

Mathematics 214: Introduction to Statistics
Review for Exam 1, February 1999

1) You roll a fair die twice in a row. What is the probability that the sum of the upper face numbers is 8?

- a) $\frac{1}{6}$ b) $\frac{\binom{12}{8}}{36}$ c) $\frac{1}{12}$ d) $\frac{5}{36}$ e) $\frac{1}{\binom{36}{8}}$

2) The set of six letters $\{A, B, C, D, E, F\}$ is used to construct 4-letter words. Repetitions of letters are allowed and the order counts, i. e., the word $ABDD$ is different from the word $BDAD$. Assume that the letters are chosen randomly, i. e. that any letter chosen from the set $\{A, B, C, D, E, F\}$ is equally likely. What is the probability that a random word has all its 4 letters different?

- a) $\frac{\binom{6}{4}}{6^4}$ b) $\frac{P_4^6}{6^4}$ c) $\frac{1}{6^4}$ d) $\frac{4!}{6!}$ e) $\frac{\binom{6}{4}}{6!}$

3) There is a well-shuffled standard card deck of 52 cards. What is the probability that a poker hand of five cards dealt randomly from the deck contains exactly 3 aces.

- a) $\frac{\binom{4}{3} \cdot \binom{48}{2}}{\binom{52}{5}}$ b) $\frac{5 \cdot 4 \cdot 3 \cdot 47^2}{52^5}$ c) $\frac{\binom{4}{3} \cdot 48^3}{\binom{52}{5}}$ d) $\frac{\binom{4}{3} + \binom{48}{2}}{\binom{52}{5}}$ e) $\frac{4^3 \cdot 47^2}{52^5}$

4) Assume A and B are events, i. e. subsets of a sample space S . Let P be a probability defined on S . Assume that $P(A) = 0.45$, $P(B) = 0.15$, and $P(A \cap B) = 0.03$. Calculate $P(A | B)$.

- a) $\frac{1}{2}$ b) 0.45 c) $\frac{1}{3}$ d) 0.03 e) $\frac{1}{5}$

5) In a certain company 60% of the employees are female and the remaining 40% are, of course, male. 30% of the female employees and 40% of the male employees are younger than 35 years of age. What fraction of all the employees of that company are younger than 35 years of age?

- a) 0.32 b) 0.5 c) 0.36 d) 0.7 e) 0.34

6) There is a box of nails. Assume that $\frac{2}{3}$ of these nails were produced by a machine (call it A) that is known to produce defective nails with probability 0.01, and the remaining $\frac{1}{3}$ of the nails were produced by a machine (call it B) that is known to produce defective nails with probability 0.03. If a nail is chosen randomly from the box and it is found to be defective, what is the probability it was produced by machine A?

- a) 1 b) 0.6 c) 0.4 d) 0.5 e) 0.2

7) At a certain institute 55% of the members have cookies in the afternoon, 40% of the members have tea in the afternoon, and 20 % of the members have neither. What fraction of the members like both cookies and tea?

- a) 40% b) 15% c) 20% d) 95% e) 80%

8) A company produces light bulbs and ships boxes consisting of 40 bulbs. Before shipping, a random sample of 6 bulbs is taken from the box and inspected — if any are defective, the box is not shipped. Assuming the box contains 8 defective bulbs, what is the probability that the box won't be shipped, i. e., that the random sample of 6 bulbs contains at least one defective.

- a) $\frac{32^6 - 8^6}{40^6}$ b) $\frac{\binom{8}{6}}{\binom{40}{6}}$ c) $\frac{\binom{32}{6}}{\binom{40}{6}}$ d) $1 - \frac{\binom{32}{6}}{\binom{40}{6}}$ e) $\frac{\binom{8}{1} \cdot \binom{32}{8}}{\binom{40}{8}}$

9) 39 % of a given population has type A blood. A specific blood typing test predicts type A blood for 37% of the population. If a person from the population has type A blood, then the test will predict with probability 0.91 that the person's blood is type A. What is the probability that a certain person actually has type A blood given that the test predicts type A blood for that person?

- a) $0.91 \cdot 0.38$ b) $\frac{0.91 \cdot 0.39}{0.37}$ c) $\frac{0.91 \cdot 0.37}{0.39}$ d) 1 e) $0.91 \cdot 0.37$

10) Assume that A and B are events of a sample space S . The probabilities $P(B) = 0.4$, $P(A|B) = 0.3$, and $P(A|\bar{B}) = 0.6$ are known. What is $P(A)$?

- a) 0.48 b) 0.12 c) 0.24 d) 0.7 e) 0.9

11) Assume A and B are disjoint events, i. e., A and B are subsets of a sample space S and the intersection $AB = A \cap B = \emptyset$. Let P be a probability defined for the sample space S . If further A and B are independent events, then it is always true that $P(A) \cdot P(B) =$

- a) $P(A) + P(B)$ b) $\frac{1}{2}$ c) 1 d) 0 e) $1 - P(A) - P(B)$

12) Let X be a discrete random variable which takes the values -1 , 2 , and 4 . Its probability function p is given as $p(-1) = 0.4$, $p(2) = 0.3$, and $p(4) = 0.3$. What is $E(X)$, i. e., what is the expected value of X ?

- a) 2 b) 1 c) 5 d) $\sqrt{1.4}$ e) 1.4

13) How many ways can 3 different books be given to 7 persons, if each person is allowed to receive several books?

- a) 7^3 b) 3^7 c) $\binom{7}{3}$ d) P_3^7 e) $3 \cdot 7$

14) Let X be a discrete random variable which takes the values -1 , 2 , 3 , and 4 . The probability function of X is given as $p(-1) = 0.1$, $p(2) = 0.2$, $p(3) = 0.1$, and $p(4) = 0.6$. What is the standard deviation of X ?

- a) 2.4 b) 2 c) $\sqrt{2.4}$ d) 1.2 e) $\sqrt{3}$

15) Of the people entering a blood bank to donate blood, 30% have type O^+ blood. For the next three people entering, let X denote the number with O^+ blood. What is $P(X = 2)$?

- a) $3 \cdot (0.3)^2 \cdot 0.7$ b) $3 \cdot (0.7)^2 \cdot 0.3$ c) $(0.3)^2$ d) $(0.7) \cdot 0.3$ e) $(0.3)^2 \cdot 0.7$

16) A certain manufacturer advertises batteries that will run for an average of 150 minutes, with a standard deviation of 10 minutes. Find the smallest interval, which contains at least 75% of the performance periods for batteries of this type?

- a) $50 \leq Y \leq 250$ b) $140 \leq Y \leq 160$ c) $110 \leq Y \leq 190$ d) $130 \leq Y \leq 170$
e) $145 \leq Y \leq 155$

1	a	b	c	X	e
2	a	X	c	d	e
3	X	b	c	d	e
4	a	b	c	d	X
5	a	b	c	d	X
6	a	b	X	d	e
7	a	X	c	d	e
8	a	b	c	X	e

9	a	X	c	d	e
10	X	b	c	d	e
11	a	b	c	X	e
12	a	b	c	d	X
13	X	b	c	d	e
14	a	b	X	d	e
15	X	b	c	d	e
16	a	b	c	X	e