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$P(B)$: "a priore" prob.

(ex): $P(G_1) = \frac{2}{3}$ (G: color of ball in barrel, 1: 1st draw) for: (G) (G) (R)

take the green ball out of barrel

2nd draw: $P(G_2 G_1) = P(G_2 \cap G_1) = P(G_2/G_1) \cdot P(G_1)$

$= \frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$

then, $P(R_3/G_2 G_1) \cdot P(G_2 G_1) = 1 \cdot \frac{1}{3} = \frac{1}{3}$

General Addition Rule (for "OR" cases)

(Events do not need to be ME)

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

If A and B are IEs. $P(A \cap B) = P(A) \cdot P(B)$

$\therefore P(A \cup B) = P(A) + P(B) - P(A) \cdot P(B)$

Degree of correlation

$$g \equiv \frac{P(B/A)}{P(B)} = \frac{P(AB)}{P(A) \cdot P(B)}$$

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$g = 1$ events are not correlated

$g = 0$ if A occurs B does not occur

$g > 1$ positively correlated events

study (ex) 1.10. horses races.

Sequence vs. Composition

① P of getting HTHH in 4 coin flips in this order.
— sequence matters

② P of getting 3 H, and 1 T in 4 coin flips (order does not matter) — composition matters

Intuitively $P_② > P_①$.

successes: HTHH, THHH, HHTH, HHHT.

$$P_① = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

$$P_② = \frac{1}{16} + \frac{1}{16} + \frac{1}{16} + \frac{1}{16} - \frac{1}{16} \times 4 = \frac{1}{4}$$

$$\boxed{P_{comp.} = P_{seq.} \cdot W}$$

$W \equiv$ multiplicity $\Rightarrow$ # of permutations (i.e. # of Combinations in any order)

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Distinguishable objects

N distinguishable objects: $W = N!$

(ex): drawing. w x y z out of a barrel, W?
→ take 1 ball out of barrel each time you draw

$W = m_1 m_2 m_3 m_4$
$= 4 \cdot 3 \cdot 2 \cdot 1$

(ex) barrel: the 26 letters of the alphabet.
How many ways can these sequences be picked up?