

Review Problems for Exam 1

- (1) There are 5 red chips and 3 blue chips in a bowl. The red chips are numbered 1, 2, 3, 4, 5 respectively, and the blue chips are numbered 1, 2, 3 respectively. If two chips are to be drawn at random and without replacement, compute the probability that these chips are have either the same number or the same color.
- (2) A person has purchased 10 of 1,000 tickets sold in a certain raffle. to determine the five prize winners, 5 tickets are drawn at random and without replacement. Compute the probability that this person will win at least one prize.
- (3) Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let E_1, E_2 and E_3 be mutually disjoint events in \mathcal{B} . Find $\Pr[(E_1 \cup E_2) \cap E_3]$ and $\Pr(E_1^c \cup E_2^c)$.
- (4) Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let A and B events in \mathcal{B} . Show that
$$\Pr(A \cap B) \leq \Pr(A) \leq \Pr(A \cup B) \leq \Pr(A) + \Pr(B).$$
- (5) Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let E_1, E_2 and E_3 be mutually independent events in \mathcal{B} with probabilities $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$, respectively. Compute the exact value of $\Pr(E_1 \cup E_2 \cup E_3)$.
- (6) Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let E_1, E_2 and E_3 be mutually independent events in \mathcal{B} with $\Pr(E_1) = \Pr(E_2) = \Pr(E_3) = 0.25$. Compute $\Pr[(E_1^c \cap E_2^c) \cup E_3]$.
- (7) A bowl contains 5 chips of the same size and shape. One the chips is red and the rest are blue. Draw chips from the bowl at random, one at a time and without replacement, until the red chip is drawn.
 - (a) Describe the sample space of this experiment.
 - (b) Define the probability function for this experiment. Justify your answer.
 - (c) Compute the probability that at least two draws will be needed to get the red chip.
- (8) Dreamboat cars are produced at three different factories A, B and C. Factory A produces 20 percent of the total output of Dreamboats, B produces 50 percent, and C produces 30 percent. However, 5 percent of the cars produced at A are lemons, 2 percent of those produced at B are lemons, and 10 percent of those produced at C are lemons. If you buy a Dreamboat and it turns out to be lemon, what is the probability that it was produced at factory A?
- (9) Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let A and B events in \mathcal{B} . Given that $\Pr(A) = 1/3, \Pr(B) = 1/5$ and $\Pr(A | B) + \Pr(B | A) = 2/3$, compute $\Pr(A^c \cup B^c)$.
- (10) Let $(\mathcal{C}, \mathcal{B}, \Pr)$ denote a probability space, and let A and B independent events in \mathcal{B} with $\Pr(B) > 0$. Given that $\Pr(A) = 1/3$, compute $\Pr(A \cup B^c | B)$.