HW4 Solutions

Math 3338-10853: Probability (Fall 2006), Dr. Jiwen He

67.

a. Since the events are independent, then A′ and B′ are independent, too. (See paragraph below equation 2.7.) P(B′|A′) = . P(B′) = 1 - .7 = .3

b. $P(A \cup B)=P(A) + P(B) - P(A)\cdot P(B) = .4 + .7 - (.4)(.7) = .82$

c. $P(AB'|\, A\cup B) = \dfrac{P(AB' \cap (A \cup B))}{P(A \cup B)} = \dfrac{P(AB')}{P(A \cup B)} = \dfrac{.12}{.82} = .146$

71. P(no error on any particular question) = .9, so P(no error on any of the 10 questions) $=(.9)^{10} =$ .3487. Then P(at least one error) $= 1 - (.9)^{10} = .6513$. For **p** replacing .1, the two probabilities are $(1\text{-}\mathbf{p})^n$ and $1 - (1\text{-}\mathbf{p})^n$.

77. Event A: { (3,1)(3,2)(3,3)(3,4)(3,5)(3,6) }, $P(A) = \frac{1}{6}$;

Event B: { (1,4)(2,4)(3,4)(4,4)(5,4)(6,4) }, $P(B) = \frac{1}{6}$;

Event C: { (1,6)(2,5)(3,4)(4,3)(5,2)(6,1) }, $P(C) = \frac{1}{6}$;

Event A∩B: { (3,4) }; $P(A\cap B) = \frac{1}{36}$;

Event A∩C: { (3,4) }; $P(A\cap C) = \frac{1}{36}$;

Event B∩C: { (3,4) }; $P(A\cap C) = \frac{1}{36}$;

Event A∩B∩C: { (3,4) }; $P(A\cap B\cap C) = \frac{1}{36}$;

$P(A)\cdot P(B) = \frac{1}{6}\cdot\frac{1}{6} = \frac{1}{36} = P(A\cap B)$

$P(A)\cdot P(C) = \frac{1}{6}\cdot\frac{1}{6} = \frac{1}{36} = P(A\cap C)$

$P(B)\cdot P(C) = \frac{1}{6}\cdot\frac{1}{6} = \frac{1}{36} = P(B\cap C)$

The events are pairwise independent.

$P(A)\cdot P(B)\cdot P(C) = \frac{1}{6}\cdot\frac{1}{6}\cdot\frac{1}{6} = \frac{1}{216} \neq \frac{1}{36} = P(A\cap B\cap C)$

The events are not mutually independent

1.

S:	FFF	SFF	FSF	FFS	FSS	SFS	SSF	SSS
X:	0	1	1	1	2	2	2	3

5. No. In the experiment in which a coin is tossed repeatedly until a H results, let Y = 1 if the experiment terminates with at most 5 tosses and Y = 0 otherwise. The sample space is infinite, yet Y has only two possible values.

7.

a. Possible values are 0, 1, 2, …, 12; discrete

b. With N = # on the list, values are 0, 1, 2, … , N; discrete

c. Possible values are 1, 2, 3, 4, … ; discrete

d. $\{ x: 0 < x < \infty \}$ if we assume that a rattlesnake can be arbitrarily short or long; not discrete

e. With c = amount earned per book sold, possible values are 0, c, 2c, 3c, … , 10,000c; discrete

f. $\{ y: 0 < y < 14 \}$ since 0 is the smallest possible pH and 14 is the largest possible pH; not discrete

g. With m and M denoting the minimum and maximum possible tension, respectively, possible values are $\{ x: m < x < M \}$; not discrete

h. Possible values are 3, 6, 9, 12, 15, … -- i.e. 3(1), 3(2), 3(3), 3(4), …giving a first element, etc,; discrete