Assignment 1

2.1 List the elements of each of the following sample spaces:

(a) The set of integers between 1 and 50 divisible by 8:

- These are: 8,16,24,32,40,48
- So, the sample space is: {8,16,24,32,40,48}

b) The set S={x|x2+4x+5=0}S = \{x | x^2 + 4x + 5 = 0\}S={x|x2+4x+5=0}:

- To find the elements of S, solve the equation x2+4x+5=0
- The discriminant is 4^2−4*1*5=16−20=-4
- Since the discriminant is negative, there are no real solutions. Thus, S={}S = \{\}S={} (the empty set).

2.3 Which of the following events are equal?

(a) A={1,3}

(b) B={x|x is a number on a die}\}:

- The set B is {1,2,3,4,5,6}

(c) C={x|x2−4x+3=0}C = \{x | x^2 - 4x + 3 = 0\}C={x|x2−4x+3=0}:

- Solve the equation: x2−4x+3=0x^2 - 4x + 3 = 0x2−4x+3=0.
- The roots are x=1 and x=3x.
- So, C={1,3}

(d) D={D = ={x|x is the number of heads when six coins are tossed}:

- The possible values for D are {0,1,2,3,4,5,6}

A=C since they both are {1,3}

2.14 List the elements of the sets corresponding to the following events:

Given:

- S={0,1,2,3,4,5,6,7,8,9}
- A={0,2,4,6,8}
- B={1,3,5,7,9}
- C={2,3,4,5}
- D={1,6,7}D = {1, 6, 7}

(a) A∪CA \cup CA∪C:

- The union of A and C is {0,2,3,4,5,6,8}

(b) $A \cap B$:

- The intersection of A and B is {} (the empty set).

(c) C' (Complement of C in S):

- $C' = \{0,1,6,7,8,9\}$.

(d) $(C' \cap D) \cup B$:

- $C' \cap D = \{1,6,7\}$ }.
- The union with B is {1,3,5,6,7,9}

(e) $(S \cap C)'$

- Since $S \cap C = CS$, the complement is C', so $(S \cap C)' = \{0,1,6,7,8,9\}$.

(f) $A \cap C \cap D'$

- $D' = \{0,2,3,4,5,8,9$ }.
- $A \cap C = \{2,4\}$.
- The intersection with $D' '$ is {2,4}.

2.63 Probabilities for PC locations in the home:

Given probabilities:

- Adult bedroom: 0.03
- Child bedroom: 0.15
- Other bedroom: 0.14
- Office or den: 0.40
- Other rooms: 0.28

(a) Probability that a PC is in a bedroom:

- The probability is $0.03+0.15+0.14=0.320.03 + 0.15 + 0.14 = 0.320.03+0.15+0.14=0.32$.

(b) Probability that a PC is not in a bedroom:

- The probability is $1-0.32=0.681 - 0.32 = 0.681-0.32=0.68$.

(c) Expected room for PC:

- The room with the highest probability is the office or den, with a probability of 0.40.

2.58 A pair of fair dice is tossed. Find the probability of:

(a) A total of 8:

- Possible outcomes: (2,6), (3,5), (4,4), (5,3), (6,2) — 5 outcomes.
- Total possible outcomes: 36.

- Probability = 5/36.

(b) At most a total of 5:

- Possible outcomes: (1,1), (1,2), (1,3), (2,1), (2,2), (3,1) — 6 outcomes.
- Probability = 6/36 = 1/6.

2.76 Probability of Hypertension and Smoking:

Given data:

- Nonsmokers: H=21, NH=48
- Moderate Smokers: H=36,NH=26
- Heavy Smokers: H=30, NH=19

(a) Probability of hypertension given heavy smoker:

- P(H|HS)=30/(30+19)=30/49.

(b) Probability of nonsmoker given no hypertension:

- P(NS|NH)=48/(48+26+19)=48/93.

2.110 Probability that a patient recovers:

Given P(recovery) = 0.8.

(a)Probability that exactly 2 of the next 3 patients survive:

- Binomial probability: P(X = 2) = (2) × (0.8)2 x (0.2) = 3 x 0.64 x 0.2 = 0.384.

(b)Probability that all 3 patients survive:

- P(X= 3) = (0.8)3 = 0.512.