

p.108

65.

U : unlocked on the inside

G: green light

243

①

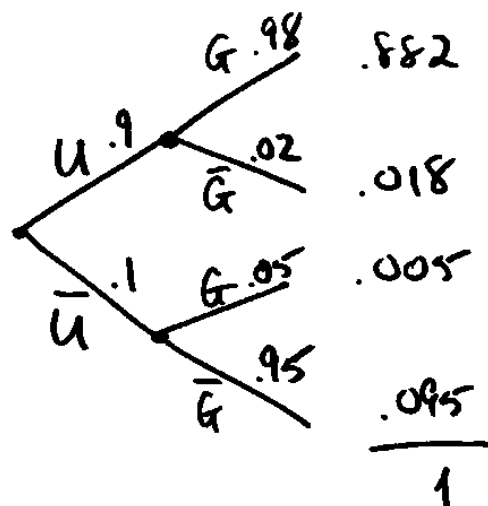
10-19

$$P(U) = .9$$

$$P(G|U) = .98$$

$$P(G|\bar{U}) = .05$$

	G	\bar{G}	
U	.882	.018	.9
\bar{U}	.005	.095	.1
	.887	.113	1



$$P(U|G) = \frac{P(U \cap G)}{P(G)}$$

$$= .882 / .887 = .994$$

②

Chapter 3 Random variables

Defn: A random variable is a variable whose value is determined by the outcome of an experiment.

Example: Flip 2 coins in sequence.

$$S = \{HH, HT, TH, TT\}$$

Let $X = \# \text{ heads}$

X	P(X)	} probability distribution
0	$\frac{1}{4}$	
1	$\frac{2}{4}$	
2	$\frac{1}{4}$	
	1	

(3)

Example: Roll 2 dice

let $X = \text{sum}$

x	$P(x)$
2	$1/36$
3	$2/36$
4	$3/36$
5	$4/36$
6	$5/36$
7	$6/36$
8	$5/36$
9	$4/36$
10	$3/36$
11	$2/36$
12	$1/36$
	<hr/> 1

Example: Draw 2 cards from a deck of 52.

let $X = \# \text{ red cards}$

x	$P(x)$
0	$25/102$
1	$52/102$
2	$25/102$

(4)

Note: each individual probability satisfies $0 \leq p(x) \leq 1$

Also, $\sum P(x) = 1$

Example: Roll 2 dice.

$X = |\text{difference}|$

$\{(1,5), (2,6), (5,1), (6,2)\}$

x	$P(x)$
0	$6/36$
1	$10/36$
2	$8/36$
3	$6/36$
4	$4/36$
5	$2/36$
	<hr/> 1

Defn: The expected value of a random variable (5)

$$E(X) = \underset{\substack{\uparrow \\ \text{"mu"}}}{\mu} = \sum x p(x)$$

Example: Flip 3 coins $n(S) = 8$
 $X = \# \text{ heads}$. Find $E(X)$

X	$P(X)$
0	$1/8$
1	$3/8$
2	$3/8$
3	$1/8$
	<u>1</u>

$$\begin{aligned} \mu = E(X) &= \sum x p(x) \\ &= 0 \cdot \frac{1}{8} + 1 \cdot \frac{3}{8} \\ &\quad + 2 \cdot \frac{3}{8} + 3 \cdot \frac{1}{8} \\ &= \frac{12}{8} = 1.5 \end{aligned}$$

$\leftarrow \{HTT, THT, TTH\}$

Defn: The variance of a random variable (6)

$$\text{is } \sigma^2 = \sum (x - \mu)^2 p(x)$$

Hw p. 108 #69
p. 125 #1, 3
p. 136 #11, 13