

EXAM Form MA PROBABILITY Dr. Rapalje

SHOW ALL WORK on this test or on separate paper. Turn in ALL worksheets.
Calculators are allowed on this test. **WARNING: As I recall, this is a KILLER test!!**

1. Evaluate the following expressions:
 - a) $8!$
 - b) $\frac{7!}{3!}$
 - c) $P(6, 4)$
 - d) $C(7, 3)$

2. If digits may be used from the following set $\{0, 1, 2, 3, 4, 5, 6\}$, find the number of each of the following, assuming that zero is not allowed in the first digit.
 - a) Three digit numbers (repetition is not allowed).

 - b) Odd three digit numbers (repetition is not allowed).

 - c) Three digit numbers in which repetition is allowed.

 - d) Three digit multiples of 5 without repeated digits. (EXTRA CREDIT!)**
HINT: There are two cases to consider: 1) ends in a 0 2) ends in a 5.

3. If the digits $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ may be used,
 - a) how many telephone numbers can be formed per area code (i.e., seven digit numbers, in which the first digit may not be zero)?

 - b) how many three digit area codes can be formed if the middle digit must be a 0, 1, or 2, and repetition is allowed?

 - c) find the total number of seven digit numbers with three digit area codes that can be formed using the criteria of parts a) and b).

4. How many seven-letter “words” without repeated letters are possible using the English alphabet? (Assume that any seven letters makes a “word”)

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5. Using the Russian alphabet, which has 32 letters, how many three-letter “words” are possible, assuming that any three letters forms a “word” and that repetition is allowed?

6. A club has nine members. Find the number of choices the members of the club have for:
 - a) Electing a president and vice-president.

 - b) Choosing 2 members to serve on a committee.

 - c) Choosing 3 members to serve on committee A, 3 different members to serve on committee B, and the remaining three to serve on committee C.

7. Determine the number of possible settings for a row of three on-off switches under each of the following condition.
 - a) There are no restrictions.

 - b) The first and third switch must be on.

 - c) The first and third switch must be the same.

8. Four distinct letters are to be chosen from the letters from the set {I, R, E, L, A, N, D}. Determine the number of ways to obtain a subset that includes the letter “L.”

9. Give definitions for:
 - a) Sample Space

 - b) Probability of A

 - c) Odds in favor of A

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10. Three people are asked to select one baseball card from eight different cards. Assuming that the selections are done randomly and with replacement:
- a) Find the probability that all three select the same card.

 - b) Find the probability that all three will select different cards.
11. Two DISTINCT numbers are randomly selected from the set $\{1, 2, 3, 4, 5, 6\}$.
- a) Find the probability that both numbers are odd.

 - b) Find the probability that both numbers are perfect squares.

 - c) Find the probability that the sum of the numbers is 7.
12. A bag contains 4 red beads, 5 green beads, and 6 blue beads. Two beads are selected randomly without replacement. Complete the probability distribution table where x denotes the number of green beads drawn.

x	$P(x)$
0	
1	
2	

13. The probability that it will snow on any given day in January is 0.75. Calculate the probabilities and round to nearest hundredth.
- a) Find the probability that it will snow on three consecutive days.

 - b) Find the probability that it will be NO snow on three consecutive days.

 - c) Find the probability that it will snow on the on two days in a row and that it will NOT snow on the third day.

 - d) Find the probability that it will snow on at least one out of three days.

MULTIPLE CHOICE:

14. A truck buyer can purchase a truck with or without the following options: CD player, 4-wheel drive, cruise control, air conditioner. How many combinations of options are available?
- A. 24 B. 16 C. 8 D. 4
15. Six accountants and 4 secretaries have applied to work at a company. How many groups of 5 employees can be chosen so that there are 3 accountants and 2 secretaries?
- A. 144 B. 120 C. 30 D. 15
16. In a study of drivers under the age of 25, 30 wear seat belts and 21 do not. If one driver is chosen at random, what is the probability that he or she does not wear a seat belt?
- A. $17/7$ B. $7/17$ C. $10/17$ D. $7/10$
17. A fitness study involves a sample of 24 females (14 of whom jog) and 18 males (8 of whom jog). If one person is chosen at random, what is the probability that person is a male or a person who jogs?
- A. $20/21$ B. $11/49$ C. $4/9$ D. $16/21$
18. According to U.S. Census Bureau data, 60% of those eligible to vote actually do vote. If 2 eligible voters are chosen at random, what is the probability they both vote?
- A. 0.36 B. 0.036 C. 0.16 D. 0.33
19. A group of students consists of 3 freshman and 5 sophomores. Two students are selected without replacement. What is the probability that both students selected are freshmen?
- A. $9/25$ B. $3/28$ C. $9/64$ D. $3/10$
20. A box contains six diskettes, of which two are defective. If two diskettes are randomly selected from the box, find the probability that both are defective.
- A. $16/30$ B. $1/3$ C. $1/9$ D. $1/15$

1a) $8! = 40320$

b) $\frac{7!}{3!} = 240$

c) $P(6,4) = 360$

d) $C(7,3) = 35$

2a) $\frac{6}{6} \frac{6}{6} \frac{5}{5} = 180$

b) $\frac{5 \cdot 5 \cdot 3}{1} = 75$

c) $\frac{6 \cdot 7 \cdot 7}{1} = 294$

d) $\frac{6 \cdot 5 \cdot 1}{30 + 25} = \frac{30}{55}$

3a) $\frac{9}{9} \frac{10}{10} \frac{10}{10} \frac{10}{10} \frac{10}{10}$

$\frac{9,000,000}{9,000,000}$

b) Given 300 area codes

c) $\frac{9,000,000 \times 300}{2700,000,000}$

4. $P(26,7)$

$\frac{26!}{7!19!} = 3315312000$

5. $\frac{32 \cdot 32 \cdot 32}{1}$

32768

6a) $P(9,2) = 9 \cdot 8 = 72$

b) $C(9,2) = \frac{9 \cdot 8}{2 \cdot 1} = 36$

c) $C(9,3) \cdot C(6,3) \cdot C(3,3)$
 $84 \cdot 20 \cdot 1 = 1680$

7a) $\frac{2}{2} \frac{2}{2} \frac{2}{2} = 8$

b) $\frac{1}{1} \frac{2}{2} \frac{1}{1} = 2$

c) $\frac{2}{2} \frac{2}{2} \frac{1}{1} = 4$

8. $C(7,1) C(6,3)$

$7 \cdot 20 = 140$

9a) Sample Space = set of all possible outcomes of an experiment.

b) Prob of A = $\frac{\# \text{ ways A can occur}}{\text{total } \# \text{ of outcomes}}$

c) Odds in favor of A = $\frac{\# \text{ favorable outcomes}}{\# \text{ unfavorable}}$

10a) $1 \cdot \frac{1}{8} \cdot \frac{1}{8} = \frac{1}{64}$

b) $1 \cdot \frac{7}{8} \cdot \frac{6}{8} = \frac{21}{32}$

11a) $\frac{3}{6} \cdot \frac{2}{5} = \frac{1}{5}$

b) $\frac{2}{6} \cdot \frac{1}{5} = \frac{1}{15}$

c) There are 30 possible outcomes.
 (1,6) (6,1) (2,5) (5,2) (3,4) (4,3)
 Ans = $\frac{6}{30} = \frac{1}{5}$

12. 4R, 5G, 6B.

E.C. $P(0G) = \frac{C(5,0) C(10,2)}{C(15,2)} = \frac{9}{21} = \frac{3}{7}$

$P(1G) = \frac{C(5,1) C(10,1)}{C(15,2)} = \frac{10}{21}$

$P(2G) = \frac{C(5,2) C(10,0)}{C(15,2)} = \frac{2}{21}$

14. B 18. A

15. B 19. B

16. B 20. D.

17. D

13. $P(\text{Snow}) = .75$ $P(\text{No Snow}) = .25$

a) $(.75)^3 \approx .42$

b) $(.25)^3 \approx .02$

c) $(.75)(.25) \approx .19$

d) $1 - P(\text{No Snow})$
 $1 - (.25)^3 \approx .98$