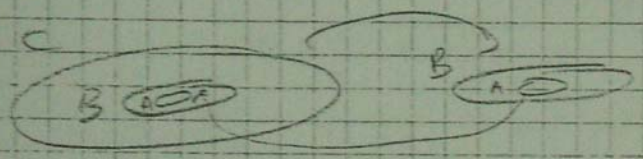
Probality Solutions Peebles 4th Ed.

1.1-1) $A = \{1,2,3\}$ $B = \{8,10,12,14\}$
$C = \{1,3,5,7,\ldots\}$

$A = \{$ integers between 0 and 4$\}$
$B = \{$ even numbers between 7 and 15$\}$
$C = \{$ odd numbers$\}$

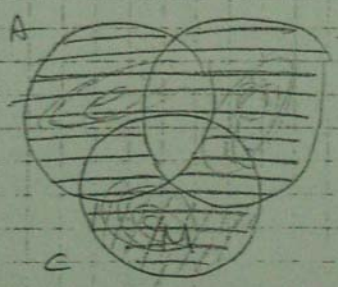
1.2-1) $C \subset A$ if $C \subset B$ and $B \subset A$



1.2-2) $A = \{-6, -4, -0.5, 0, 1.6, 8\}$
$B = \{-0.5, 0, 1, 2, 4\}$

a) $A - B = \{-6, -4, 1, 6, 8\}$
b) $B - A = \{1, 2, 4\}$
c) $A \cup B = \{-6, -4, -0.5, 0, 1, 1.6, 2, 4, 8\}$
d) $A \cap B = \{-0.5, 0\}$

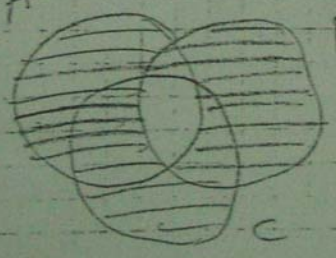
1.2-6)

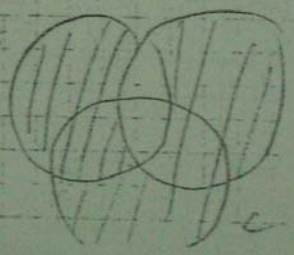


a) $M = C - [(C \cap A) \cup (C \cap B)]$ ✓

b) $(A \cup B \cup C) - (A \cap B \cap C) =$
$(\bar{A} \cap B) \cup (\bar{B} \cap C) \cup (\bar{C} \cap A)$ ✓

c) $\overline{(A \cap B \cap C)} = \bar{A} \cup \bar{B} \cup \bar{C}$ ✓

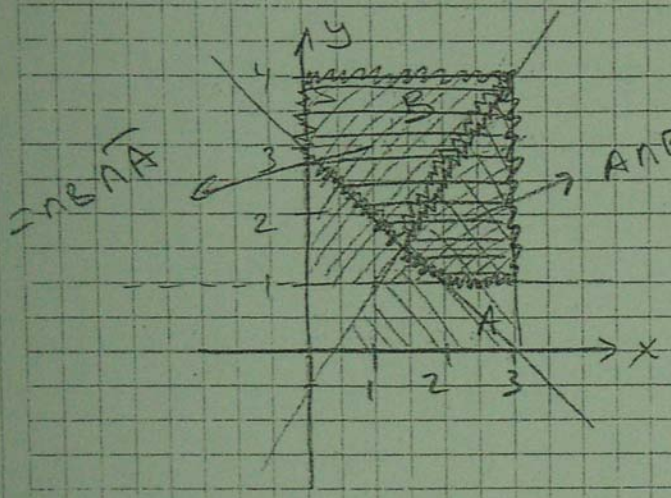




1.2-11) $S = \{ 0 \le x \le 3 , 0 \le y \le 4 \}$

$A = \{ y \le \frac{3x-1}{2} \}$ $B = \{ y \ge 1 \}$

$C = \{ y \ge 3 - x \}$



1.2-15) $A = \{ 1 \le s \le 14 \}$ $B = \{ 3, 6, 14 \}$

$C = \{ 2 < s \le 9 \}$

a) $C \subset B$ TRUE b) $C \subset A$ FALSE c) $B \cap C = \emptyset$ FALSE

d) $C \cup B = S$ FALSE e) $\overline{S} = \emptyset$ TRUE f) $A \cap \overline{S} = \emptyset$ TRUE

g) $C \subset A \subset B$ FALSE

1.3-1) $P(A) = \frac{3}{6}$ $P(B) = \frac{3}{6}$ $P(A \cap B) = \frac{1}{6}$ (1, 3, 5, 6)

$P(A \cup B) = \frac{3}{6} + \frac{3}{6} - \frac{1}{6} = \frac{5}{6}$ $P(A \cap B) = \frac{1}{6}$

1.3-2) 1,6 2,5 3,4 4,3 5,2 6,1 — 6,5 5,6

7 fare — 2 fare

$P(A) = \frac{7}{36}$ $P(B) = \frac{2}{36}$ $P(A \cup B) = P(A) + P(B)$

$= \frac{9}{36} = \frac{8}{36}$

1.3-3)

a) $S = \{0 \le x \le 100\}$

b) $A = \{20 \le y \le 35\}$ c) 0 //

$\frac{35-20}{100}$ //

1.3-4) $S = \{a_1, a_2, \dots a_{10}\}$

$A = \{a_1, a_5, a_9\}$ $B = \{a_1, a_2, a_6, a_9\}$ $C = \{a_6, a_5\}$

a) $P(A \cup C) = P(A) + P(C) - P(A \cap C)$

$= \frac{3}{10} + \frac{2}{10} - \frac{1}{10} = \frac{4}{10}$

b) $P(B \cup \bar{C}) = P(B) + P(\bar{C}) - P(B \cap \bar{C})$

$= \frac{4}{10} + 1 - \frac{2}{10} - \frac{2}{10} = 1$

c) $B \cup C = \{a_1, a_2, a_6, a_5\}$ $A \cap (B \cup C) = \{a_1, a_5\}$

$P(C) = \frac{2}{10}$

d) $P(\overline{A \cup B}) = 1 - P(A \cup B) = 1 - \left(\frac{3}{10} + \frac{4}{10} - \frac{2}{10}\right) = \frac{5}{10}$

e) $P(\overline{\cdots}) = \frac{2}{10}$

1.3-6) a) $P(A) = \frac{1}{6}$ {a 6 shows up} $P(B) = \frac{2}{6}$ {2 or 5}

b) $P(C) = 1 - (P(A) + P(B))$ {1, 3, 4 shows up}

1.3-7) 500 ball = 75 bl + 150 g + 175 r + 70 w + 30 blue

$P(\text{Black}) = \frac{75}{500}$ $P(\text{Green}) = \frac{150}{500}$ $P(\text{Red}) = \frac{175}{500}$

$P(\text{White}) = \frac{70}{500}$ $P(\text{Blue}) = \frac{30}{500}$

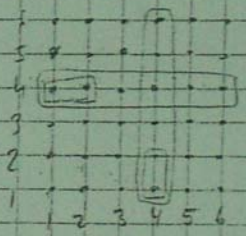
5 4 3 2 1

1.3-8) a) $P(A) = \frac{4}{52}$ b) $\frac{20}{52}$ c) $\frac{2}{52}$

1.3-9) $A = \{(4,1),(4,2),(1,4),(2,4)\}$

$B = \{(4,1),(4,2),(4,3),(4,4),(4,5),(4,6)$
$(1,4),(2,4),(3,4),(4,4),(5,4),(6,4)\}$

a) $P(A) = \frac{4}{36}$ b) $P(B) = \frac{11}{36}$



c) $P(C) = \frac{4}{36}$

1.3-10)

A	B	C
H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

$S =$

1+1+1+1

a) $P(A) = \frac{4}{8}$ c) $= \frac{2}{8}$

b) $P(B) = \frac{2}{8}$

1.3-11) 10Ω 22Ω 48Ω

0.25W

0,5W

1W

$P(0,25|10\Omega) = 0,08$ $P(0,25|22) = 0,20$

$P(0,5|10\Omega) = 0,10$ $P(0,5|22) = 0,26$

$P(1|10\Omega) = 0,01$ $P(1|22) = 0,05$

$P(0,25) = 0,40$ $P(0,25|48) = 0,12$

$P(0,5) = 0,51$ $P(0,5|48) = 0,15$

$P(1) = 0,09$ $P(1|48) = 0,03$

1.3-12) a) one 2 one 3 or larger

$P(A) = \frac{8}{36}$

b) 4 or less and 10 or more $P(B) = \frac{12}{36}$

1.3-13) 4 shows up with Prob $\frac{2}{7}$

other have $\frac{1}{7}$

3 → 4 " " Prob $\frac{2}{7}$ others $\frac{1}{7}$

sum up to 7

(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)

$\frac{1}{7}\frac{1}{7} + \frac{1}{7}\frac{1}{7} + \frac{1}{7}\frac{1}{7} + \frac{2}{7}\frac{2}{7} + \frac{1}{7}\frac{1}{7} + \frac{1}{7}\frac{1}{7}$

$\frac{9}{49}$ // $\frac{6}{36}$ =

1.4-1) Q, Q

a) $P(Q) = \frac{4}{52}$ $P(Q|Q) = \frac{3}{51}$

$P(Q \cap Q) = \frac{4}{52} \cdot \frac{3}{51}$

b) $P(Q) = \frac{4}{52}$ $P(\text{Seven}|Q) = \frac{4}{51}$

$P(\text{Seven} \cap Q) = \frac{4}{52} \cdot \frac{4}{51}$

c) $P(Q \cap Q) = \frac{4}{52} \cdot \frac{3}{51}$

1.4-2) $P(S) = \frac{4}{52}$ $P(S|S) = \frac{3}{51}$

$P(S \cap S) = \frac{4}{52}\frac{3}{51}$ $P(S|S \cap S) = \frac{2}{50}$

$P(S \cap S \cap S) = \frac{4}{52}\frac{3}{51}\frac{2}{50}$

$P(S \cap S \cap S \cap S) = \frac{4 \cdot 3 \cdot 2 \cdot 1}{52 \cdot 51 \cdot 50 \cdot 49}$

1.4-3) $D = \{\text{Draw } 22\Omega\}$ $E = \{\text{Draw } 10\%\}$

$P(D) = \frac{24}{100}$ $P(E) = \frac{38}{100}$ $P(D \cap E) = \frac{14}{100}$

$P(D|E) = \frac{14}{38} = \frac{P(D \cap E)}{P(E)} = \frac{14/100}{38/100} = \frac{14}{38}$

$P(E|D) = \frac{14}{24} = \frac{14/100}{24/100} = \frac{14}{24}$

1.4-4)

a) $\{\text{Select a } 22\text{-}\Omega \text{ Resistor}\} = D$ $\frac{24}{100}$

$B_1 = \{\text{Select } \%5\}$ $B_2 = \{\text{Select } \%10\}$

$P(D) = P(D|B_1)P(B_1) + P(D|B_2)P(B_2)$

$\frac{10}{62}\frac{62}{100} + \frac{14}{38}\frac{38}{100} = \frac{24}{100}$

b) $P(5\% | 22\Omega) = \frac{P(22|5\%)P(5\%)}{P(22\Omega)} = \frac{\frac{10}{62} \cdot \frac{62}{100}}{\frac{24}{100}}$

$\frac{10}{24}$ //

$\frac{95}{210}$

1.4-5) a) $P(0{,}01\mu F \mid B2) = \frac{P(0{,}01 \cap B2)}{P(B2)} = \frac{\frac{95}{600}}{\frac{210}{600}}$

$= \frac{95}{210}$ ✓

b) $P(B3 \mid 0{,}01\mu F) = \frac{P(B3 \mid 0{,}01\mu F)\, P(0{,}01\mu F)}{P(B3 \mid 0{,}01\mu F)\, P(0{,}01\mu F) + P(\quad)P(0{,}1) + \quad P(1)}$

$= \frac{\frac{25}{140}\cdot\frac{140}{600}}{\frac{25}{140}\cdot\frac{140}{600} + \frac{75}{185}\cdot\frac{185}{600} + \frac{145}{295}\cdot\frac{295}{600}} \quad \frac{\frac{25}{245}\cdot\frac{1}{3}}{\frac{1}{3}\left(\frac{20}{145}+\frac{95}{210}+\frac{25}{245}\right)}$

$= \frac{\frac{25}{600}}{\frac{245}{600}} = \frac{25}{245}$

1.4-6) $P(0{,}01 \mid \begin{matrix}B1\\B2\\B3\end{matrix})$ $P(0{,}1 \mid \begin{matrix}B1\\B2\\B3\end{matrix})$ $P(1 \mid \begin{matrix}B1\\B2\\B3\end{matrix})$

3 tane

1.4-7) $P(B_1) = 0{,}6$ $P(B_2) = 0{,}4$ $P(B_1 \mid A_1) = ?$

$P(A_1 \mid B_1) = P(A_2 \mid B_2) = 0{,}95$ $P(B_2 \mid A_2) = ?$

$P(A_2 \mid B_1) = P(A_1 \mid B_2) = 0{,}05$

$P(B_1 \mid A_1) = \frac{P(A_1 \mid B_1)\, P(B_1)}{P(A_1)}$ $P(A_1) = P(A_1 \mid B_1)P(B_1) + P(A_1 \mid B_2)P(B_2)$

$= \frac{0{,}95 \cdot 0{,}6}{0{,}59} = 0{,}966$ $= 0{,}59$

$P(B_2 \mid A_2) = \frac{P(B_2 \mid B_2)P(B_2)}{P(A_2)}$ $P(A_2) = P(A_2 \mid B_1)P(B_1) + P(A_2 \mid B_2)P(B_2)$

$= \frac{0{,}95 \cdot 0{,}4}{0{,}41} = 0{,}926$ $= 0{,}41$

1.4-8) $P(B_1) = 0,7 \quad P(B_2) = 0,3$

$P(A_1|B_1) = P(A_2|B_2) = 0,95$

$P(A_2|B_1) = P(A_1|B_2) = 0$

$$P(B_1|A_1) = \frac{P(A_1|B_1)P(B_1)}{P(A_1)} = \frac{0,95 \cdot 0,7}{0,665} = \frac{1}{2}$$

$$P(B_2|A_2) = \frac{P(A_2|B_2)P(B_2)}{P(A_2)} = \frac{0,95 \cdot 0,3}{0,285} = 1$$

$P(A_1) = P(A_1|B_1)P(B_1) + P(A_1|B_2)P(B_2)$

$= 0,95 \cdot 0,7 + 0 \cdot 0,3 = 0,665$

$P(A_2) = P(A_2|B_1)P(B_1) + P(A_2|B_2)P(B_2)$

$= 0 \cdot 0,7 + 0,95 \cdot 0,3 = 0,285$

No - error channel

1.4-9)

	10 W	25 W	50 W	
	100 %15	70 %10	30 %10	Total 200
Good	85	63	27	175
Def	15	7	3	25
	100	70	30	200

a) $\frac{15}{100}$ b) $\frac{3}{200}$ c) $\frac{25}{200}$

1.4-10) $P(A) = 0,01 \quad P(B) = 0,03 \quad P(B|A) = 0,06$ if both fail

a) $P(B|A) = \frac{P(B \cap A)}{P(A)} \Rightarrow P(B \cap A) = P(B|A)P(A) = 0,006$

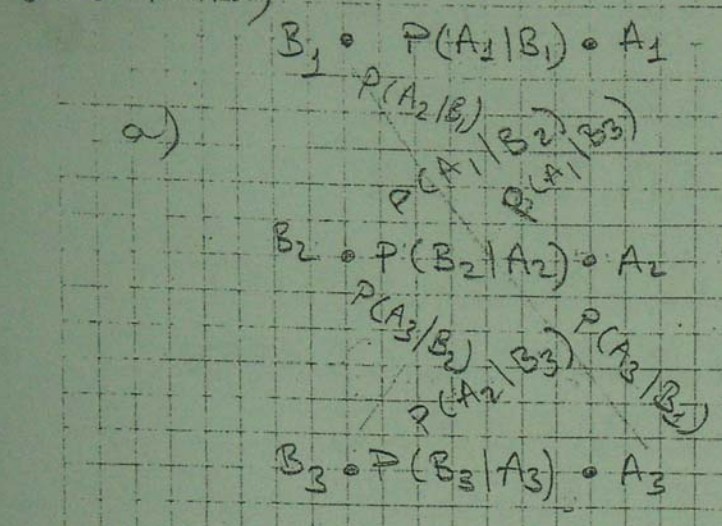
b) $P(A|B) = \frac{P(B|A)P(A)}{P(B)} = \frac{0,06 \cdot 0,01}{0,03} = 0,02$

c) $P(A \cap B) \neq P(A_1)P(A_2) =$

not independent

1.4-11)

a)



$P(A_i|B_j) = 0,1 \quad i \neq j$

$P(A_i|B_j) = 0,8 \quad i = j$

$P(B_1) = 0,5$

$P(B_2) = 0,3$

$P(B_3) = 0,2$

b) $P(A_1) = P(A_1|B_1)P(B_1) + P(A_1|B_2)P(B_2) + P(A_1|B_3)P(B_3)$

$P(A_1) = 0,45$

$P(A_2) = P(A_2|B_1)P(B_1) + P(A_2|B_2)P(B_2) + P(A_2|B_3)P(B_3)$

$= 0,31$

$P(A_3) = P(A_3|B_1)P(B_1) + P(A_3|B_2)P(B_2) + P(A_3|B_3)P(B_3)$

$= 0,24$

c) $P(B_1|A_1) = \frac{P(A_1|B_1)P(B_1)}{P(A_1)} = 0,88$

$P(B_1|A_2) = \frac{P(A_2|B_1)P(B_1)}{P(A_2)} = 0,161$

$P(B_1|A_3) = \frac{P(A_3|B_1)P(B_1)}{P(A_3)} = 0,208$

$P(B_2|A_1) = 0,066$

$P(B_2|A_2) = 0,774$

$P(B_2|A_3) = 0,125$

$P(B_3|A_1) = 0,044$

$P(B_3|A_2) = 0,064$

$P(B_3|A_3) = 0,666$

1.4-12)

	102	101	100	99	98
%45 Line 1	0,02	0,06	0,88	0,03	0,01
%55 Line 2	0,03	0,08	0,83	0,04	0,02

a) $P(102) = P(102|L1)P(L1) + P(102|L2)P(L2)$

$= 0,02 \cdot 0,45 + 0,03 \cdot 0,55 = 0,0255$

$P(101) = P(101|L1)P(L1) + P(101|L2)P(L2)$

$= 0,06 \cdot 0,45 + 0,08 \cdot 0,55 = 0,071$

$P(100) = 0,8525$

$P(99) = 0,0355$

$P(98) = 0,0155$

$P(L1|100) = \frac{P(100|L1)P(L1)}{P(100)} = \frac{0,88 \cdot 0,45}{0,8525} = 0,464$

b) ~~$P(100|L1) = 0,88$~~

c) $P(99 \cup 98) = P(98) + P(99) =$ ~~0,051~~ 0,051

1.4-13) $P(A) = 1/3 \quad P(B) = 1/3 \quad P(C) = 1/3$

$P(D|A) = 0,001 \quad P(D|B) = 0,003 \quad P(D|C) = 0,002$

a) $P(D) = P(D|A)P(A) + P(D|B)P(B) + P(D|C)P(C)$

$= 0,001 \cdot 1/3 + 0,003 \cdot 1/3 + 0,002 \cdot 1/3$

$= 0,006/3 = 0,002$ //

b) $P(A|D) = \frac{P(D|A)P(A)}{P(D)} = \frac{0,001 \cdot 1/3}{0,002} = 0,166$

$P(B|D) = \frac{P(D|B)P(B)}{P(D)} = \frac{0,003 \cdot 1/3}{0,002} = 0,5$

$P(C|D) = \frac{P(D|C)P(C)}{P(D)} = \frac{0,002 \cdot 1/3}{0,002} = 0,333$

1.4-14) $D_1 = \{52 \text{ card regular deck}\}$

$D_2 = \{16 \text{ card } J, Q, K, \text{Aces}\}$

$D_3 = \{36 \text{ card } 2, ____, 10\}$

$P(D_1) = 1/2 \quad P(D_2) = 1/3 \quad P(D_3) = 1/6$

a) $P(Ace) = P(Ace|D_1)P(D_1) + P(Ace|D_2)P(D_2) + P(Ace|D_3)P(D_3)$

$= \frac{4}{52}\cdot\frac{1}{2} + \frac{4}{16}\cdot\frac{1}{3} + 0 = \frac{1}{26} + \frac{1}{12} = \frac{6+13}{13\cdot 12} = \frac{19}{13\cdot 12}$

b) $P(Three) = P(Th, D_1)P(D_1) + P(Th, D_2)P(D_2) + P(Th, D_3)P(D_3)$

$= \frac{4}{52}\cdot\frac{1}{2} + 0 + \frac{4}{36} = \frac{1}{26} + \frac{1}{9} = \frac{9+26}{26\cdot 9} = \frac{35}{26\cdot 9}$ $\frac{1}{26} + \frac{1}{54}$

c) $P(Red) = P(R, D_1)P(D_1) + P(R, D_2)P(D_2) + P(R, D_3)P(D_3)$

$= \frac{1}{2}\cdot\frac{1}{2} + \frac{1}{2}\cdot\frac{1}{3} + \frac{1}{2}\cdot\frac{1}{6} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12} = \frac{1}{2}$ //

1.5-1) $P(A) = \frac{44}{100} \quad P(B) = \frac{62}{100} \quad P(C) = \frac{32}{100}$

$P(A \cap B) = \frac{28}{100} \quad P(A \cap C) = 0 \quad P(B \cap C) = \frac{24}{100}$

$P(A \cap B \cap C) = 0$

$P(A \cap B) = P(A) \cap P(B) = \frac{44}{100}\cdot\frac{62}{100} \stackrel{?}{=} \frac{28}{100}$ ×

Not statistically independent

1.5-2) $P(A \cap B) = P(A)P(B) \quad P(A \cap C) = P(A)P(C) \quad P(A \cap D) = P(A)P(D)$

$P(B \cap C) = P(B)P(C) \quad P(B \cap D) = P(B)P(D) \quad P(C \cap D) = P(C)P(D)$

$P(A \cap B \cap C) = P(A)P(B)P(C) \quad P(A \cap B \cap D) = P(A)P(B)P(D)$

$P(A \cap C \cap D) = P(A)P(C)P(D) \quad P(B \cap C \cap D) = P(B)P(C)P(D)$

$P(A \cap B \cap C \cap D) = P(A)P(B)P(C)P(D)$

a b c

a, b, c, ab, ac, bc, abc ____/____/____

1.5-4) N tore event var

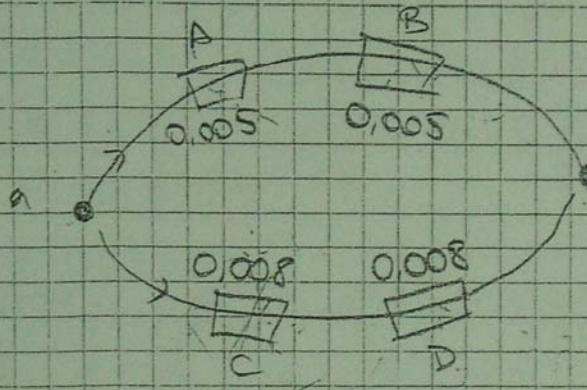
Then there are $2^N - 1$ combinations

but you don't take the single ones

so you require

$2^N - N - 1$ equations,

1.5-5)



· All repeaters fail independently of each other

P(A), P(B), P(C), P(D) fail

$P(Fail) = P(A \cap C) + P(A \cap \bar{C} \cap D) + P(\bar{A} \cap B \cap C) + P(\bar{A} \cap B \cap \bar{C} \cap D)$

$= P(A)P(C) + P(A)P(\bar{C})P(D) + P(\bar{A})P(B)P(C) + P(\bar{A})P(B)P(\bar{C})P(D)$

$= 40\mu + 39,68\mu + 39,8\mu + 39,5\mu$

$= 0,000159$ (159 μ)

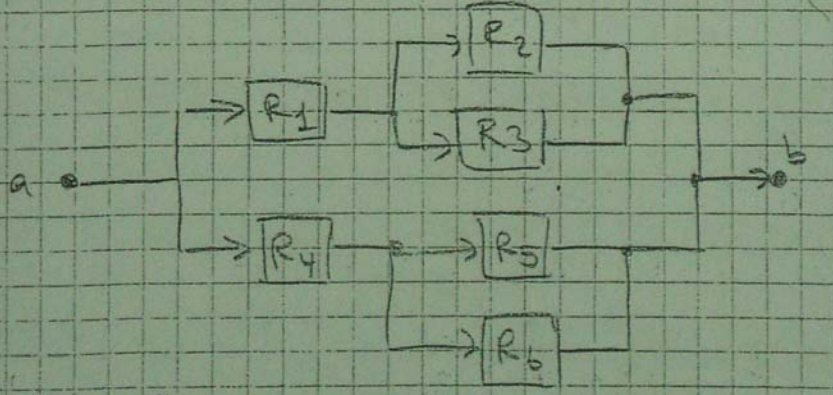
$P(A \cap C) = P(A) P(C) P(\bar{B}) P(\bar{D})$

$+ P(\bar{A}) P(C) P(B) P(\bar{D})$

$+ P(A) P(\bar{C}) P(\bar{B}) P(D)$

$+ P(\bar{A}) P(\bar{C}) P(B) P(D)$

1.5-6)



$P(R_1) = 0,005$

$P(R_2) = P(R_3) = P(R_4) = 0,01$, $P(R_5) = P(R_6) = 0,05$

$P(Fail) = \overset{①}{P}(R_1 \cap R_4) + \overset{②}{P}(\bar{R}_1 \cap R_4 \cap R_5 \cap R_6) +$

$+ \overset{③}{P}(\bar{R}_1 \cap R_2 \cap R_3 \cap R_4) + \overset{④}{P}(\bar{R}_1 \cap R_2 \cap R_3 \cap \bar{R}_4 \cap R_5 \cap R_6)$

$= \overset{①}{50\mu} + \overset{②}{12,4\mu} + \overset{③}{0,99\mu} + \overset{④}{0,25\mu} = 63,64\mu$

$= 0,00006364$

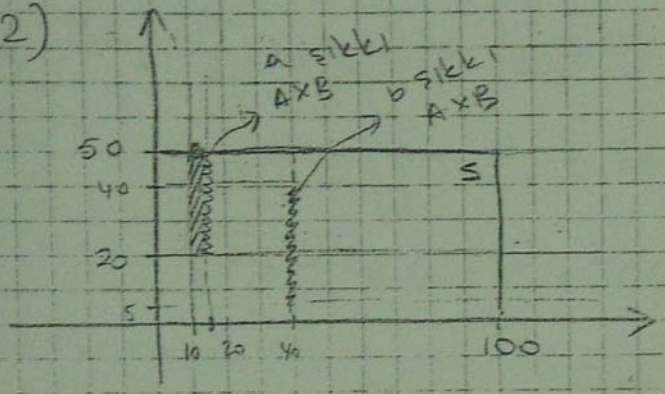
1.6-1) $S_1 = \{A, B, C, D, E\}$

$S_2 = \{M1, M2, M3, M4\}$

$S = 20$ elements $= S_1 \times S_2$

$= \{(A, M1), (A, M2), ____, (E, M4)\}$

1.6-2)



1.6-3) $S = 6 \cdot 6 \cdot 6 \cdot 6 = 1296 = 6^4$

$\binom{1296}{4} = \frac{1296}{1292!4!} = \frac{1296 \cdot 1295 \cdot 1294 \cdot 1293}{4!}$

Permutation olunca $\times 4!$ $1296 \cdot 1295 \cdot 1294 \cdot 1293$

$= 2,8 \cdot 10^{12}$

1.6-4) $\binom{52}{5} = \frac{52}{47!\,5!} = \frac{52 \cdot 51 \cdot 50 \cdot 49 \cdot 48}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$

$= 2,59 \cdot 10^6$

1.7-1) $P(\text{out of tolerance}) = 0,03$

a) $P(\text{every 4 out of tolerance}) = \binom{4}{4}(0,03)^4 (1-0,03)^0$

$P(\frown) = 0,81 \cdot 10^{-6}$

b) $P(\text{two out of tol}) = \binom{4}{2}(0,03)^2 (1-0,03)^2$

$= \frac{24 \cdot 3}{2} = 0,005$

c) $P(\text{in tolerance}) = \binom{4}{0}(0,03)^0 (1-0,03)^4$

$= 0,885$

1.7-2) $P(\text{Land}) = 0,8$

a) $P(\rightsquigarrow) = \binom{6}{0} (0,8)^0 (1-0,8)^6$

$= 64\ 10^{-6} = 0,000064$

b) $P(\rightsquigarrow) = 1 - 0,000064$

c) $P(\rightsquigarrow) = \binom{6}{3} 0,8^3 0,2^3 + \binom{6}{4} 0,8^4 0,2^2 +$

$+ \binom{6}{5} 0,8^5 0,2^1 + \binom{6}{6} 0,8^6 0,2^0$

$= \frac{6 \cdot 5 \cdot 4}{3 \cdot 2} 0,8^3 \cdot 0,2^3 + \frac{6 \cdot 5}{2} 0,8^4 0,2^2 +$

$+ 6 \cdot 0,8^5 0,2 + 0,8^6$

$= 0,983$ it is succesful

1.7-3) a) $N = 2$

$P(\sim) = \binom{2}{2} 0,4^2 0,6^0 = 0,160$

b) $N = 4$

$P(\sim) = \binom{4}{2} 0,4^2 0,6^2 + \binom{4}{3} 0,4^3 0,6 + \binom{4}{4} 0,4^4$

$= 6 \cdot 0,4^2 \cdot 0,6^2 + 4 \cdot 0,4^3 \cdot 0,6 + 0,4^4$

$= 0,5248$

1.7-4) $P(L) = 0,4$

a) $P(\text{at least 1 tic for 3}) = \binom{5}{3} 0,4^3 0,6^2 + \binom{5}{4} 0,4^4 0,6 + \binom{5}{5} 0,4^5 1$

$= 10 \cdot 0,4^3 0,6^2 + 5 \cdot 0,4^4 \cdot 0,6 + 0,4^5$

$= 0,31744$

(www.cappadoce.com)

b) $P(\text{not late at all}) = \binom{5}{0} 0,4^0\ 0,6^5 = 0,077$

1.7-5) $P(D) = 0,3$ 5 flight each day

a) $P(\text{not late}) = \binom{5}{0} 0,3^0\ 0,7^5 = 0,168$

b) $P(\text{all late}) = \binom{5}{5} 0,3^5\ 0,7^0 = 0,00243$

c) $P(\text{three or more on time}) = \binom{5}{3} 0,3^2\ 0,7^3 + \binom{5}{4} 0,3^1\ 0,7^4 + \binom{5}{5} 0,3^0\ 0,7^5$

$= 10 \cdot 0,3^2\ 0,7^3 + 5\ 0,3\ 0,7^4 + 0,7^5$

$= 0,836$

1.7-6) five on time

$P(\text{zero delay}) = \binom{5}{0} 0,3^0\ 0,7^5 = 0,168$

four on time

$P(\text{one delay}) = \binom{5}{1} 0,3^1\ 0,7^4 = 0,360$

three on time

$P(\text{two delay}) = \binom{5}{2} 0,3^2\ 0,7^3 = 0,308$

two on time

$P(\text{three delay}) = \binom{5}{3} 0,3^3\ 0,7^2 = 0,132$

one on time

$P(\text{four delay}) = \binom{5}{4} 0,3^4\ 0,7 = 0,028$

zero on time

$P(5 \text{ delay}) = \binom{5}{5} 0,3^5\ 0,7^0 = 0,002$

Two or more should be on time then

$P(\text{two or more}) = 0,868$

1.7-7) $P(H) = 0,7$ 5 times 2H win
$P(T) = 0,3$

a) $P(\text{win}) = \binom{5}{2} 0,7^2 0,3^3 = 10 \cdot 0,7^2 \cdot 0,3^3$

$\frac{5 \cdot 4^2}{2} = 0,132$

No, he shouldn't play the game

b) $P(\text{win}) = \binom{5}{4} 0,7^4 0,3^1 = 0,360 + \binom{5}{5} 0,7^5 0,3^0$

$= 0,52$

1.7-8) $P(\text{Hit}) = 0,8$

a) $P(\text{win a set}) = \binom{6}{5} 0,8^5 0,2 + \binom{6}{6} 0,8^6 0,2^0$

$= 6 \cdot 0,8^5 \cdot 0,2 + 0,8^6 = 0,655$

b) $P(\text{becoming Marksman}) = \binom{3}{3} 0,655^3 = 0,281$ //

1.7-9) $P(En) = 0,05$ $P(Sn) = 0,001$

$P(En \cap Sn) = P(En) P(Sn) = 0,000050$ fail

$P(\overline{En \cap Sn}) = 1 - 0,00005 = 0,99995$

1.7-10) $P(\text{Fail}) = 0,06$ $P(\text{Success}) = 0,94$

a) $P(\text{all operate}) = \binom{6}{0} 0,06^0 0,94^6 = \binom{6}{6} 0,94^6 0,06^0$

$= 0,689$ //

b) $P(\text{all fail}) = \binom{6}{6} 0,06^6 0,94^0 = 46,65 \cdot 10^{-6}$

c) $P(\text{one fail}) = \binom{6}{1} 0,06^1 0,94^5 = 0,264$

zero 1 two or more fail

1.7-11) $P(\text{Rep}) = 0,9 \quad P(\text{Fail}) = 0,1$

a) $P_1(\quad) = 1 - P_2(\text{zero fail one fail})$

$P_2(\quad) = \binom{8}{0} 0,1^0 0,9^8 + \binom{8}{1} 0,1^1 0,9^7$

$= 0,813$

$P_1(\quad) = 1 - 0,813 = 0,187$ //

b) $P(\text{All prop rep}) = \binom{8}{8} 0,9^8 0,1^0 = 0,430$

1.7-12) $P(\text{Ref}) = 0,99 \quad P(\text{Fail}) = 0,01$

Not more than three fail

$P(\text{not more than three fail}) = \binom{250}{0} 0,01^0 0,99^{250} + \binom{250}{1} 0,01^1 0,99^{249}$

$+ \binom{250}{2} 0,01^2 0,99^{248} + \binom{250}{3} 0,01^3 0,99^{247}$

$\lambda = 250$
$p = 0,01$

$= \frac{(250 \cdot 0,01)^0 e^{-(2,5)}}{0!} + \frac{(250 \cdot 0,01)^1 e^{-2,5}}{1!}$

$+ \frac{(2,5)^2 e^{-2,5}}{2!} + \frac{(2,5)^3 e^{-2,5}}{3!}$

$= 0,082 + 0,250 + 0,256 + 0,213$

$= 0,801$ //

2.1-1) $S = \{0, 1, 2.5, 6\}$

a) $X(s) = \{0, 2, 5, 12\}$ $\quad X = 2s$

b) $X(s) = \{-1, 4, 30.25, 179\}$ $\quad X = 5s^2 - 1$

c) $X(s) = \{1, -1, 0\}$ $\quad X = \cos(\pi s)$

d) $X(s) = \{1, -\frac{1}{2}, \frac{-2}{13}, \frac{-1}{17}\}$ $\quad X = (1 - 3s)^{-1}$

2.1-2) $S = \{-2 < s \leq 5\}$

a) $X(s) = \{-4 < s \leq 10\}$ $\quad -15 \leq 5s < 6$, $-14 \leq 1 - 3s < 5$

b) $X(s) = \{0 \leq s \leq 124\}$

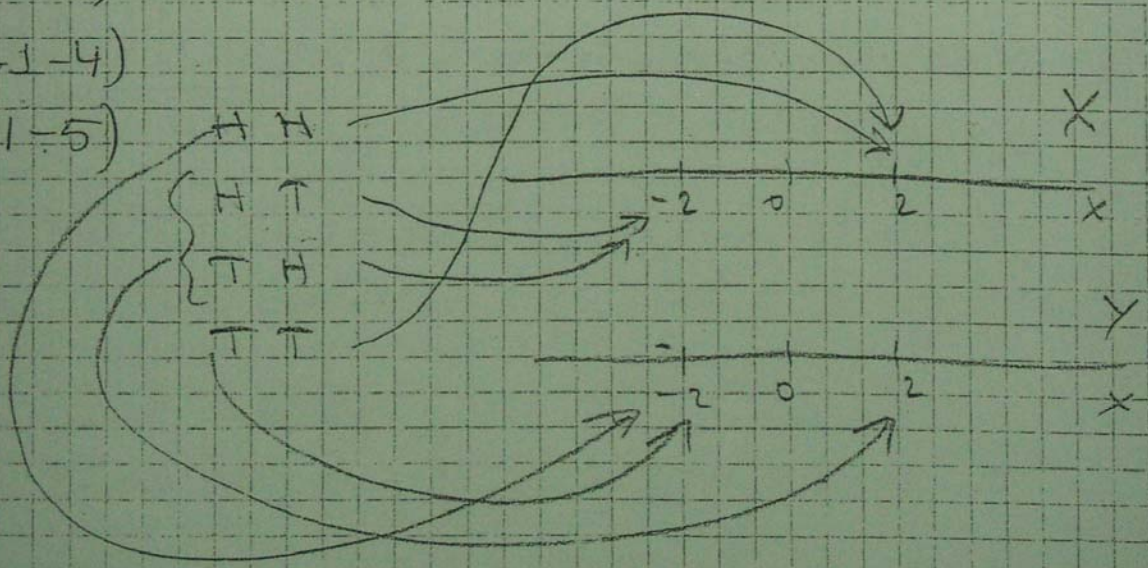
c) $X(s) = \{-1 \leq s \leq 1\}$

d) $X(s) = \{-\frac{1}{14} \geq s > \frac{1}{5}\}$

2.1-3) a) cont b) Mixed c) Discrete
d) Discrete

2.1-4)

2.1-5)



X = "dollars won"

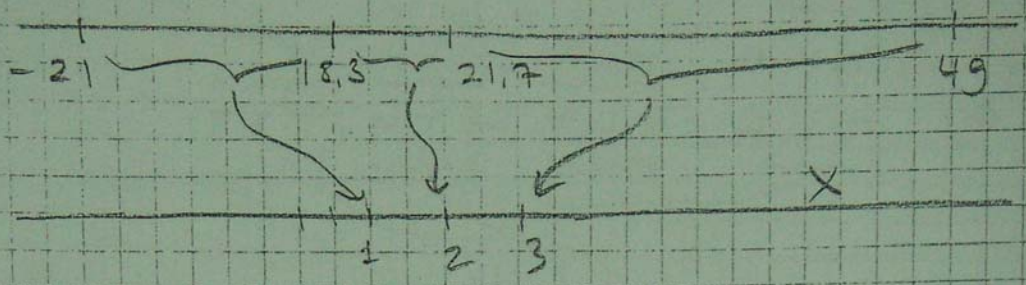
Y = "dollars lost"

$P(X=1) = 0,56$

$P(X=2) = 0,048$

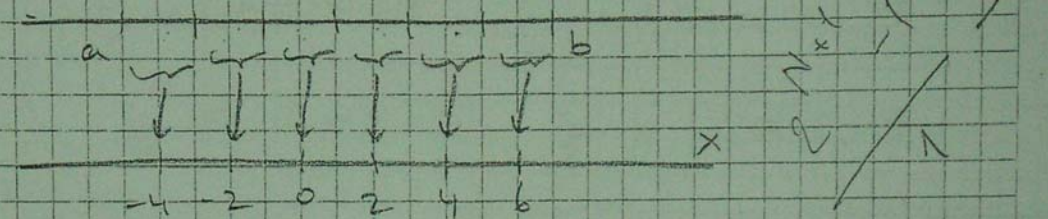
$P(X=3) = 0,39$

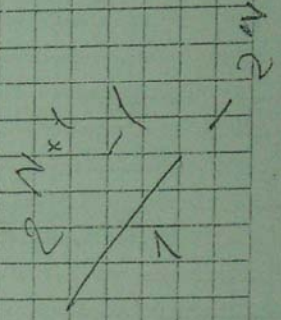
2.1-6)



X = "thermostat setting"

2.1-7) a)





b) $a = -5 \quad b = 7$

2.1-8) $S = \{ a_0 < s \leq a_N \}$ N subsets

$X(s) = \{ a_1, a_2, \ldots a_N \}$

smallest "input subset" $\Delta = a_1 - a_0$

$a_n - a_{n-1} = 2^{n-1} \Delta$

Δ, a_n in terms of a_0, a_N and N

$a_1 - a_0 = \Delta$

$a_2 - a_1 = 2^{2-1} \Delta$

$a_3 - a_2 = 2^{3-1} \Delta$

$a_{n-1} - a_{n-2} = 2^{n-1-1} \Delta$

$a_N - a_{N-1} = 2^{N-1} \Delta$

$a_N - a_0 = 2\Delta \cdot \frac{(N-2)(N-1)}{2}$

$a_N - a_0 = \Delta (N-2)(N-1)$

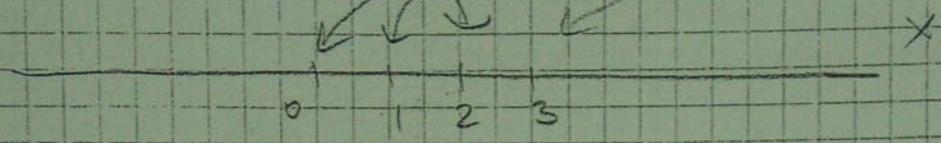
$\Delta = \frac{a_N - a_0}{N}$ //

$a_N = a_0 + \frac{a_N - a_0}{N} (N-2)(N-$

$\Delta (2^N - 1)$

$\Delta = \frac{a_N - a_0}{N}$

2.1-9) a) HHH HHT HTH HTT
THH THT TTH TTT



b) $P(X=0) = \frac{1}{8}$ $P(X=1) = \frac{3}{8}$

$P(X=2) = \frac{3}{8}$ $P(X=3) = \frac{1}{8}$

2.1-10) $P\{head\} = 0,6$ $P\{tail\} = 0,4$

$P(X=3) = \frac{6}{10} \cdot \frac{6}{10} \cdot \frac{6}{10} = \frac{27}{125} = \frac{216}{1000}$

$P(X=0) = \frac{4}{10} \cdot \frac{4}{10} \cdot \frac{4}{10} = \frac{64}{1000}$

$P(X=1) = \binom{3}{1} 0,6^1 0,4^2 = 3 \cdot \frac{6}{10} \cdot \frac{4}{10} \cdot \frac{4}{10} = \frac{288}{1000}$

$P(X=2) = \binom{3}{2} 0,6^2 0,4^1 = \frac{3 \cdot 6 \cdot 6 \cdot 4}{1000} = \frac{432}{1000}$

2.1-11) 180Ω, 470Ω, 1000Ω, 2200Ω

$E_2 = \{2,16 ; 4,37 ; 6,6 ; 8,74\}$

$P(E_2 = 2,16) = 1/4$

$4,37) = 1/4$

$6,6) = 1/4$

$8,74) = 1/4$