QWorld Global QBronze Workshop | Homework Day 2

إجمالي النقاط 20/20

عنوان البريد الإلكتروني *

m.saber87@hotmail.com

* Name, surname

Mohamed Saber Ahmad

Questions

Code

```
q2 = QuantumRegister(1,"qreg")
c2 = ClassicalRegister(1,"creg")
qc2 = QuantumCircuit(q2,c2)

Your code here1#
Your code here2#

qc2.measure(q2,c2)
job = execute(qc2,Aer.get_backend('qasm_simulator'),shots=100)
counts = job.result().get_counts(qc2)
print(counts) # counts is a dictionary
```

1/1 Suppose that the code above creates the following quantum state. What should replace #Your code here1 ? (Hint: Think about the vector representation of this state to start with if you are stuck) ✓

$$\frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$$

✓ qc2.x(q2[0])

1/1 Suppose that the code above creates the following quantum state. What should replace #Your code here2? (Hint: Think about the vector representation of this state to start with if you are stuck) ✓

$$\frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$$

✓ qc2.h(q2[0])

2/2 Mark the ones which are valid quantum vectors. (Think about their transpose) ✓

- [ ] (1/4 0 1/4 0)
- [x] ✓ (-1/2 1/2 1/2 1/2)
- [x] ✓ (0 -1 0 0)
- [x] ✓ (1/√2 0 0 -1/√2)
- [ ] (1/√2 1/√2 1/√2 1/√2)
- [x] ✓ (2/3 -1/3 2/3 0)

2/2 We have a circuit containing a single qubit which we have simulated for 1024 times. The outcome is {'1': 502, '0': 522}. What can be the angle of the qubit? (select more than one) ✓

- ✓ 45 ☑
- ✓ 135 ☑
- 30 ☐
- 90 ☐
- 60 ☐
- 180 ☐

1/1 ?⟨What is the result of Z|0 ✓

- ✓ |0⟩ ◉
- -|1⟩ ○
- -|0⟩ ○
- |1⟩ ○

1/1 ?⟨What is the result of Z|1 ✓

- -|0⟩ ○
- ✓ -|1⟩ ◉
- |1⟩ ○
- |0⟩ ○

2/2 What is the result of HZH|0⟩? (First apply H and then Z and then H again) ✓

- -|1⟩ ○
- ✓ |1⟩ ◉
- |0⟩ ○
- -|0⟩ ○

2/2 .Mark the true ones ✓

- ✓ Square of a reflection matrix is the identity matrix. ☑
- Square of a rotation matrix is identity matrix. ☐
- ✓ In the real plane, the angle between the state |0⟩ and |1⟩ is 90 degrees. ☑
- All entries of a reflection matrix should be positive ☐
- Hadamard is a rotation matrix. ☐

Code

```
from math import pi

q =  QuantumRegister(1) # quantum register with a single qubit
c = ClassicalRegister(1) # classical register with a single bit
qc = QuantumCircuit(q,c) # quantum circuit with quantum and classical registers

Your code here#


measure the qubit #
qc.measure(q,c)
```

2/2 We have a circuit with a single qubit created with the code given above. What should come to #Your code here if we want to rotate the qubit by the angle 60 degrees?(When you are writing a fraction, write it in reduced form e.g. instead of 10*pi/4, write 5*pi/2, do not leave any space ✓

next to commas)

✓ qc.ry(2*pi/3,q[0])

2/2 If the angle of a real valued qubit is x, what is the probability of observing state |1⟩? ✓

- cos(x)+sin(x)
- cos^2(x)
- cos(x)
- sin(x)
- ✓ sin^2(x)

Code

```
q2 = QuantumRegister(2,"qreg")
c2 = ClassicalRegister(2,"creg")
qc2 = QuantumCircuit(q2,c2)


qc2.x(q2[1])
qc2.z(q2[1])

qc2.measure(q2,c2)
job = execute(qc2,Aer.get_backend('qasm_simulator'),shots=100)
counts = job.result().get_counts(qc2)
print(counts) # counts is a dictionary
```

2/2 What will be the output of the above code? ✓

- {'-10': 100}
- {'-11': 100}
- ✓ {'10': 100}
- {'1': 100, '1': 100}

Code

```
q = QuantumRegister(2,"q")
c = ClassicalRegister(2,"c")
qc = QuantumCircuit(q,c)

qc.x(q[0])

qc.measure(q[0],c[0])

qc.h(q[1]).c_if(c,0)

qc.measure(q,c)
```

2/2 What will be the output of the above code? ✓

- ✓ {'01': 1024}
- {'00': 1024}
- {'10': 502, '11': 522}
- {'11': 1024}

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