BB84

Q. Alice is sending 10 qubits

$R = \{ r_0 = |0\rangle, \; r_1 = |1\rangle \}$ rectangular basis

$D = \{ d_0 = |+\rangle, \; d_1 = |-\rangle \}$ diaginal basis

a) Since Alice is sending 10 qubits and the probability of Bob measuring in the same basis as in which Alice prepared the state is $\frac{1}{2}$, so they'll get 5 bits of strings as key.

b). Since Eve is Eavesdropping and she measured all the states in R basis

Eve introduces an error when their basis is diff than Alice and Bob's.

50% of time they guess the right basis and when the basis is wrong they induce an error with 50% prob. $(0.5 \times 0.5) = 0.25$

25% probability that they introduce an error

Mon		4	11	18	25
Tue		5	12	19	26
Wed		6	13	20	27
Thu		7	14	21	28
Fri	1	8	15	22	29
Sat	2	9	16	23	30
Sun	3	10	17	24	

So the probability that Eve could Eavesdrop on 10 bits and not introduce an error.
is $(0.75)^{10} = 5.6\%$ for 10 bits
So, 94.4% prob, she'll induce an error.

So, it'll induce an error 25% prob,
so, with Eve, Eavesdropping, Alice and Bob are only expected to dd $\boxed{\text{2-3 bits}}$

Prob that first bit in Alice's key is same as of Bob is 25%

R. basis

c) If Eve measures in Y basis

$$Y = \left\{ \frac{|0\rangle + i|1\rangle}{\sqrt{2}}, \frac{|0\rangle - i|1\rangle}{\sqrt{2}} \right\}$$

the answer, ~~rema~~ remains the same.
for (b) →

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Notes