

HW 1, due Thursday Feb 7

1. You flip 3 fair coins which are either H(eads) or T(ails). List all the elements in the the sample space. Find the probability that you flip exactly 2 heads. Compute the expected number of heads using two methods: sum over the sample space and sum over the number of possible heads.
2. A deck of 52 cards has 13 hearts. What is the probability the first 3 cards are hearts? If the first card is a heart, what is the probability the next 2 cards are hearts? If the first 2 cards are hearts, what is the probability the next card is a heart?
3. Consider events A and B . Suppose $P(A|B) = P(A|\bar{B})$. Show that A and B are independent.
4. Consider events A and B . Let C be the event that where either A occurs or B occurs, but not both. Show $P(C) = P(A) + P(B) - 2P(A \cap B)$.
5. Consider events A and B . Suppose $P(A) = 0.2$, $P(B) = 0.3$ and $P(A \cup B) = 0.4$. Compute $P(A \cap B)$ and $P(\bar{A}|B)$.
6. A cat has a litter of kittens. Each kitten has a 50% chance of being female and 50% chance of being male. Let A the event that there is at most one female. Let B be the event that the litter contains both sexes. Are A and B independent? Explain.
7. There are two methods, A and B to teach Math 456. Method A works for 80% of the students and method B for 90%. B takes more work on the instructor's part and is thus used only 30% of the time math 456 is taught. Mike took 456 but the class did not work for him. What is the probability Mike was taught 456 using method A ?
8. The population is 40% Whigs and 60% Tories. 30% of Whigs favor wearing wigs and 70% of Tories favor wearing wigs. A randomly chosen person is found to favor wearing a wig. Find the conditional probability that this person is a Whig.
9. Let Y be a random variable who probability density function is given by $P(Y = y) = \frac{y}{10}$ when y is an integer between 1 and n inclusive. What should n be for this to be valid probability density function? Compute $E(Y)$, $V(Y)$, $E(17Y - \pi)$ and $E(1/Y)$.
10. 10% of bottles produced at a factory have cracks. If two bottles are selected, find the mean and variance of the number of cracked bottles selected.