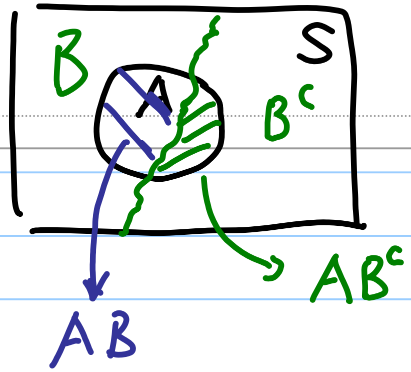
Note Title 8/23/2013



$$P(A) = P(AB) + P(AB^c)$$

$$= P(A|B) \cdot P(B) + P(A|B^c) \cdot P(B^c)$$

$$P(A|B) = \frac{P(AB)}{P(B)}$$

- A man shoots a target. When sunny day, he has 0.8 prob. to hit the target; when raining day, he has 0.4 prob. to hit. The weather has 0.7 prob. to be sunny, and 0.3 prob. to be raining.

- $\underbrace{\text{P(hit the target today)?}}_{E}$

① define & model

A: today is sunny

B: today is raining

$P(E|A) = 0.8$ $\quad P(E|B) = 0.4$

$P(A) = 0.7$ $\quad P(B) = 0.3$

② analyze :

$$P(E) = P(E|A) \cdot P(A) + P(E|B) \cdot P(B)$$

$$= 0.8 \times 0.7 + 0.4 \times 0.3 = 0.68$$

- In a gamble game, there are three cards, two are blank and one has sign. They are folded and put on table, and your task is to pick the signed card. First, you pick one card. Then, the casino player will remove one blank card from the remaining two. Now you have the option to change your pick, or stick to your original pick. Which option should you take? What is the probability of each option?

0. define & model

R_1 : pick right at 1 round

W_1 : " wrong " " "

$P(R_1) = 1/3 \quad P(W_1) = 2/3$

second round:

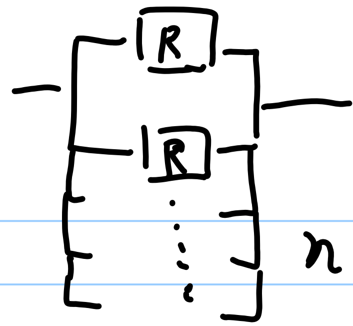
A: { stick pick and win }

B: { change pick and win }

$P(A) \, ? \, P(B)$

$$P(A) = P(A|R_1) \cdot P(R_1) + P(A|W_1) \cdot P(W_1)$$
$$= 1 \times 1/3 + 0 \times 2/3 = 1/3$$

$$P(B) = P(B|R_1) \cdot P(R_1) + P(B|W_1) \cdot P(W_1)$$
$$= 0 \times 1/3 + 1 \times 2/3 = 2/3$$



$$p(\text{sys}) = p(\text{at least one module works})$$
$$= 1 - p(\text{all modules fail})$$
$$= 1 - p(1\ \text{fail}) \cdot p(2\ \text{fail}) \cdots \cdots$$
$$= 1 - (1-R)^n$$

$$p(A|B) = \frac{p(B|A) \cdot p(A)}{p(B|A) \cdot p(A) + p(B|A^c) \cdot p(A^c)}$$

$$p(A|B) = p(AB) / p(B)$$
$$p(B|A) = p(AB) / p(A)$$

$$p(A|B) = \frac{p(AB)}{p(B)} = \frac{p(B|A) \cdot p(A)}{p(B|A) \cdot p(A) + p(B|A^c) \cdot p(A)}$$

law of total prob.

- A man shoots a target. When sunny day, he has 0.8 prob. to hit the target; when raining day, he has 0.4 prob. to hit. The weather has 0.7 prob. to be sunny, and 0.3 prob. to be raining.

- Q: the man misses the target today, what is prob. that today is sunny? Raining?
  - The raining prob. is enlarged given the shooting result

① define & model

hit, $\overline{hit}$, sunny, rain

Q: $P(sun \mid \overline{hit})$?

$P(rain \mid \overline{hit})$?

$p(hit \mid sun) = 0.8$

$p(hit \mid rain) = 0.4$

$p(sun) = 0.7$ $\quad$ $p(rain) = 0.3$

$$p(\overline{hit}) = p(\overline{hit} \mid sun) \cdot p(sun) + p(\overline{hit} \mid rain) \cdot p(rain)$$

$$= 0.2 \times 0.7 + 0.6 \times 0.3$$

$$= 0.14 + 0.18 = 0.32$$

$$p(sun \mid \overline{hit}) = \frac{p(\overline{hit} \mid sun) \cdot p(sun)}{p(\overline{hit})}$$

$$= \frac{0.2 \times 0.7}{0.32} = \frac{0.14}{0.32} = 0.4375$$