

**Homework 1; Due 11.30 a.m. Wed October 7.**

1.1.4 (a) The possible outcomes are 123 132 213 231 312 321

(b) (i) The event consists of the outcomes 213 and 231, for a probability of  $2/6 = 1/3$ . (ii) This event is 132 and 231, again with probability  $2/6 = 1/3$ .

(iii) The event is 231, probability  $1/6$ .

(iv) The event is 213, 231 and 132, with probability  $3/6 = 1/2$ .

(v) This event is 231 and 312, with probability  $2/6 = 1/3$ .

(c)  $X(123) = 3$ ,  $X(132) = X(321) = X(213) = 1$ ,  $X(231) = X(312) = 0$

(d)  $X = 3$  with probability  $1/6$ ,  $1$  with probability  $3/6$ ,  $0$  with probability  $2/6$ , using the results of part (c).

1.1.7 (a) (i)  $\{1, 2\}$ ,  $\{2, 3\}$ ,  $\{2, 4\}$  with probability  $3/6 = 1/2$ .

(ii)  $\{1, 3\}$  and  $\{2, 3\}$  with probability  $2/6 = 1/3$ .

(iii)  $\{1, 2\}$ ,  $\{1, 3\}$ ,  $\{2, 3\}$  with probability  $3/6 = 1/2$ .

(b)  $X(\{1, 2\}) = 3$  with probability  $1/6$ ,  $X(\{1, 3\}) = 4$  with probability  $1/6$

$X(\{1, 4\}) = X(\{2, 3\}) = 5$  with probability  $2/6$ ,  $X(\{2, 4\}) = 6$  with probability  $1/6$ ,

and  $X(\{3, 4\}) = 7$  with probability  $1/6$

1.1.8 (a) (i) 12, 21, 23, 32, 24, 42 with probability  $6/12$

(ii) 13, 31, 23, 32 with probability  $4/12$

(iii) 12, 21, 13, 31, 23, 32 with probability  $6/12$

(b)  $X(12) = X(21) = 3$  with probability  $2/12$ ,  $X(13) = X(31) = 4$  with probability  $2/12$

$X(14) = X(41) = X(23) = X(32) = 5$  with probability  $4/12$ ,  $X(24) = X(42) = 6$  with probability  $2/12$ ,

and  $X(34) = X(43) = 7$  with probability  $2/12$

Note: The probabilities and the possible values of  $X$  are the same as in 1.1.7 (a) and (b).

(c) (i) 31, 32, 34 with probability  $3/12$

(ii) 13, 23, 43 with probability  $3/12$

1.1.9 (a) (i) 12, 22, 21, 23, 32, 24, 42 probability  $7/16$

(ii) 13, 23, 32, 31, 33 probability  $5/16$

(iii) 12, 13, 23, 33, 32, 31, 22, 21, 11 probability  $9/16$

(b)  $X(11) = 2$  with probability  $1/16$ ,  $X(12) = X(21) = 3$  with probability  $2/16$

$X(13) = X(22) = X(31) = 4$  with probability  $3/16$ ,

$X(14) = X(23) = X(32) = X(41) = 5$  with probability  $4/16$

$X(24) = X(33) = X(42) = 6$  with probability  $3/16$ ,  $X(34) = X(43) = 7$  with probability  $2/16$ ,

and  $X(44) = 8$  with probability  $1/16$ .

Note that  $X$  now can take more possible values than in the previous two problems.

2.1.7  $A = \{\text{male}\}$ ,  $B = \{\text{lefthanded}\}$ .

$$P(A^c \cap B^c) = 1 - P(A \cup B) = 1 - P(A) - P(B) + P(A \cap B) = 1 - 0.5 - 0.1 + 0.06 = 0.46.$$

$$2.1.8 P(A \cap B) = P(A) + P(B) - P(A \cup B) = P(A) + (1 - P(B^c)) - P(A \cup B) = 0.4 + 0.45 - 0.7 = 0.15.$$