

SHOW ALL WORK on this test or on separate paper. Turn in ALL worksheets.

Calculators are allowed on this test. Circle Answers. (2 ½ each)

1. Evaluate the following expressions:
 - a) $9!$
 - b) $\frac{9!}{6!}$
 - c) $P(7, 3)$
 - d) $C(15, 3)$
 - e) $C(15, 12)$

2. How many 4 letter “words” can be formed under each of the following conditions.
 - a) Using the letters a, e, i, o, u (repetition is allowed).

 - b) Using the letters a, e, i, o, u (repetition is not allowed).

 - c) Using the letters a, e, i, o, u, and the word must begin with “a” and end with “e” (repetition is allowed).

 - d) Using the letters a, e, i, o, u, and the word must begin with “a” and end with “e” (repetition is not allowed).

3. If there are eight members in a club,
 - a) how many ways are there to elect a president, vice-president, and secretary? Is this a permutation or a combination? Why?

 - b) how many ways are there to choose three members of the club to attend a conference? Is this a permutation or a combination? Why?

 - c) how many seating arrangements can be formed that will allow the members to sit in a row of eight seats at a concert? Is this a permutation or combination? Why?

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

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

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

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

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

7. Give definitions for:
 - a) Sample Space

 - b) Probability of A

 - c) Odds in favor of A

8. Two **DISTINCT** numbers are randomly selected from the set $\{1, 2, 3, 4, 5\}$.
 - 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.

9. A bag contains 4 red beads, 5 green beads, and 6 blue beads. Two beads are selected randomly without replacement.
- a) Find $P(\text{no blue beads})$
 - b) Find $P(1 \text{ red, } 1 \text{ blue})$ any order
 - c) Find $P(\text{Exactly } 1 \text{ blue})$
 - d) Find $P(\text{Both blue})$
10. The probability that it will rain on any given day in January is 0.25. Calculate the probabilities and round to nearest hundredth.
- a) Find the probability that it will rain on three consecutive days.
 - b) Find the probability that it will be NO rain on three consecutive days.
 - c) Find the probability that it will rain on the on two days in a row and that it will NOT rain on the third day.
 - d) Find the probability that it will rain on at least one out of three days.

MULTIPLE CHOICE:

11. A dentist is making a denture for one of her patients. She must choose from 5 styles of teeth, 3 types of acrylic, and either a stippled or smooth finish. How many options does she have?
A. 30 B. 15 C. 10 D. 3
12. Five students competed in a poetry contest. After the competition, a \$100 first prize, a \$50 second prize, and a \$20 third prize were awarded. How many different ways can the awards be given?
A. 125 B. 60 C. 12 D. 3
13. Because of cutbacks, a government office must dismiss 2 of the 6 workers in that office. How many groups of 2 workers can be chosen?
A. 64 B. 30 C. 15 D. 12
14. Four men and 5 women are competing to become members of a cheerleading squad that will consist of 2 men and 2 women. How many different squads can be selected?
A. 60 B. 20 C. 9 D. 4
15. Under certain conditions, there is a 0.2 probability that a randomly selected driver will fail a driver's license test. If 2 randomly selected drivers are tested under these conditions, what is the probability that at least 1 will fail?
A. 0.64 B. 0.36 C. 0.2 D. 0.04
16. Two common sources of caffeine for U.S. adults are coffee and tea. Forty percent of U.S. adults drink coffee but not tea, while 25% drink both. What is the probability that a randomly selected adult does not drink coffee?
A. 0.85 B. 0.65 C. 0.35 D. 0.15
17. Ten percent of the tennis balls manufactured by a company are defective. If two balls are randomly selected with replacement from the day's production, find the probability that both of them are defective.
A. 1/100 B. 1/90 C. 1/10 D. 1/5

LAM I Probability MBC

1a) $9! = 362880$
 b) $\frac{9!}{6!} = \frac{9 \cdot 8 \cdot 7 \cdot 6!}{6!} = 504$
 c) $P(7,3) = 7 \cdot 6 \cdot 5 = 210$
 d) $C(15,3) = \frac{15 \cdot 14 \cdot 13}{3 \cdot 2 \cdot 1} = 455$
 e) $C(15,12) = C(15,3) = 455$

2a) $\underline{5} \underline{5} \underline{5} \underline{5} = 625$
 b) $\underline{5} \underline{4} \underline{3} \underline{2} = 120$
 c) $\underline{1} \underline{5} \underline{5} \underline{1} = 25$
 d) $\underline{1} \underline{3} \underline{2} \underline{1} = 6$

3a) $\underline{8} \underline{7} \underline{6}$
 $\text{or } P(8,3) = 336$
Permutation.
 Order is significant
 b) $\frac{8 \cdot 7 \cdot 6}{3 \cdot 2 \cdot 1} = 56$
Combination
 Order not significant
 c) $8! = 40320$
Permutation
 Order is significant.

4. $\underline{26} \underline{25} \underline{24} \underline{23}$
 $\text{or } P(26,4) = 358800$

5. $\underline{32} \underline{32} \underline{32} \underline{32}$
 $= 32^4 = 1048576$

6a) $\underline{2} \underline{2} \underline{2} \underline{2} \underline{2} = 32$
 b) $\underline{2} \underline{1} \underline{1} \underline{2} \underline{2} = 8$
 c) $\underline{2} \underline{2} \underline{1} \underline{2} \underline{2} = 16$

7a) Sample Space = Set of all possible outcomes.
 b) $P(A) = \frac{\text{no ways A can occur}}{\text{total \# outcomes}}$ or $\frac{\text{favorable}}{\text{total \#}}$
 c) odds in favor = favorable to unfavorable.

- 8 $\{1, 2, 3, 4, 5\}$
 $\left\{ \begin{array}{l} (1,2) (1,3) (1,4) (1,5) \\ (2,1) (2,3) (2,4) (2,5) \\ (3,1) (3,2) (3,4) (3,5) \\ (4,1) (4,2) (4,3) (4,5) \\ (5,1) (5,2) (5,3) (5,4) \end{array} \right\}$

No. outcomes = $5 \cdot 4 = 20$

a) Both odd $(1,3) (1,5) (3,1) (3,5) (5,1) (5,3)$

$P(\text{Both odd}) = \frac{6}{20} = \frac{3}{10}$

c) Both Perfect Squares = $(1,4) (4,1)$

$P(P.S.) = \frac{2}{20} = \frac{1}{10}$

c) $\text{Sum} = 7$ $(2,5) (3,4) (4,3) (5,2)$

$P(\text{Sum} = 7) = \frac{4}{20} = \frac{1}{5}$

11. $5 \cdot 3 \cdot 2 = 30$ (A)

12. $5 \cdot 4 \cdot 3 = 60$ (B)

13. $C(6,2) = 15$ (C)

14. $C(4,2) \cdot C(5,2) = 6 \cdot 10 = 60$ (A)

15. $1 - P(\text{Both Arr})$

$1 - (0.8)(0.8) = .36$ (B)

16.

	C	No C
T	.25	
No T	.40	

 $1 - .65 = .35$ (C)

17. $(.1)(.1) = .01$ (A)

9. 4R, 5G, 6B

a) $P(\text{not B}) = \frac{C(9,2)C(6,0)}{C(15,2)} = \frac{36 \cdot 1}{105} = \frac{12}{35}$

or $\frac{30}{15} \cdot \frac{8}{14} = \frac{12}{35}$

b) $P(1R, 1B) = \frac{C(4,1)C(6,1)}{C(15,2)} = \frac{4 \cdot 6}{105} = \frac{8}{35}$

c) $P(1B, 1 \text{ not B}) = \frac{C(6,1)C(9,1)}{C(15,2)}$

$= \frac{6 \cdot 9}{105} = \frac{18}{35}$

d) $P(\text{Both B}) = \frac{C(6,2)C(9,0)}{C(15,2)} = \frac{15 \cdot 1}{105} = \frac{1}{7}$

or $\frac{3}{15} \cdot \frac{5}{14} = \frac{1}{7}$

10 a) $P(\text{Rain}) = \frac{1}{4}$ $P(\text{No Rain}) = \frac{3}{4}$

a) $P(R,R,R) = \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{64}$

b) $P(\text{No R, No R, No R}) = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{27}{64}$

c) $P(R,R, \text{No R}) = \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{3}{4} = \frac{3}{64}$

d) $P(\text{Rain at least 1 day}) = 1 - P(\text{No R}) = 1 - \frac{27}{64} = \frac{37}{64}$