

- ① A source transmits a message through a noisy communication channel. Each symbol is 0 or 1 with prob  $p$  &  $1-p$  respectively. That is  $p(s=0)=p$

$$p(s=1)=1-p$$

$s \rightarrow$  source symbol (bit)  
 $r \rightarrow$  received symbol (bit)

$$p(r=0|s=0)=1-\epsilon_0 \quad p(r=1|s=1)=1-\epsilon_1$$

$$p(r=0|s=1)=\epsilon_1 \quad p(r=1|s=0)=\epsilon_0$$

- a) what is the prob that  $j$ th symbol is received correctly
- b) what is the prob. that the string of bits 1011 is received correctly

- ② Let  $A$  &  $B$  be independent events. Use the definition of independence to prove the following:

- a) The events  $A$  &  $B^c$  are independent
- b) The events  $A^c$  and  $B^c$  are independent

- ③  $A, B,$  and  $C$  are independent events

Prove that  $A$  and  $B$  are conditionally independent given  $C$

- ④ There are 52 cards in a deck. 13 of them are RED. 13 of them are BLUE. 13 of them are BLACK. 13 of them are YELLOW

Three cards are drawn without replacement.

What is the prob that none of the cards is RED?