HW 1 Solution

1a) $A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ $p(A_i) = \frac{1}{10}$ $i = 1, \ldots, 10$

b) No for 2 reasons. 1) The sample space will differ since an area code cannot start with 0 or 1 and area codes starting with other numbers may not be in a local phone book. 2) Each number in the sample space will not be equally likely.

2) a. Differ by 0: $A = \{\{1,1\}, \{2,2\}, \{3,3\}, \{4,4\}, \{5,5\}, \{6,6\}\}$

Differ by 1: $B = \{\{1,2\}, \{2,3\}, \{3,4\}, \{4,5\}, \{5,6\}, \{2,1\}, \{3,2\}, \{4,3\}, \{5,4\}, \{6,5\}\}$

Let S be the sample space. $|S| = 6^2 = 36$

$|A| = 6$, $|B| = 10$

$$P(A \cup B) = \frac{|A| + |B|}{|S|} = \frac{16}{36}$$

b. $A = \{\{1,5\}, \{2,5\}, \{3,5\}, \{4,5\}, \{5,5\}, \{5,6\}, \{5,1\}, \{5,2\}, \{5,3\}, \{5,4\}, \{6,5\}, \{1,6\}, \{2,6\}, \{3,6\}, \{4,6\}, \{6,6\}, \{6,1\}, \{6,2\}, \{6,3\}, \{6,4\}\}$

Let S be the sample space.

$$P(A) = \frac{|A|}{|S|} = \frac{20}{36}$$

A = Set of all events with 2 Heads

3. $A = \{\{HHTTT\}, \{HTHTT\}, \{HTTHT\}, \{HTTTH\}, \{THHTT\}, \{THTHT\}, \{THTTH\}, \{TTHHT\}, \{TTHTH\}, \{TTTHH\}\}$

$|A| = 10$ or $|A| = \binom{5}{2} = \frac{5!}{2!(5-2)!} = \frac{120}{2 \cdot 6} = 10$

B = set of all events with 4 heads.

$B = \{\{HHHHT\}, \{HTHHH\}, \{HHTHH\}, \{HHHTH\}, \{THHHH\}\}$

$|B| = 5$ or $|B| = \binom{5}{4} = \frac{5!}{4!(5-4)!} = \frac{120}{24} = 5$

C = set of all events with 0 heads.

$C = \{\{TTTTT\}\}$ $|C| = 1$

S = sample space $|S| = 2^5 = 32$

D = set of all events with even # Heads

$Pr[D] = \frac{|A| + |B| + |C|}{|S|} = \frac{16}{32} = 0.5$

4. 170 men, so $320 - 170 = 150$ women.
100 men, 160 total go to college so $160 - 100 = 60$ women go to college. $150 - 60 = 90$ women do not go to college

6. $P(A^c \cap B^c) = P(A \cup B)^c$ Demorgan's Law
$= 1 - P(A \cup B)$
$= 1 - 0.3 - 0.5$ disjoint events
$= 0.2$

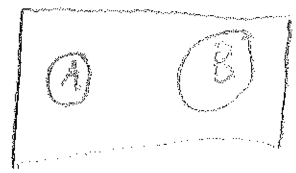
6.aH. $P(A^c) = 1 - P(A) = 0.7$

$P(B^c) = 1 - P(B) = 0.5$

$P(A^c \cap B^c) = P(A^c) + P(B^c) - P(A^c \cup B^c)$ not disjoint

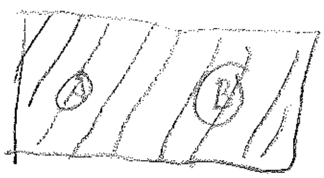
$= 0.7 + 0.5 - 1$

$= 0.2$

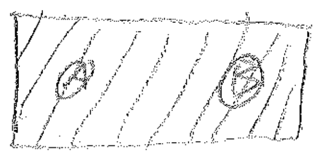


Disjoint

B^c



A^c



$A^c \cup B^c = 1$