

Probability Calculation

Note Title

9/3/2008

Experiment S = Sample space. Event A .

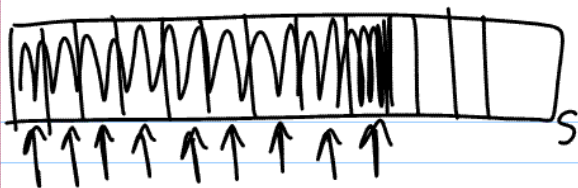
(1) $0 \leq P(A) \leq 1$ for all events A .

(2) $P(S) = 1$; $P(\emptyset) = 0$.

(3) Let A_1, A_2, \dots be mutually exclusive ($A_i \cap A_j = \emptyset$)

for all $i \neq j$. Then

$$P(A_1 \cup A_2 \cup \dots) = \sum_{i=1} P(A_i)$$



Implied by (3): A_1, A_2, \dots, A_n are mutually exclusive events, then

$$P(A_1 \cup A_2 \dots \cup A_n) = \sum_{i=1}^n P(A_i)$$

$$A_{n+1}, A_{n+2} \dots = \emptyset$$

$S =$ Sample space

$E_1, E_2, \dots \Rightarrow$ basic events in S .

Not a union of any other events in S .

① $E_1 = \{\text{Heads}\}$ $E_2 = \{\text{Tails}\}$

② $E_1 = \{111111\dots1\}$ $E_2 = \{21111\dots1\}, \dots$

$$E_1 \cup E_2 \cup \dots = S$$

$$E_i \cap E_j = \emptyset$$

$$P(A) = P(E_1 \cup E_2 \cup \dots \cup E_n) = \sum_{i=1}^n P(E_i)$$

$$A = (E_1 \cup E_2 \cup \dots \cup E_n)$$

set the probabilities of basic events

E_i

E_i are equally likely events

If E_i are equally likely, then

$$\sum_{i=1}^n P(E_i) = \sum_{i=1}^n \frac{1}{\# \text{ of events } E_i \text{ in } S} = \frac{n}{\# \text{ of events } E_i \text{ in } S}$$

$$= \frac{\# \text{ of events } E_i \text{ in } A}{\# \text{ of events } E_i \text{ in } S}$$

① $E_1 = \{\text{Heads}\}$ $E_2 = \{\text{Tails}\}$ $A = \text{Heads}$

$$P(A) = \frac{1}{2}$$

Probability Examples Worksheet

① a. (D_1, D_2) (D_1, G_1) (D_1, G_2) (D_1, G_3)

10 events

$$\binom{5}{2}$$

(D_2, G_1) (D_2, G_2) (D_2, G_3)

(G_1, G_2) (G_1, G_3)

(G_2, G_3)

b. (G_1, G_2) (G_1, G_3) (G_2, G_3)

c. $\frac{1}{10}$ Equally likely events

$$d. P(A) = \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{3}{10}.$$

2.	11	12	13	14	15	16
a.	21	22	23	24	25	26
	31	32	33	34	35	36
	41	42	43	44	45	46
	51	52	53	54	55	56
	61	62	63	64	65	66

b. $\frac{1}{36}$

$$c. P(A) = \frac{1}{36} + \frac{1}{36} + \frac{1}{36} + \frac{1}{36} + \frac{1}{36} + \frac{1}{36} = \frac{6}{36}$$

$$d. P(B) = \frac{1}{36} + \frac{1}{36} + \frac{1}{36} + \frac{1}{36} + \frac{1}{36} + \frac{1}{36} = \frac{6}{36}$$

$$e. P(\text{craps}) = \frac{1}{36}$$