

Homework 32, due November 20

Name:

Choose 1 person to be Alice, 1 to be Bob, and 1 to be the quantum channel. Alice should fill in the following table.

Bit (0 or 1)															
Basis (X or +)															
Photon Sent (↖, ↑, ↗, →)															

Bob should now fill in the following table.

Basis (X or +)															
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The person acting as the quantum channel now compares Alice's and Bob's choices and fills in the following (using the Binary Random Number Generator to select a direction if Bob chose a different basis than Alice).

Photon Received (↖, ↑, ↗, →)															
Bit (0 or 1)															

Alice now tells Bob which basis she chose for each bit, and Alice and Bob discard the bits for which they chose different bases. Alice and Bob generate the following sequence of bits, which they can use as a one-time pad:

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Part B:

The person acting as the quantum channel is now Eve, and is choosing a basis and measuring each photon before Bob receives it. Work together to fill in the following table. Try to detect Eve's eavesdropping.

Alice's Bit (0 or 1)															
Alice's Basis (X or +)															
Photon Sent (↖, ↑, ↗, →)															
Eve's Basis															
Eve Receives															
Bob's Basis															
Bob Receives															
Bit (0 or 1)															

Alice and Bob generate the following sequences of bits:

Alice															
Bob															

Was Eve's eavesdropping detected? What is the probability that they will not detect Eve's eavesdropping if they randomly check (and discard) n bits?