE	5777	HTTP://127.0.0.1:7545	AUTOMINING	QUICKSTART

MNEMONIC
rabbit inner federal feed refuse episode slim uniform heavy vendor trial give

HD PATH
m44'60'0'0account_index

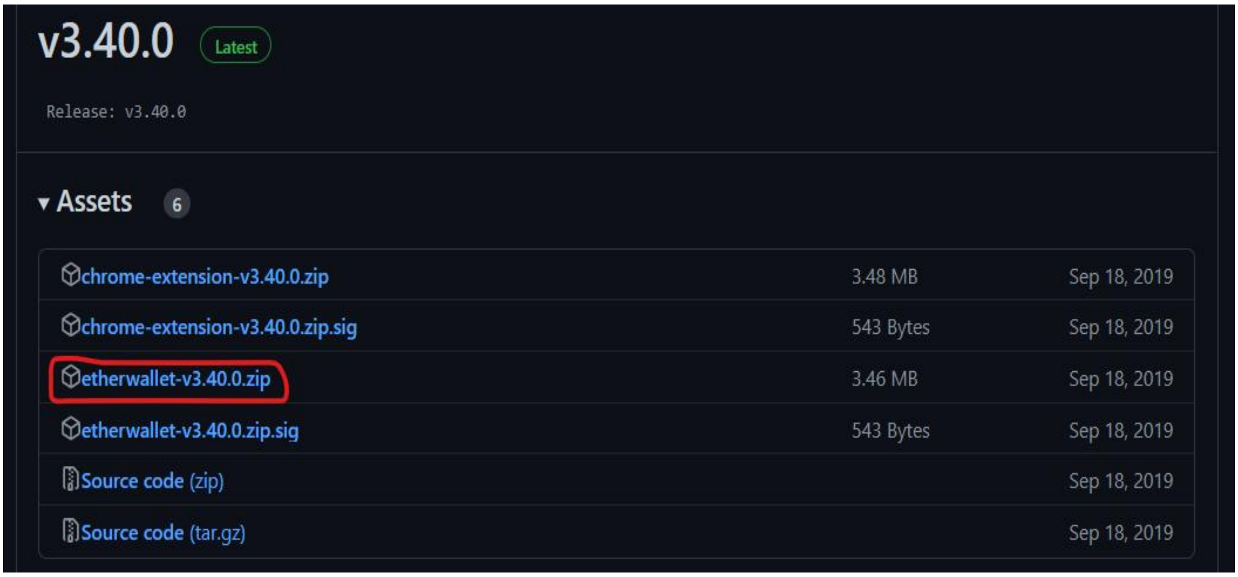
ADDRESS	BALANCE	TX COUNT	INDEX
0×4CC2F120857c7C9028825855deba52C084b25580	100.00 ETH	0	0
0×523f53e97031BA221bFa0D31A07359b300694D3E	100.00 ETH	0	1
0×8579da099b85C0d5e3878bBF65A24dC6534B27c1	100.00 ETH	0	2
0×cc7B8538AbD187cCCa66065fea2D49B04F8e1bA1	100.00 ETH	0	3

You can see here a list of accounts along with their address, balance, and other information. In the header, you can see blocks, transaction information, etc. Observe RPC SERVER Address here, with this address you will be interacting with this blockchain.

Step 3:

Installation of MyEtherWallet

MyEtherWallet is an online wallet & client-side interface, which can interact with Ethereum blockchain & perform operations on the blockchain. But here we are using private blockchain running in our local, which can’t be accessed by an online version, so we will download it from https://github.com/kvhnuke/etherwallet/releases and run it locally.



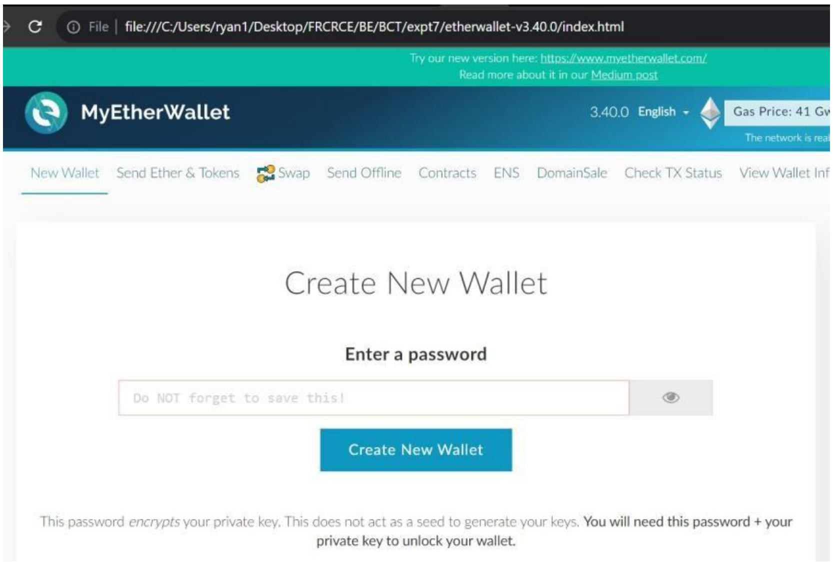
v3.40.0 Latest

Release: v3.40.0

▾ Assets 6

chrome-extension-v3.40.0.zip	3.48 MB	Sep 18, 2019
chrome-extension-v3.40.0.zip.sig	543 Bytes	Sep 18, 2019
etherwallet-v3.40.0.zip	3.46 MB	Sep 18, 2019
etherwallet-v3.40.0.zip.sig	543 Bytes	Sep 18, 2019
Source code (zip)		Sep 18, 2019
Source code (tar.gz)		Sep 18, 2019

You can download the latest release, unzip it, and open index.html.



File | file:///C:/Users/ryan1/Desktop/FRCRCE/BE/BCT/expt7/etherwallet-v3.40.0/index.html

Try our new version here: https://www.myetherwallet.com/
Read more about it in our Medium post

MyEtherWallet 3.40.0 English Gas Price: 41 Gw
The network is real

Create New Wallet

Enter a password

Do NOT forget to save this!

Create New Wallet

This password *encrypts* your private key. This does not act as a seed to generate your keys. You will need this password + your private key to unlock your wallet.

Step 4:

Write Smart Contract in Solidity

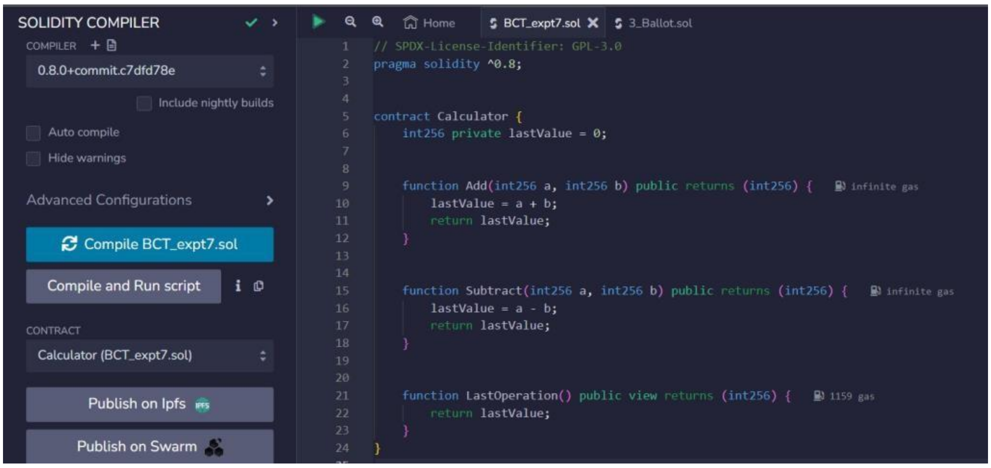
Open Remix IDE https://remix.ethereum.org/

We will use it to write and compile our smart contract code.

```
pragma solidity ^0.4.24;
contract Calculator {
    int private lastValue = 0;
    function Add(int a, int b) public returns (int)
        {lastValue = a + b;
        return lastValue;
    }
    function Subtract(int a, int b) public returns (int)
        {lastValue = a - b;
        return lastValue;
    }
    function LastOperation() public constant returns (int)
        {return lastValue;
    }
}
```

In the above code you can see there is one field *lastValue*, which stores the last operation performed. Here LastOperation has a constant keyword, but add and subtract do not. because LastOperation doesn't change the state whether or not add and subtract are mutating it.

Open [Remix IDE]() and replace the existing code with the above one. Then click *Start to compile* and if it compiles successfully, you can see your contract name (Calculator here) in the green box, below the details button. On click of the details button, you can see all the data about the compiled contract, including generated byte code, which we will be using further.



SOLIDITY COMPILER

COMPILER: 0.8.0+commit.c7dfd78e

□ Include nightly builds

□ Auto compile

□ Hide warnings

CONTRACT: Calculator (BCT_expt7.sol)

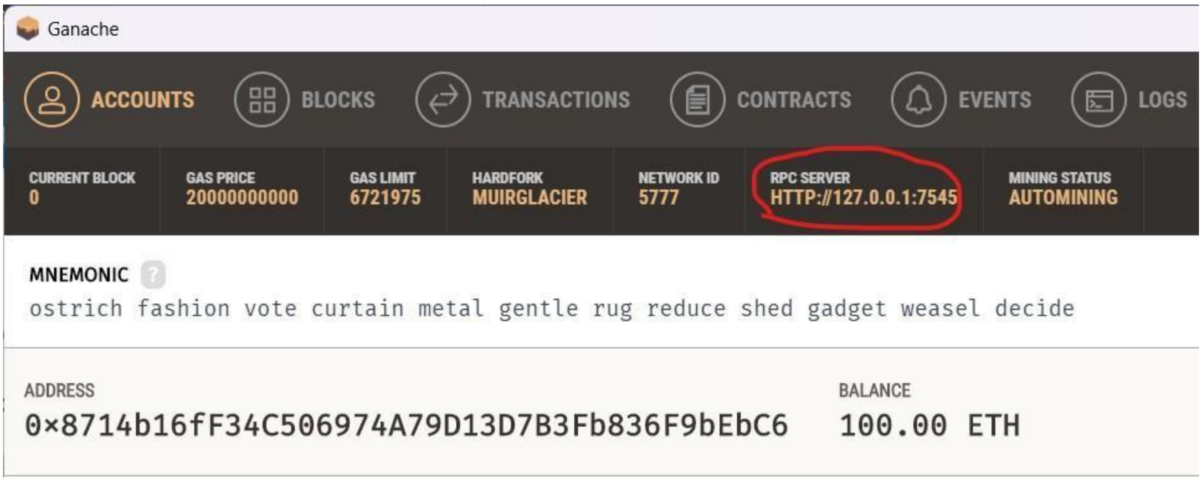
```
// SPDX-License-Identifier: GPL-3.0
pragma solidity ^0.8;


contract Calculator {
    int256 private lastValue = 0;


    function Add(int256 a, int256 b) public returns (int256) {
        lastValue = a + b;
        return lastValue;
    }


    function Subtract(int256 a, int256 b) public returns (int256) {
        lastValue = a - b;
        return lastValue;
    }


    function LastOperation() public view returns (int256) {
        return lastValue;
    }
}
```

Your code is compiled successfully, now let's deploy and test it.

Step 5:

Deploy Smart Contract to Private Ethereum Blockchain & Test It

We will deploy it to blockchain running in Ganache with the help of MyEtherWallet. Open Ganache and grab *RPC SERVER* URL.



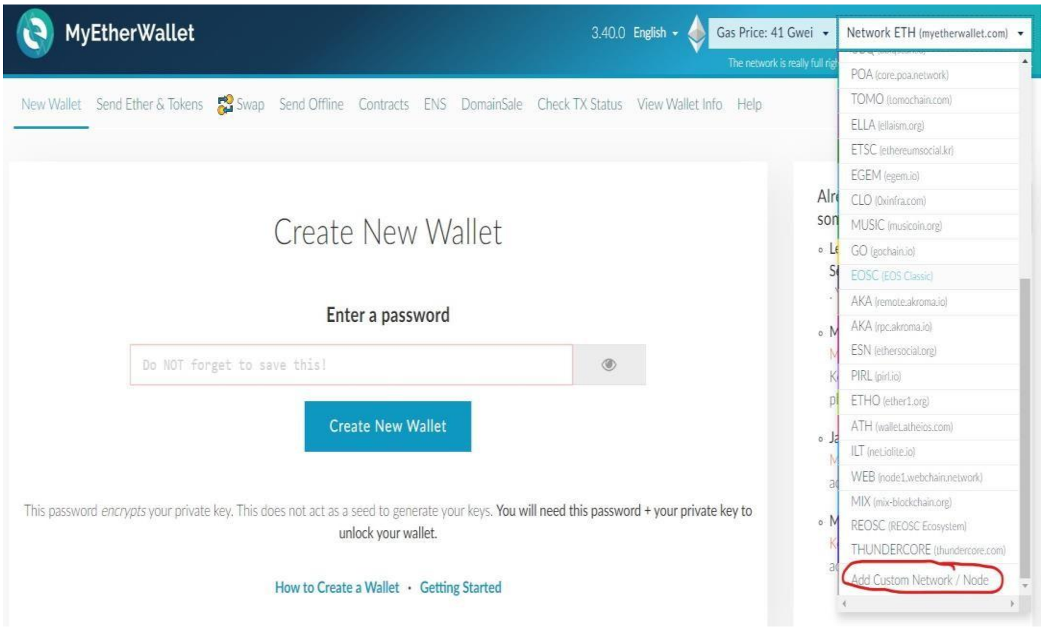
CURRENT BLOCK 0
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MUIRGLACIER
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING

MNEMONIC
ostrich fashion vote curtain metal gentle rug reduce shed gadget weasel decide

ADDRESS
0×8714b16fF34C506974A79D13D7B3Fb836F9bEbC6

BALANCE
100.00 ETH

Now, open index.html of MyEhterWallet, and connect to this blockchain. To do this click on dropdown as shown in the image and select Add Custom Network/Node



Create New Wallet

Enter a password

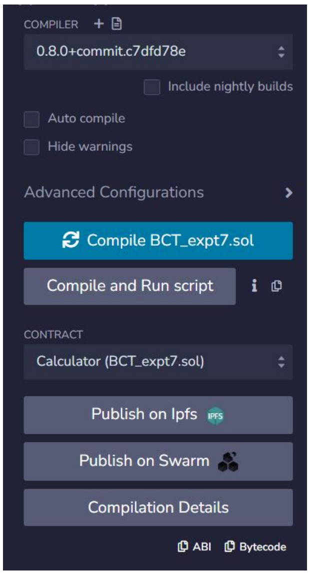
Do NOT forget to save this!

This password *encrypts* your private key. This does not act as a seed to generate your keys. You will need this password + your private key to unlock your wallet.

You will see the success message on the bottom.

Now go to contacts in the menu and click deploy the contract, here you need Byte Code of your smart contract to deploy, which we will get from details of the contract in Remix IDE.

Go back to Remix IDE, click on details & copy BYTECODE.



COMPILER

0.8.0+commit.c7dfd78e

□ Include nightly builds

□ Auto compile

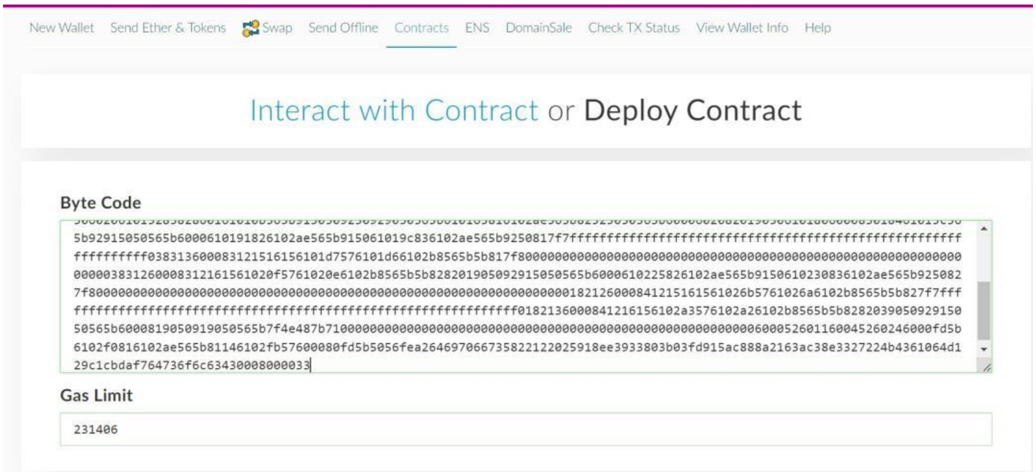
□ Hide warnings

CONTRACT

Calculator (BCT_expt7.sol)

We need to pick the contents of *an object*, copy it, and paste in Byte Code in Deploy Contract in MyEtherWallet.

Right after pasting Byte Code, Gas Limit should appear. To access your wallet, MyEtherWallet needs a private key. Wallet? Yes, let me explain wallet to you in the next step.



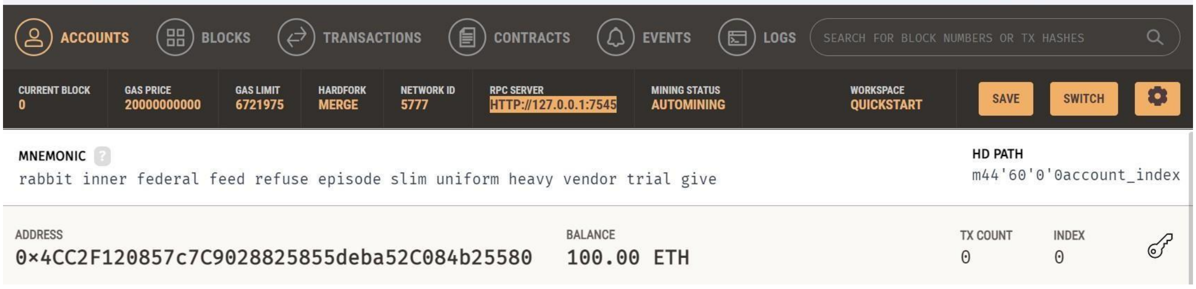
Byte Code

```
5b92915050565b6000610191826102ae565b915061019c836102ae565b9250817f7fffffffffffffffffffffffffffffffffffffffffffffffffffff
ffffffffff038313600083121516156101d7576101d66102b8565b5b817f800000000000000000000000000000000000000000000000000000000000
0000038312600083121615610 20f5761020e6102b8565b5b828201905092915050565b6000610225826102ae565b915061023083 6102ae565b925082
7f800000000000000000000000000000000000000000000000000000000000000001821260008412151615610 26b5761026a6102b8565b5b827f7fff
ffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff0182136000841216156102a3576102a26102b8565b5b828203905092 9150
50565b60008190509190505 65b7f4e487b7100000000000000000000000000000000000000000000000000000000600052601160045260246000fd5b
6102f0816102ae565b81146102fb57600080fd5b5056fea26469706673582212202591 8ee3933803b03fd915ac888a2163ac38e3327224b4361064d1
29c1cbdaf764736f6c63430008000033
```

Gas Limit

231406

To access your wallet, MyEtherWallet needs a private key. Ganache will have a few accounts created by default. The place where the information about the account is stored is referred to as a wallet. We will use one of those accounts.



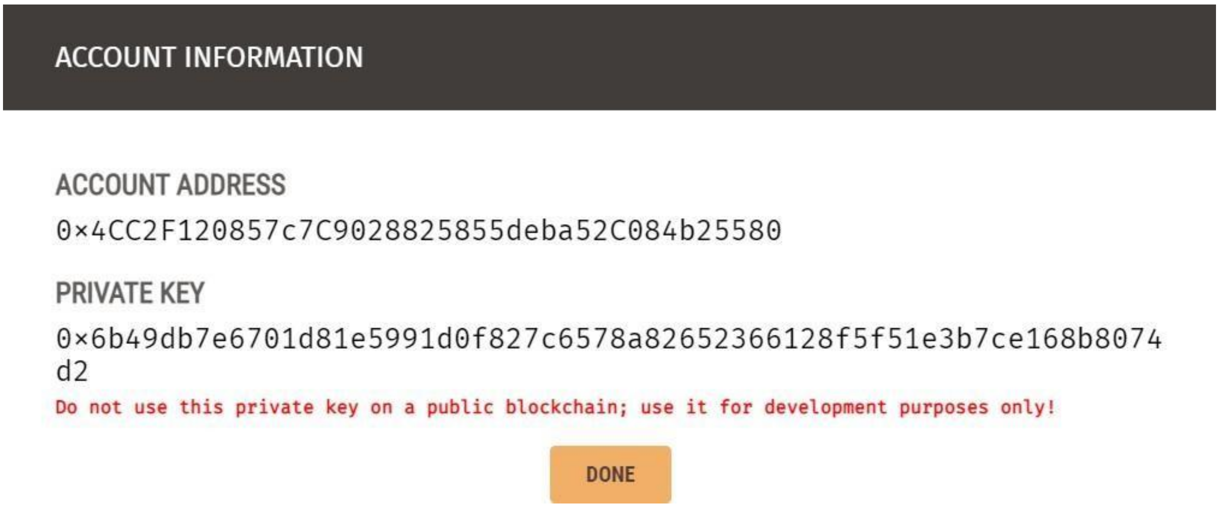
CURRENT BLOCK 0 | GAS PRICE 20000000000 | GAS LIMIT 6721975 | HARDFORK MERGE | NETWORK ID 5777 | RPC SERVER HTTP://127.0.0.1:7545 | MINING STATUS AUTOMINING | WORKSPACE QUICKSTART

MNEMONIC
rabbit inner federal feed refuse episode slim uniform heavy vendor trial give

HD PATH
m44'60'0'0account_index

ADDRESS	BALANCE	TX COUNT	INDEX
0×4CC2F120857c7C9028825855deba52C084b25580	100.00 ETH	0	0

Open Ganache and copy a key from one of the wallets.



ACCOUNT INFORMATION

ACCOUNT ADDRESS

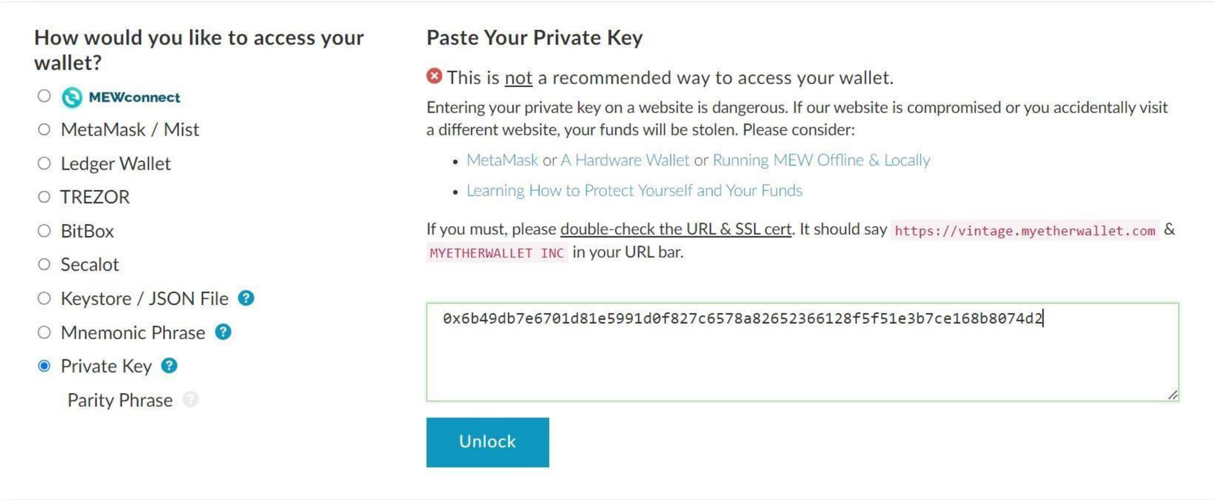
0×4CC2F120857c7C9028825855deba52C084b25580

PRIVATE KEY

0×6b49db7e6701d81e5991d0f827c6578a82652366128f5f51e3b7ce168b8074
d2

Do not use this private key on a public blockchain; use it for development purposes only!

Now, use this in the MyEtherWallet, and click **Unlock**.



How would you like to access your wallet?

○ MEWconnect
○ MetaMask / Mist
○ Ledger Wallet
○ TREZOR
○ BitBox
○ Secalot
○ Keystore / JSON File
○ Mnemonic Phrase
● Private Key
Parity Phrase

Paste Your Private Key

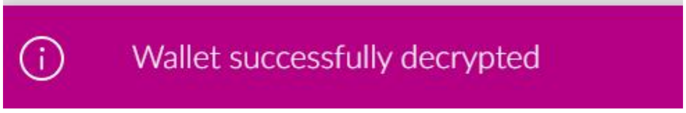
This is not a recommended way to access your wallet.

Entering your private key on a website is dangerous. If our website is compromised or you accidentally visit a different website, your funds will be stolen. Please consider:

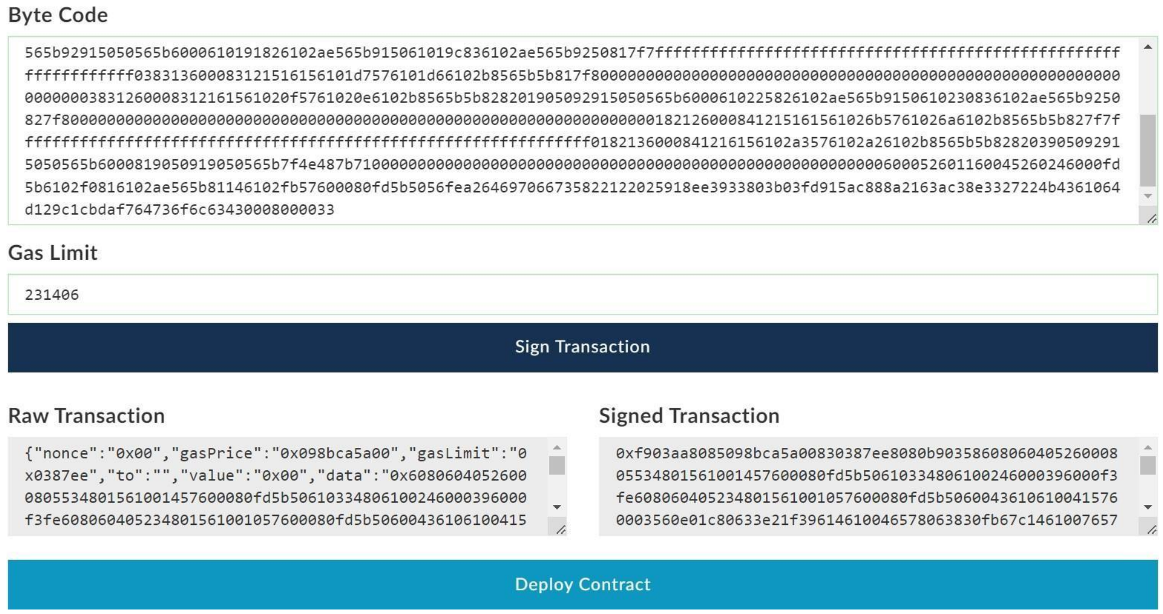
- MetaMask or A Hardware Wallet or Running MEW Offline & Locally
- Learning How to Protect Yourself and Your Funds

If you must, please double-check the URL & SSL cert. It should say `https://vintage.myetherwallet.com` & `MYETHERWALLET INC` in your URL bar.

```
0x6b49db7e6701d81e5991d0f827c6578a82652366128f5f51e3b7ce168b8074d2
```



Wallet successfully decrypted



Byte Code

```
565b92915050565b6000610191826102ae565b915061019c836102ae565b9250817f7ffffffffffffffffffffffffffffffffffffffffffffffffff
fffffffffff03831360008312151616156101d7576101d66102b8565b5b817f80000000000000000000000000000000000000000000000000000000
000000038312600083121615615610204f5761020e6102b8565b5b8282019050929150505650565b6000610225826102ae565b915061023083610 2ae565b9250
827f800000000000000000000000000000000000000000000000000000000000000182126000841215161561026b5761026a6102b8565b5b827f7f
fffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff0182136000841216156102a3576102a26102b8565b5b82820390509291
5050565b6000819050919050565b7f4e487b71000000000000000000000000000000000000000000000000000000006000526011600452602460 00fd
5b6102f0816102ae565b81146102fb57600080fd5b5056fea2646970667358221220259 18ee3933803b03fd915ac888a2163ac38e3327224b4361064
d129c1cbdaf764736f6c63430008000033
```

Gas Limit

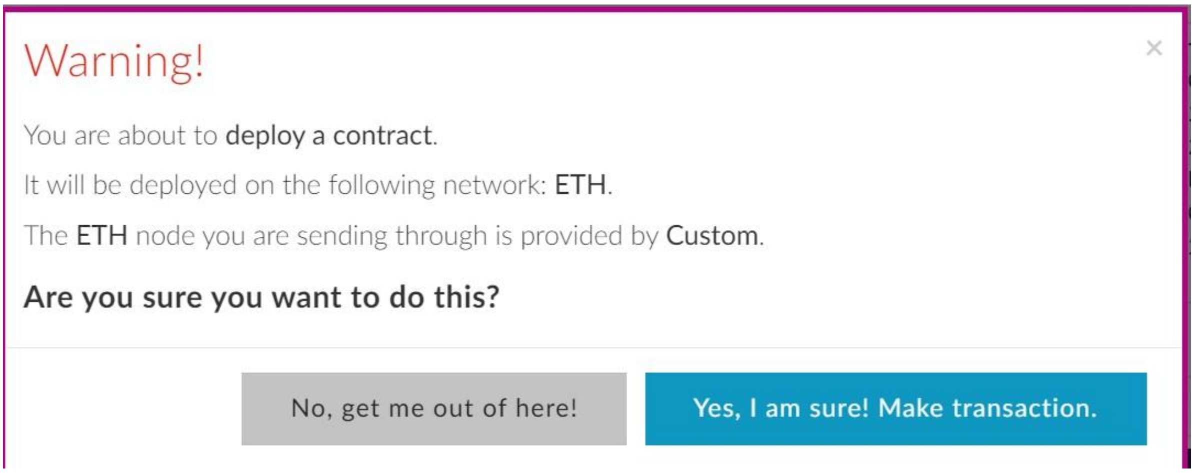
```
231406
```

Raw Transaction

```
{"nonce":"0x00","gasPrice":"0x098bca5a00","gasLimit":"0
x0387ee","to":"","value":"0x00","data":"0x6080604052600
080553480156100145760008 0fd5b5061033480610024600039600 0
f3fe6080604052348015610010576000 80fd5b50600436106100415
```

Signed Transaction

```
0xf903aa8085098bca5a00830387ee8080b90358608060405260008
0553480156100145760008 0fd5b50610334806100246000396000f3
fe6080604052348015610010576000 80fd5b5060043610610041576
0003560e01c80633e21f39614610046578063830fb67c1461007657
```



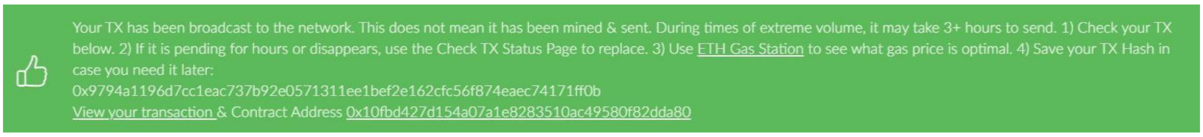
Warning!

You are about to **deploy a contract**.

It will be deployed on the following network: ETH.

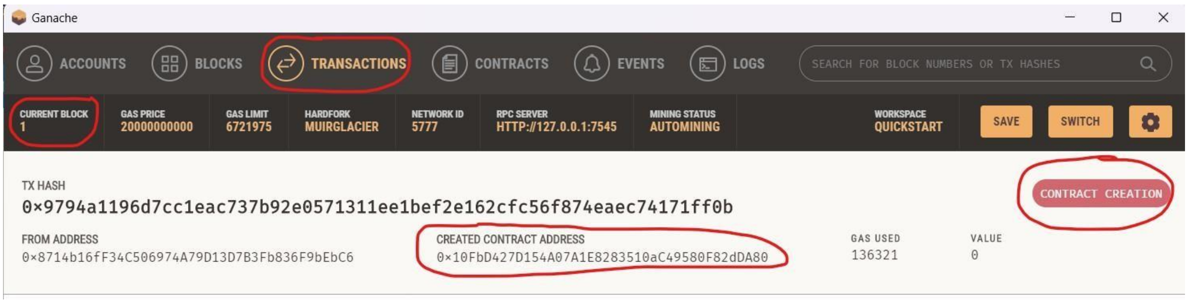
The ETH node you are sending through is provided by Custom.

Are you sure you want to do this?



Your TX has been broadcast to the network. This does not mean it has been mined & sent. During times of extreme volume, it may take 3+ hours to send. 1) Check your TX below. 2) If it is pending for hours or disappears, use the Check TX Status Page to replace. 3) Use ETH Gas Station to see what gas price is optimal. 4) Save your TX Hash in case you need it later:
0x9794a1196d7cc1eac737b92e0571311ee1bef2e162cfc56f874eaec74171ff0b
View your transaction & Contract Address 0x10fbd427d154a07a1e8283510ac49580f82dda80

Let’s verify in Ganache whether it’s deployed successfully. Go to transactions in Ganache, here you can see one *Contract Creation* transaction is created in a block. Congrats! Your smart contract is deployed successfully.



CURRENT BLOCK 1 | GAS PRICE 20000000000 | GAS LIMIT 6721975 | HARDFORK MUIRGLACIER | NETWORK ID 5777 | RPC SERVER HTTP://127.0.0.1:7545 | MINING STATUS AUTOMINING | WORKSPACE QUICKSTART

TX HASH
0×9794a1196d7cc1eac737b92e0571311ee1bef2e162cfc56f874eaec74171ff0b

FROM ADDRESS
0×8714b16fF34C506974A79D13D7B3Fb836F9bEbC6

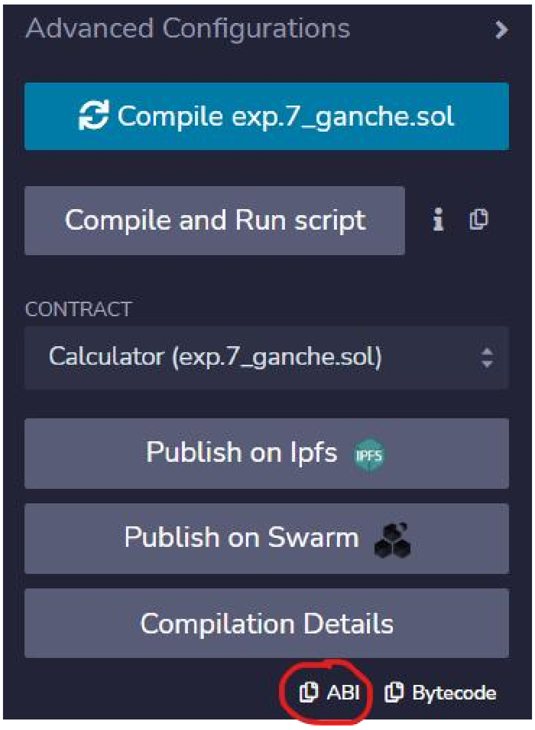
CREATED CONTRACT ADDRESS
0×10FbD427D154A07A1E8283510aC49580F82dDA80

GAS USED
136321

VALUE
0

Let’s test it now, click to open the above-shown transaction, and copy **CREATED CONTRACT ADDRESS**. Go to MyEtherWallet & under Contracts, click Interact with Contract, paste the Contract Address here.

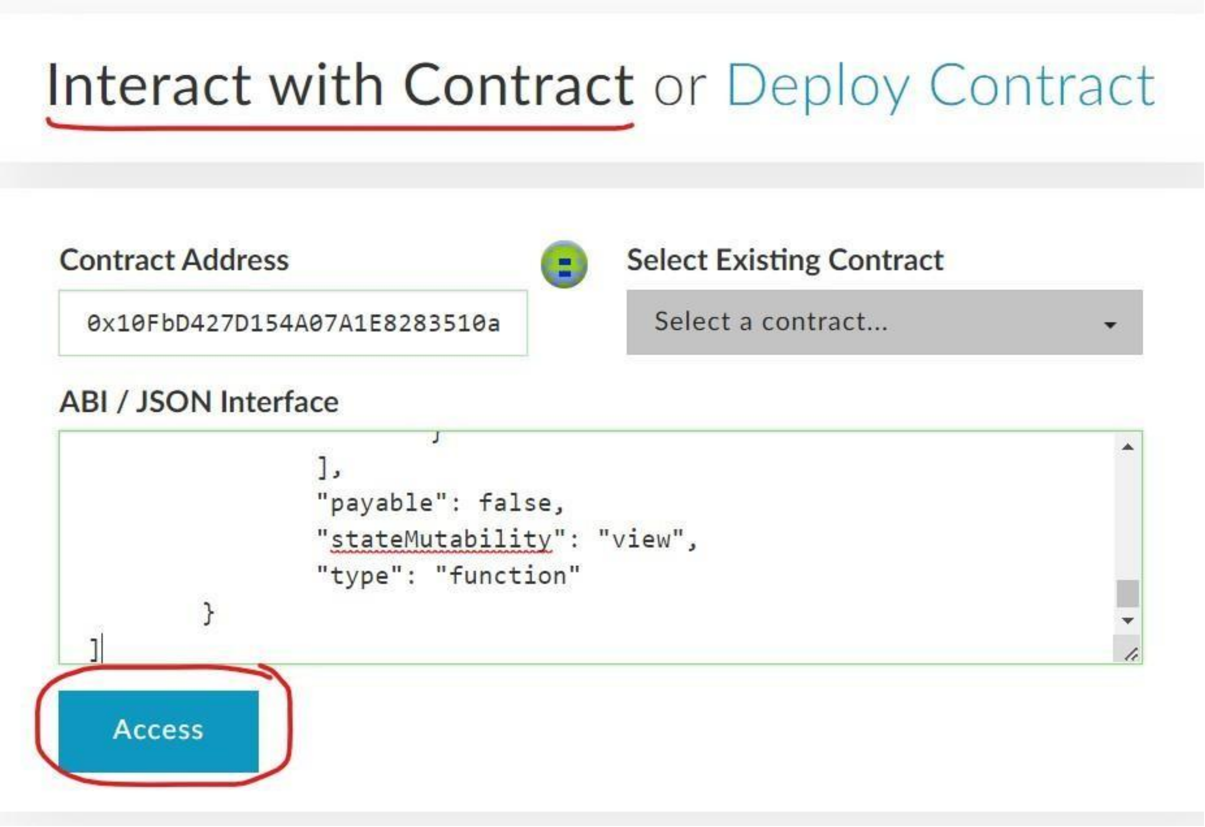
For the ABI interface, you need to go to Remix IDE then details, get ABI form here and paste. ABI interface contains information about functions available in a smart contract.



CONTRACT

Calculator (exp.7_ganche.sol)

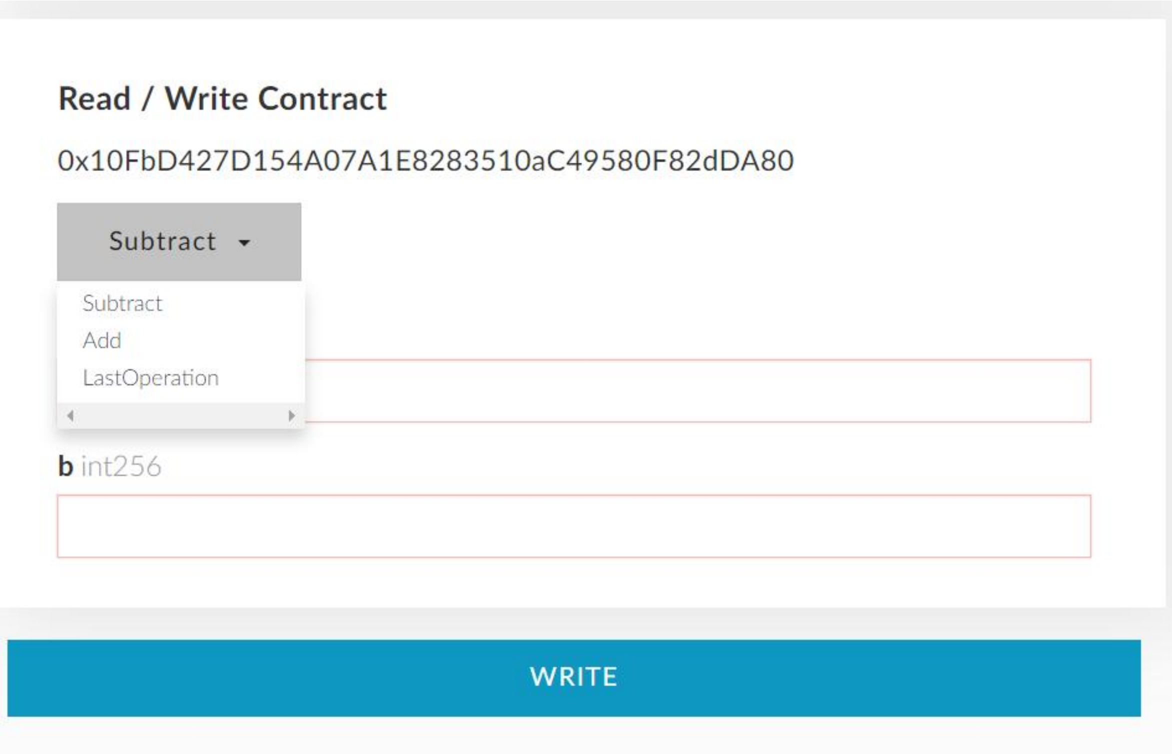
After clicking Access, you can see all available functions in your smart contract.



Contract Address: 0x10FbD427D154A07A1E8283510a

ABI / JSON Interface

```
                ],
                "payable": false,
                "stateMutability": "view",
                "type": "function"
        }
]
```

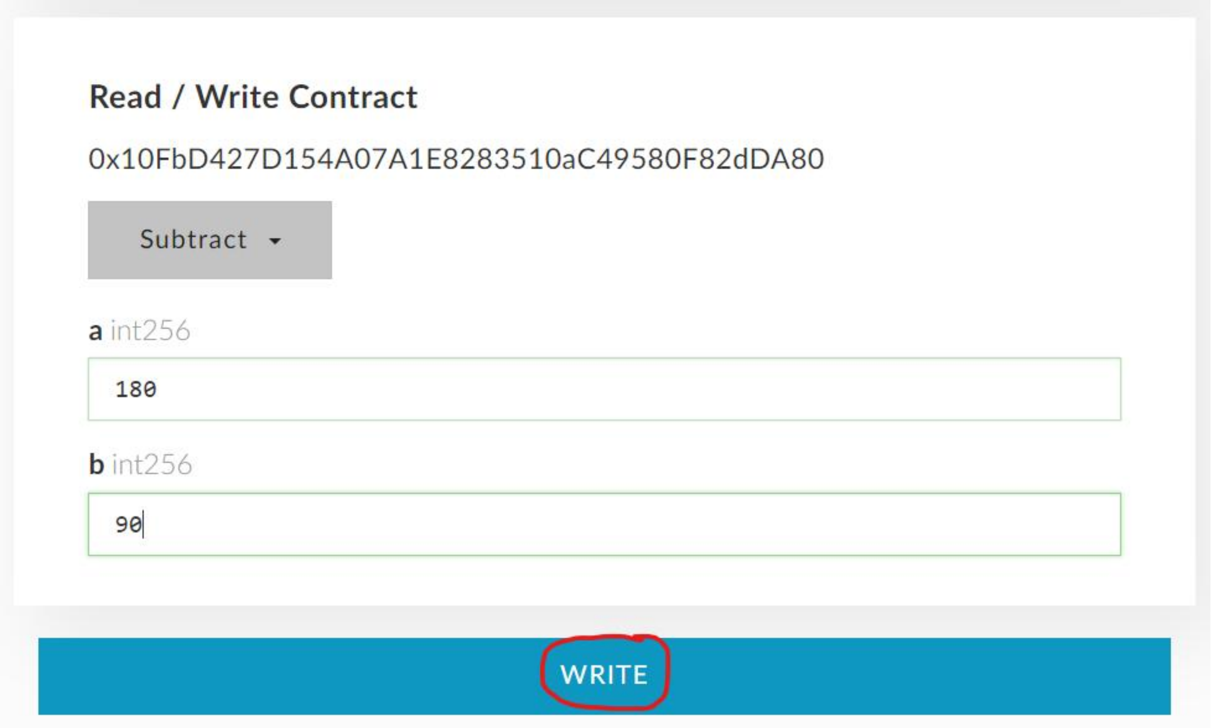


Read / Write Contract

0x10FbD427D154A07A1E8283510aC49580F82dDA80

b int256

Let’s call them and test.



Read / Write Contract

0x10FbD427D154A07A1E8283510aC49580F82dDA80

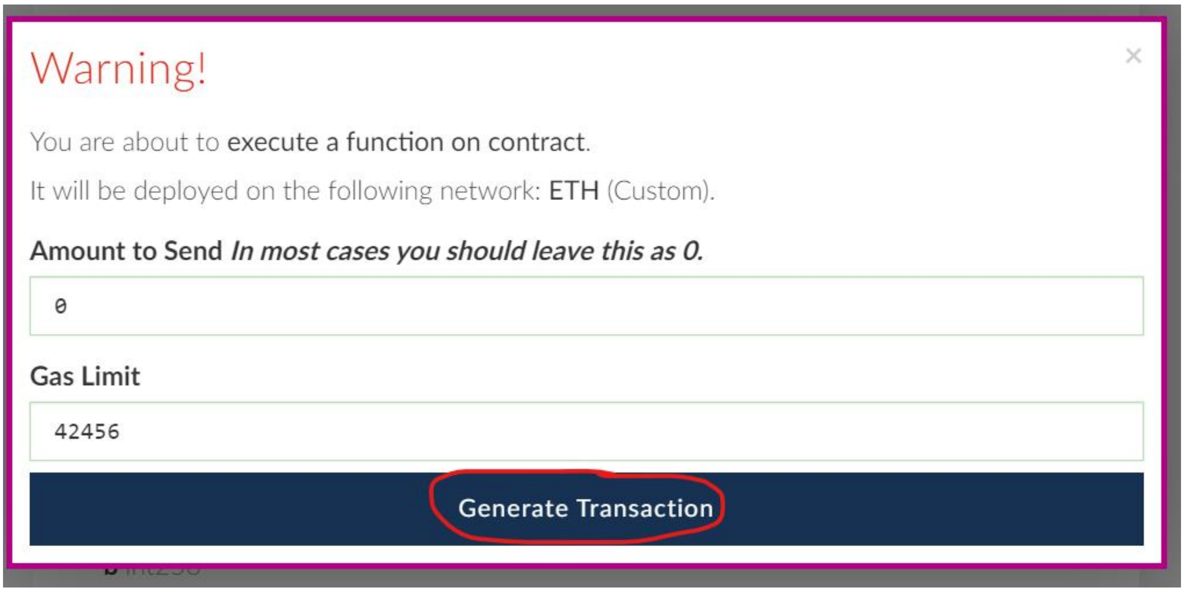
a int256

180

b int256

90

While calling Add or Subtract, it will show a warning before making a transaction, along with the gas limit.



Warning!

You are about to **execute a function on contract.**

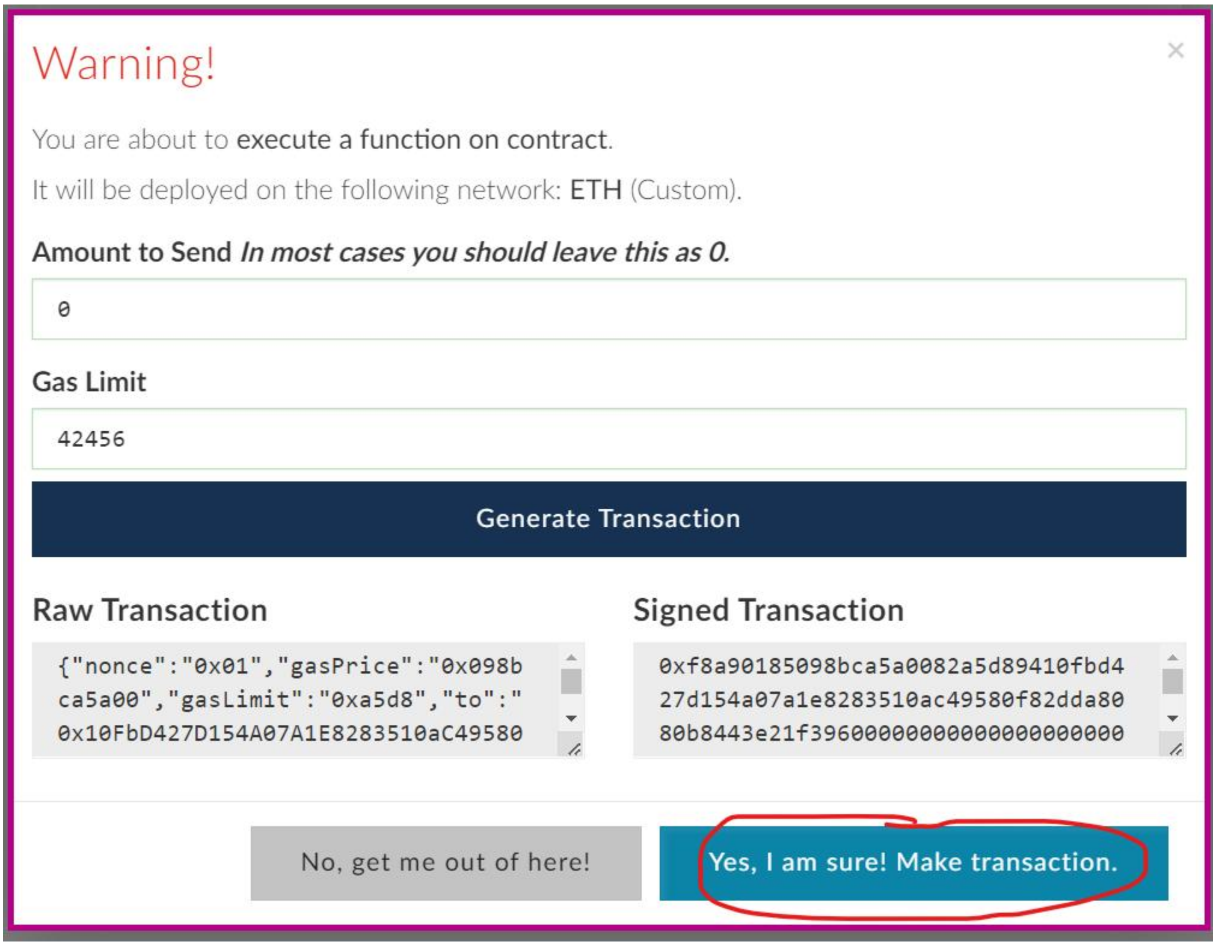
It will be deployed on the following network: **ETH** (Custom).

Amount to Send ***In most cases you should leave this as 0.***

0

Gas Limit

42456



Warning!

You are about to execute a function on contract.

It will be deployed on the following network: ETH (Custom).

Amount to Send *In most cases you should leave this as 0.*

0

Gas Limit

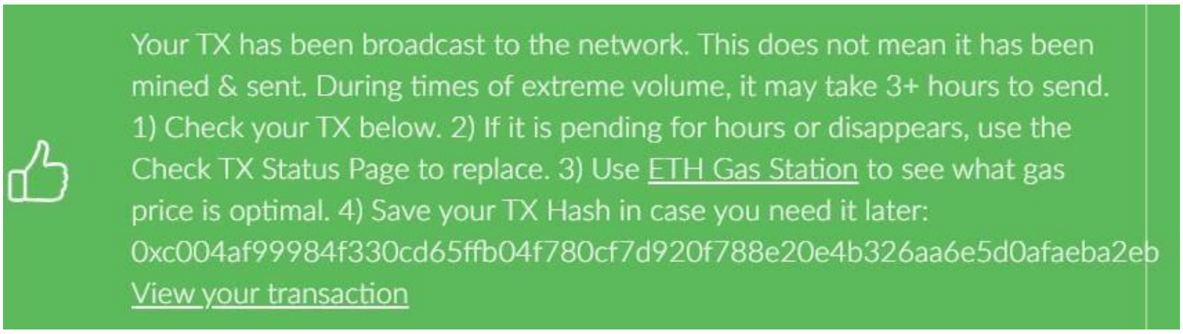
42456

Raw Transaction

```
{"nonce":"0x01","gasPrice":"0x098b
ca5a00","gasLimit":"0xa5d8","to":"
0x10FbD427D154A07A1E8283510aC49580
```

Signed Transaction

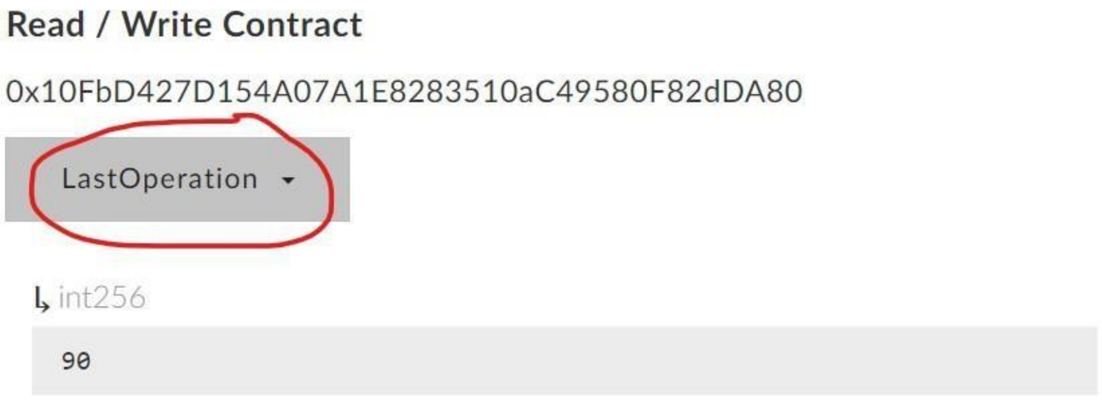
```
0xf8a90185098bca5a0082a5d89410fbd4
27d154a07a1e8283510ac49580f82dda80
80b8443e21f3960000000000000000000000
```



Your TX has been broadcast to the network. This does not mean it has been mined & sent. During times of extreme volume, it may take 3+ hours to send. 1) Check your TX below. 2) If it is pending for hours or disappears, use the Check TX Status Page to replace. 3) Use ETH Gas Station to see what gas price is optimal. 4) Save your TX Hash in case you need it later: 0xc004af99984f330cd65ffb04f780cf7d920f788e20e4b326aa6e5d0afaeba2eb

View your transaction

But in LastOperation no warning will appear because it adds no data to the blockchain.



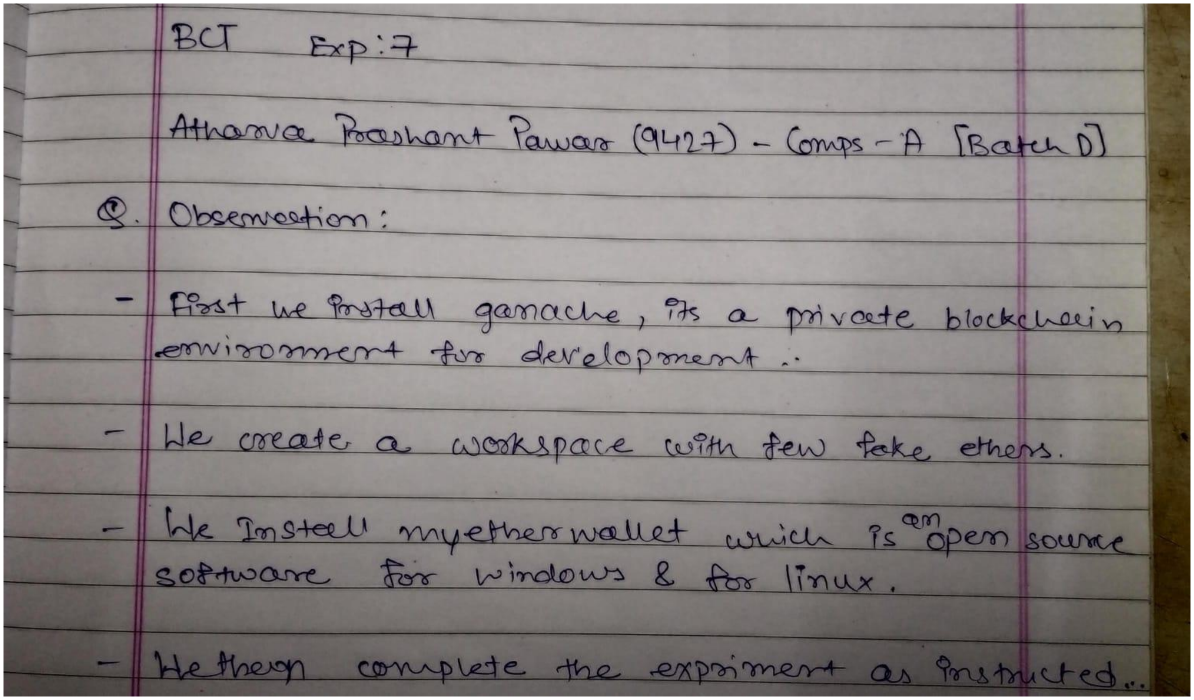
Read / Write Contract

0x10FbD427D154A07A1E8283510aC49580F82dDA80

↳ int256

```
90
```

Conclusion: We have used ganache to perform transactions with smart contract by using ganache Platform.



BCT Exp: 7

Atharva Prashant Pawar (9427) - Comps - A [Batch D]

Q. Observation:

- First we install ganache, its a private blockchain environment for development.

- We create a workspace with few fake ethers.

- We Install myetherwallet which is an open source software for windows & for linux.

- We then complete the expriment as instructed..