# Key chapter 3

$E_1 = 1 \quad E_2 : 2 \quad E_3 : 3 \quad E_4 : 4 \quad E_5 = 5 \quad E_6 = 6$

1. A: $E_2$, B: $E_1, E_3, E_4$ C: $E_1, E_2, E_3$ D: $\emptyset$ E: $E_1, E_2, E_3, E_5$ F: $E_2$

3 Recall $P E_1 + E_2 + P E_3 + P E_4 + P E_5 = 1$ so $.15 + .15 + .15 + .15 + E_5 = 1$

$P(E_5) = .4$

5 $P(E_1) + P(E_2) + 8 \cdot P(\text{rest}) = 1$

$.3 + .45 + 8x = 1 \Rightarrow 8x = .25 \quad x = .03125$

6 a) observe 1, obs 2, ..., obs 36, obs 0, obs 00

b) each event has a prob of 1/38

c) A = obs 0 or 00   simple events = obs 0, obs 00

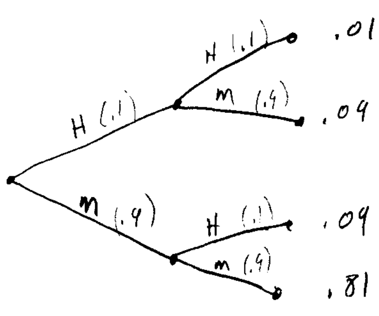
so $P(A) = P(E_0) + P(E_{00})$

$= 1/38 + 1/38 = \frac{2}{38} = \frac{1}{19}$

d) $E_{1\text{-}18}$ = obs 1, 2, 3, ..., 17, or 18   each simple event has prob 1/38

$P(E_{1\text{-}18}) = \frac{1}{38} + \frac{1}{38} + \cdots \frac{1}{38} = 18\left(\frac{1}{38}\right) = .4737$

7 a)




b) $.01 + .09 + .81 + P(E_{Hm}) = 1$

$P(E_{Hm}) = .09$

or multiply up the tree

c) $P(E_c) = P(E_{HH}) + P(E_{Hm}) + P(E_{mH}) = .19$

$.01 \quad .09 \quad .09$

5.10 a) A taster tastes and ranks 3 types of tea A, B, C

1) 1) A, B, C; 2) (C, B, A) 3) (B, C, A)

4) (A, C, B) 5) (C, A, B) 6) (B, A, C)

c) each simple event has a prob of $1/6$ of occurring

A best = $E_1 + E_4 = 1/6 + 1/6 = 1/3$

A [illegible] = $E_2 + E_3 = 1/6 + 1/6 = 1/3$

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Supplement 1 $n = 14$ $r = 3$ no repeats order does not matter

$$C^{14}_{3} = \binom{14}{3} = \frac{14!}{3!(14-3)!} = 364$$

2 a) $n = 9$ $r = 2$ no replacement order does not matter

$$C^{9}_{2} = \binom{9}{2} = \frac{9!}{2!(9-2)!} = 36$$

b) $n = 4$ $r = 2$ no replacement order does not matter

$$C^{4}_{2} = \binom{4}{2} = \frac{4!}{2!(2!)} = 6$$

c) lets look at only democrats that combo is $\binom{5}{2} = \frac{5!}{2!(5-2!)} = 10$

so $10 + 6 = 16$ of the total possible are of the same party that means $36 - 16 = 20$ possible combos of one or the other

3 $n = 5$ $r = 5$ no replacement order does matter

$$P^{5}_{5} = \frac{5!}{(5-5)!} = \frac{5!}{0!} = 120 \text{ possible ways}$$

4 $n = 24$ $r = 16$ no replacement order does matter

$$P^{24}_{16} = \frac{24!}{(24-16)!} = 1.54 \times 10^{19}$$

5 $n = 10$ $r = 4$ replacements order does matter

$10^4 = 10{,}000$

38 order matters no replacements $P^4_2 = \frac{4!}{(4-2)!} = \frac{4 \cdot 3}{} = 12$

a) $B_1 B_2$ $B_1 W_1$ $B_1 W_2$ $B_2 W_1$ $B_2 W_2$ $W_1 W_2$

$B_2 B_1$ $W_1 B_1$ $W_2 B_1$ $W_1 B_2$ $W_2 B_2$ $W_2 W_1$ each with prob $\frac{1}{12}$ occuring

b) $\frac{6}{12} = \frac{1}{2}$

41 order matters replacement allowed so additional combos to 38 are

$B_1 B_1$ $B_2 B_2$ $W_1 W_1$ $W_2 W_2$ so 16 total combo's now

prob of each = $\frac{1}{16}$

b) $\frac{8}{16} = \frac{1}{2}$