Homework 3

Due Mar 11 at 8:29pm **Points** 20 **Questions** 11 **Time Limit** None
Allowed Attempts Unlimited

Take the Quiz Again

Attempt History

	Attempt	Time	Score
KEPT	Attempt 10	2 minutes	18 out of 20
LATEST	Attempt 10	2 minutes	18 out of 20
	Attempt 9	2 minutes	18 out of 20
	Attempt 8	2 minutes	16 out of 20
	Attempt 7	1 minute	16 out of 20
	Attempt 6	2 minutes	16 out of 20
	Attempt 5	3 minutes	16 out of 20
	Attempt 4	7 minutes	16 out of 20
	Attempt 3	6 minutes	14 out of 20
	Attempt 2	5 minutes	12 out of 20
	Attempt 1	143 minutes	13 out of 20

ⓘ Correct answers are hidden.

Score for this attempt: **18** out of 20
Submitted Mar 9 at 11:45am
This attempt took 2 minutes.

Question 1

2 / 2 pts

[Q44-01] We have a circuit with a single qubit created with the code given below. What should replace "#Your code here" if we want to rotate the qubit by an angle of 120 degrees?

*If your answer includes a fraction, write it in reduced form e.g. instead of 10*pi/4, write 5*pi/2. Moreover, do not leave any space next to commas.*

```
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)
```

qc.ry(4*pi/3,q[0])

Question 2

1 / 1 pts

[**Q48-01**] What is the result of $Z|0\rangle$?

- $|0\rangle$
- $-|0\rangle$
- $|1\rangle$
- $-|1\rangle$

Question 3

2 / 2 pts

[**Q48-03**] What is the result of $HZH|0\rangle$?

- $-|0\rangle$
- $|1\rangle$
- $|0\rangle$
- $-|1\rangle$

Question 4

2 / 2 pts

[**Q48-05**] Mark the true statements.

- [ ] All entries of a rotation operator should be positive.
- [x] Square of a reflection operator is the identity matrix.
- [ ] Square of a rotation operator is identity matrix.
- [ ] Hadamard is a rotation operator.
- [x] In the real plane, the angle between the state $|0\rangle$ and $|1\rangle$ is 90 degrees.

Question 5

1 / 1 pts

[**Q60-06**] What should be the dimension of a vector representing a quantum system with 5 qubits?

- ( ) 1
- (•) 32
- ( ) 10
- ( ) 5

Question 6

2 / 2 pts

[**Q60-01**] What is the result of applying CNOT to the quantum state $\frac{|01\rangle+|11\rangle}{\sqrt{2}}$ if the first qubit is the control and second qubit is the target? The ordering followed is |first qubit, second qubit ⟩.

- ( ) $|01\rangle$
- ( ) $|11\rangle$
- ( ) $\frac{|11\rangle+|01\rangle}{\sqrt{2}}$

- $\frac{|01\rangle+|10\rangle}{\sqrt{2}}$

Question 7

2 / 2 pts

[**Q60-07**] We have a circuit with two qubits created using the code given below. What should replace "#Your code here" if we want to obtain the state $\frac{|00\rangle+|01\rangle}{\sqrt{2}}$? (Follow Qiskit's ordering of qubits)

```
qc = QuantumCircuit(2)
#Your code here
```

qc.h(0)

Incorrect

Question 8

0 / 2 pts

[**Q60-02**] Mark the true statements.

- [ ] It is not possible to apply a NOT operator controlled by two qubits at the same time.
- [x] Unitary simulator returns the current state vector.
- [x] It is possible to apply a NOT gate to a target qubit depending on whether some qubit is in state 0.
- [ ] We can check the value of a qubit by the statement if(q[0]==1).

Question 9

2 / 2 pts

[**Q60-03**] If the output of the following code is to be {'01': 500, '10': 500}, what should you replace "#Your code here" with?

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


qc2.h(q2[0])
qc2.cx(q2[0],q2[1])
#Your code here

qc2.measure(q2,c2)
job = execute(qc2,Aer.get_backend('qasm_simulator'),shots=1000)
counts = job.result().get_counts(qc2)
print(counts) # counts is a dictionary
```

qc2.x(q2[0])

Question 10

2 / 2 pts

[**Q60-05**] How do you obtain the state $\frac{|10\rangle+|01\rangle}{\sqrt{2}}$ if you start with the state $\frac{|00\rangle+|11\rangle}{\sqrt{2}}$ (Order: |first,second⟩)

- Apply CNOT where second qubit is the control first qubit is the target.
- Apply H to both qubits.
- Apply Z to second qubit.
- (●) Apply X to first qubit.

Question 11

2 / 2 pts

[**Q60-04**] Suppose you have a circuit with 3 qubits. What happens when you apply H to only the second qubit?

- ☐ We obtain an equal superposition of eight states.
- ☐ H is applied to others as well.

- [ ] This is not possible.
- [x] Others are not changed, as if I is applied to them.
- [x] We obtain the state $\frac{|010\rangle+|000\rangle}{\sqrt{2}}$

Quiz Score: **18** out of 20