Equally Likely Events : E an event, sample S

$$P(E) = \frac{n(E)}{n(S)}$$

Example: Roll two dice (one white/one blue). What is the probability that the sum is 8?

Sample space: $\{1, 2, 3, \dots, 11, 12\}$ ← **Not equally likely events**

Sample space: $(1, 1)$ $(1, 2)$ - - - - · $(1, 6)$ ⎫
⎬ **36 elements**

$(5,3)$ $(4,4)$ $(3,5)$ $(2,6)$

$P(\text{sum is 8}) = \frac{5}{36}$

$(6,1)$ $\boxed{(6,2)}$ - - - - - - $(6,6)$ ⎭

Example: Coin flipped 3 times. What is the probability of at least two heads?

Sample space: $\{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT\}$

$$P(\text{at least 2 heads}) = \frac{4}{8} = \frac{1}{2} = \frac{C(3,2) + C(3,3)}{8} = \frac{3+1}{8} = \frac{1}{2}$$

Coin flipped 11 times. What is the prob of getting at least 6 heads?

$$P(\text{at least 6 heads}) = \frac{C(11,6) + C(11,7) + C(11,8) + \cdots + C(11,11)}{2^{11}}$$

Example: Nine cards labeled 1-9, randomly choose 3
^ in order to make 3-digit number. What is prob this
different cards
    number is 500 or bigger?

Sample space has $P(9,3) = 9 \cdot 8 \cdot 7$ elements

$$\underline{5} \cdot \underline{8} \cdot \underline{7} \text{ ways to get} \geq 500$$

$$P(\geq 500) = \frac{5 \cdot 8 \cdot 7}{9 \cdot 8 \cdot 7} = \frac{5}{9}$$

Example: 15 cards labeled 1-15. 3 randomly and placed in row (in order). What is the probability that

a) all three are odd? Sample space: $15 \cdot 14 \cdot 13$ elements

$$P(\text{all odd}) = \frac{8 \cdot 7 \cdot 6}{15 \cdot 14 \cdot 13} = 0.123$$

b) first two odd, third even?

$$P(\overset{?}{\smile}) = \frac{8 \cdot 7 \cdot 7}{15 \cdot 14 \cdot 13} = 0.144$$

c) all 3 are larger than 10?

$$P(\overset{\downarrow}{}) = \frac{5 \cdot 4 \cdot 3}{15 \cdot 14 \cdot 13} = 0.022$$

1	2	3	Switching wins
Goat	Goat	Car	NO
Goat	Car	Goat	Yes
Car	Goat	Goat	Yes