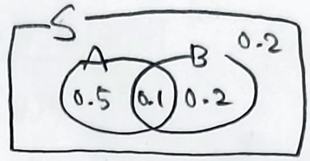
Total : 35 pt

2.80

If $A \subset B$, $P(A \cap B) = P(A) \neq P(A)P(B)$ if $B \neq S$.

2.88 (5pt)

a. yes, →



b. 0 when they are disjoint.

c. $P(A \cap B)$ should not be larger than $P(A)$ & $P(B)$

d. 0.3 $(= P(B))$

2.110

Let event A : not be defective, event B : come from line I.

$$P(A) = P(A \cap S) = P(A \cap (B \cup B^c)) = P((A \cap B) \cup (A \cap B^c)) \overset{\text{disjoint}}{=} P(A \cap B) + P(A \cap B^c)$$

$$= P(A|B)P(B) + P(A|B^c)P(B^c) = 0.908$$

2.114

a. $0.95 \cdot 0.1 = 0.095$

b. $0.95 \cdot 0.9 = 0.885$

c. $0.05 \cdot 0.1 = 0.005$

d. $1 - (0.05) \cdot (0.9) = 0.955$

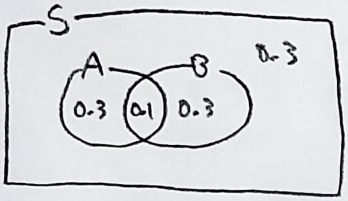
2.134 (5 pt)

F: failure to learn. Then, $P(F|A) = 0.2$, $P(F|B) = 0.1$, $P(A) = 0.7$, $P(B) = 0.3$.

$$P(A|F) = \frac{P(F|A) \cdot P(A)}{P(F)} = \frac{P(F|A)}{P(F|A)P(A) + P(F|B)P(B)} = \frac{14}{17}$$

2.172 (3pt, 3pt, 4pt)

a, b $\Rightarrow$



$P(A|B) = \frac{1}{4}$, $P(A^c|B^c) = \frac{1}{2}$, $P(A|B^c) = \frac{1}{2}$

False.

c. $P(A|B) + P(A^c|B) = \dfrac{P(A\cap B) + P(A^c \cap B)}{P(B)} = \dfrac{P((A \cup A^c)\cap B)}{P(B)}$ by disjoint & axiom

$= \dfrac{P(B)}{P(B)} = 1$

2.175

$P(A) = 0.5$, $P(B) = 0.5$, $P(B) = 0.5$ $\quad P(A \cap B \cap C) = \frac{1}{4}$

$P(A\cap B \cap C) \neq P(A)P(B)P(C)$, not mutually Independent.

3.6 (5pt)

$\exists$ ${}_5C_2 = 10$ sample points. $(1,2), (1,3), \cdots, (3,5), (4,5)$.

a. $P(2) = 0.1$, $P(3) = 0.2$, $P(4) = 0.3$, $P(5) = 0.4$

b. $P(3) = 0.1$, $P(4) = 0.1$, $P(5) = 0.2$, $P(6) = 0.2$, $P(7) = 0.2$, $P(8) = 0.1$, $P(9) = 0.1$

3.11

	0	1	2	3	
$P(x)$	$\frac{8}{27}$	$\frac{12}{27}$	$\frac{6}{27}$	$\frac{1}{27}$	$\Rightarrow \frac{1}{3}, \frac{2}{3}$
$P(y)$	$\frac{2744}{3375}$	$\frac{588}{3375}$	$\frac{42}{3375}$	$\frac{1}{3375}$	$\Rightarrow \frac{1}{15}, \frac{14}{15}$
$P(z)$	$\frac{27}{125}$	$\frac{36}{125}$	$\frac{54}{125}$	$\frac{8}{125}$	$\Rightarrow \frac{2}{5}, \frac{3}{5}$

$\frac{1}{3} + \frac{1}{15} = \frac{2}{5}$, $1 - \frac{2}{5} = \frac{3}{5}$

3.26

A: contact 1 customer, B: contact 2 customer

X: # of sales

$P(X=0) = P(X=0 \cap A) + P(X=0 \cap B) = \frac{1}{3}\cdot\frac{9}{10} + \frac{2}{3}\cdot\left(\frac{9}{10}\right)^2 = \frac{252}{300}$

$P(X=1) = P(X=1 \cap A) + P(X=1 \cap B) = \frac{1}{3}\cdot\frac{1}{10} + \frac{2}{3}\cdot\frac{9}{10}\cdot\frac{1}{10}\cdot 2 = \frac{46}{300}$

$P(X=2) = P(X=2 \cap A) + P(X=2 \cap B) = 0 + \frac{2}{3}\cdot\frac{1}{10}\cdot\frac{1}{10} = \frac{2}{300}$

Y: daily sales.

$E[Y] = 0\cdot P(X=0) + 50000\cdot P(X=1) + 100000\cdot P(X=2) = \frac{25000}{3}$

$V[Y] = (50000)^2 P(X=1) + (100000)^2 P(X=2) - \left(\frac{25000}{3}\right)^2$

$\sigma(Y) = \sqrt{V[Y]} \simeq \$\,19508.$

3.29 (5pt)

$\sum_{k=1}^{\infty} P(Y \geq k) = \sum_{k=1}^{\infty}\sum_{j=k}^{\infty} P(Y=j) = \sum_{k=1}^{\infty}\sum_{j=k}^{\infty} p(j) = \sum_{j=1}^{\infty}\sum_{k=1}^{j} p(j) = \sum_{j=1}^{\infty} j\,p(j)$

$= \sum_{y=1}^{\infty} y\,p(y) = E(Y)$

3.33

a. $E(aY+b) = E(aY) + E(b) = aE(Y) + b = a\mu + b$

b. $V(aY+b) = E((aY+b-a\mu-b)^2) = E[a^2(Y-\mu)^2] = a^2E[(Y-\mu)^2] = a^2\sigma^2$

3.34 (5pt)

$E[10Y] = 10E[Y] = 10[0\cdot 0.1 + 1\cdot 0.5 + 2\cdot 0.4] = \$13$

$V(Y) = 0.5 + 4\cdot 0.4 - 1.3^2 = 0.41$, $V(10Y) = 100\cdot V(Y) = \$41$