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’|A) = . P(B’) = .7 = .3

b. P(A ∪ B) = P(A) + P(B) − P(A)P(B) = .4 + .7 − (.4)(.7) = .82

c. P(AB|A ∪ B) = \frac{P(AB') \cap (A ∪ B)}{P(A ∪ B)} = \frac{P(AB')}{P(A ∪ B)} = \frac{.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−p)^{10} and 1 − (1−p)^{10}.

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 ∩ B) = \frac{1}{36};
Event A ∪ C: \{ (3,4) \}; P(A ∪ C) = \frac{1}{36};
Event B ∪ C: \{ (3,4) \}; P(B ∪ C) = \frac{1}{36};
Event A ∩ B ∩ C: \{ (3,4) \}; P(A ∩ B ∩ C) = \frac{1}{36};
P(A)P(B) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36} = P(A ∩ B)
P(A)P(C) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36} = P(A ∩ C)
P(B)P(C) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36} = P(B ∩ C)
The events are pairwise independent.
P(A)P(B)P(C) = \frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{216} \neq \frac{1}{36} = P(A ∪ B ∩ C)
The events are not mutually independent.

1. | S: | FFF | SFF | FSF | FFS | FSS | SFS | SFS | SSS |
---|---|---|---|---|---|---|---|---|
X: | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |

5. No. In the experiment in which a coin is tossed repeatedly until a 1 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, ... \text{ i.e. } 3(1), 3(2), 3(3), 3(4), ... giving a first element, etc.; discrete