

QWorld Global QBronze Wokrshop | Homework Day 5 Total points 20/20 Email address \* m.saber87@hotmail.com

Mohamed Saber Ahmad

## Questions

Name, surname \*

<b>/</b>	Which one is true about Grover's Search?	3/3
$\circ$	You need to know what is inside the oracle to flip the sign of the marked element.	
•	None of the above.	/
$\bigcirc$	In Grover's search, if you run the algorithm for more iterations you get a better result of the search of the sea	ılt.
$\bigcirc$	Grover's search provides exponential speedup.	
$\circ$	All of the above.	

- ✓ Let's say we have 4 elements in the database. If after the first query phase the resulting state is  $1/2(|00\rangle-|01\rangle+|10\rangle+|11\rangle)$ , which one is the marked element?
- |01> () |11<sub>)</sub>
- (10) O |00)
- How do we flip the sign of the marked element without knowing which 2/2 element is marked?
- O We can not, we should know the marked element beforehand
- We multiply all amplitudes by -1. We use a procedure called phase kickback
- ✓ When represented visually, what does inversion phase correspond to? 2/2
- Reflection over the equal superposition state
- Reflection over y-axis
- Reflection over x-axis
- Reflection over 45 degrees

How many qubits do you need to represent 64 elements? (Not counting 2/2 any extra qubits, only to represent elements)  32  16  8  6  What should be a and b to create an equal superposition representing 4/4 the elements in the search space? (Assuming that qubits starting from 0 represent the search space) Write your answer as a,b without leaving space e.g. 10,x 6h  Which operator(s) do you apply to set the ancilla qubit in state  -)?  Which operator(s) do you apply to set the ancilla qubit in state  -)?  Whow would you apply a NOT operator to qreg[4] if qreg[0], qreg[1], 3/3 qreg[2], and qreg[3] are all in state 1?  Apply 4 sequential CNOTs where greg[0], qreg[1], qreg[2] and qreg[3] are the control qubits and qreg[4] is the target qubit  Apply 2 CCNOTs where qreg[0] and qreg[1] are the controls in the first one, qreg[2] and qreg[3] are the controls in the second one and qreg[4] is the target qubit of both CCNOTs  Use two ancilla qubits and apply 2 CCNOTs where qreg[0] and qreg[1] are the controls in the second one and creg[4] are the controls in the second one.  Use two ancilla qubits and apply 2 CCNOTs where qreg[0] and qreg[1] are the controls in the second one.		re given a circuit named mycircuit and a quantum register named qreg. There are 64 ents in the search space.		
<ul> <li>✓ How many qubits do you need to represent 64 elements? (Not counting 2/2 any extra qubits, only to represent elements)</li> <li>32</li> <li>16</li> <li>8</li> <li>6</li> <li>✓ What should be a and b to create an equal superposition representing 4/4 the elements in the search space? (Assuming that qubits starting from 0 represent the search space) Write your answer as a,b without leaving space e.g. 10,x</li> <li>6,h</li> <li>✓ Which operator(s) do you apply to set the ancilla qubit in state  -)?</li> <li>1/2</li> <li>H</li> <li>X</li> <li>First X, then H</li> <li>Z</li> <li>✓ Apply 4 sequential CNOTs where qreg[0], qreg[1], qreg[2] and qreg[3] are the control qubits and qreg[4] is the target qubit</li> <li>Apply 2 CCNOTs where qreg[0] and qreg[1] are the controls in the first one, qreg[2] and qreg[3] are the controls in the second one and qreg[4] is the target qubit of both CCNOTs</li> <li>Use two ancilla qubits and apply 2 CCNOTs where qreg[0] and qreg[1] are the controls in the first one, qreg[2] and qreg[3] are the controls in the second one and and ancilla qubits are the target qubits of the CNOTs and apply to me more CCNOT where ancilla qubits are the controls and qreg[4] is the target</li> </ul>	ou a	are given the following code piece:		
32  16  8  6  What should be a and b to create an equal superposition representing the elements in the search space? (Assuming that qubits starting from O represent the search space) Write your answer as a,b without leaving space e.g. 10,x  6h  Which operator(s) do you apply to set the ancilla qubit in state  ¬)? 2/2  H  X  First X, then H  Z  How would you apply a NOT operator to qreg[4] if qreg[0], qreg[1], 3/3 qreg[2], and qreg[3] are all in state !?  Apply 2 cCNOTs where qreg[0] and qreg[1] are the controls in the first one, qreg[2] and qreg[3] are the controls in the second one and qreg[4] is the target qubit of the controls in the first one, qreg[2] and qreg[3] are the controls in the second one and ancilla qubits are the target qubit of the CCNOTs  Use two ancilla qubits and apply 2 CCNOTs where qreg[0] and qreg[1] are the controls in the second one and and ancilla qubits are the target qubit of the CCNOTs  Use two ancilla qubits are the toc CCNOTs where qreg[0] and qreg[1] are the controls in the escond one and and ancilla qubits are the toc CCNOTs where ancilla qubits are the controls and qreg[4] is the target				
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