

Quantum Computing for Gifted Students



My first quantum circuit *Saved* A Bell state Visualizations seed 5485

H \oplus \otimes \otimes \otimes \otimes \otimes I T S Z T^\dagger S^\dagger P RZ • ⓘ ⋮

|0> \otimes if ⋮ \sqrt{X} \sqrt{X}^\dagger Y RX RY U RXX RZZ + Add

q 0 H \oplus H \oplus \oplus \oplus H \otimes
 q 1 H \oplus H \oplus \oplus \oplus H \otimes
 + \otimes
 c2

Probabilities ⓘ ⋮ Q-sphere ⓘ ⋮

Probability (%) 0 20 40 60 80 100
 Computational basis states 00 01 10 11

100% 0
 101% 0
 111% 0
 110% 0
 Phase 0
 $3\pi/2$ ☑ State ☑ Phase angle

OpenQASM 2.0 ⋮
 Open in Quantum Lab

```

1 OPENQASM 2.0;
2 include "qelib1.inc";
3
4 qreg q[2];
5 creg c[2];
6
7 h q[0];
8 h q[1];
9 cx q[0],q[1];
10 h q[0];
11 h q[1];
12 x q[0];
13 x q[1];
14 cx q[0],q[1];
15 x q[0];
16 x q[1];
17 h q[0];
18 h q[1];
  
```

You can make you own quantum program codes!
You can tell others how quantum computing works!

Programme period: July 2022 to January 2023
Organizer: HKUST and HKAGE
Target: 40 students (Secondary 4-5)

Application form to:
Dr. Ting Pong Choy,
Department of Physics
HKUST
(Deadline: 16/05/2022)



Quantum Computing for Gifted Students

Session	Date	Time	Topic
1	2-Jul	1000-1300	<i>A brief history of computers</i>
2	9-Jul		A brief introduction to quantum computers
3	16-Jul		Matrix representation of quantum gates
4	23-Jul		<i>Quantum circuits, search algorithm</i>
5	30-Jul		<i>Complex numbers, single qubit gates</i>
6	6-Aug		<i>Universal circuits, quantum Fourier transform</i>
7	13-Aug		Quantum mechanics, quantum entanglement
8	20-Aug		<i>A brief introduction to building quantum computers</i>
9	27-Aug		<i>Breaking RSA encryption</i>
10	3-Sep		<i>An introduction to quantum cryptography</i>
11	10-Sep		<i>An introduction to quantum communication</i>
12	17-Sep		<i>An introduction to quantum error correction</i>
13	8-Oct		<i>Quantum algorithms - I</i>
14	15-Oct		<i>Quantum algorithms - II</i>
15	22 Oct to 12 Nov	TBC	Programming exercises and hand-on tutorials
16	19 Nov to 31 Dec	TBC	Small scale group projects
17	Mid Jan 2023	TBC	Showcase event

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