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Test 1: Truly Random Number Generator (7/8/2021)

In classical computing we cannot really generate a random number. The best we can do is to generate a pseudorandom number to approximate the real random number. However, in quantum computation, we can generate a truly random number. In this assignment you are asked to create a quantum program on IBM Q to generate a truly random 5-bit number.

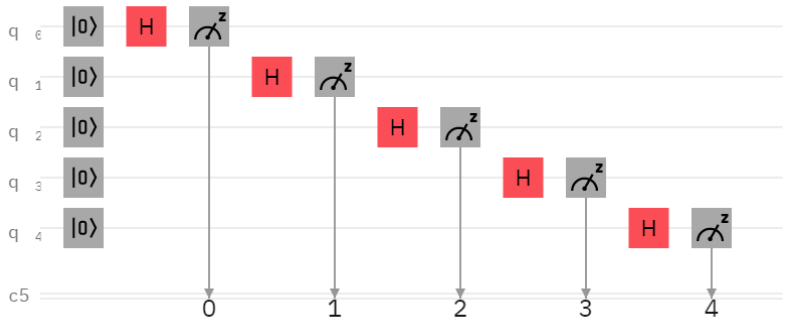
Method 1

```
OPENQASM 2.0;
include "qelib1.inc";

qreg q[5];
creg c[5];

reset q[0];
reset q[1];
reset q[2];
reset q[3];
reset q[4];

h q[0];
measure q[0] -> c[0];
h q[1];
measure q[1] -> c[1];
h q[2];
measure q[2] -> c[2];
h q[3];
measure q[3] -> c[3];
h q[4];
measure q[4] -> c[4];
```



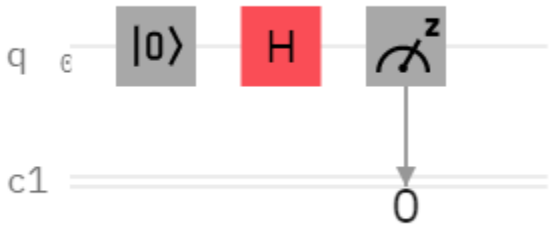
This approach uses Hadamard gate to change probability qubit to 50 percent of 1 state and 50 percent of 0 state. **Method 1**: Run the circuit one time then we get 5 random classical bits (i.e., 10101).

Method 2

```
OPENQASM 2.0;
include "qelib1.inc";

qreg q[1];
creg c[1];

reset q[0];
h q[0];
measure q[0] -> c[0];
```



Method 2: Run this circuit 5 time and then we get 5 random classical bits like a **Method 1**.