1. What does the Rule of Sum state?

A. The number of ways to do one task is added to the number of ways to do another task, provided they cannot occur simultaneously.

B. The total ways of doing tasks depend on their individual probabilities.

C. Tasks must occur simultaneously to apply the rule.

D. Each task must be equally probable to apply the rule.

Answer: A

2. If Task A can be done in 3 ways and Task B can be done in 5 ways, and they cannot occur simultaneously, in how many ways can either Task A or Task B be performed?

A. 15

B. 8

C. 2

D. 1

Answer: B

3. What is the formula to calculate the number of permutations of n distinct objects taken r at a time?

A. $P(n, r) = \frac{n!}{(n-r)!}$

B. $P(n, r) = n \times r$

C. $P(n, r) = \frac{n!}{r!}$

D. $P(n, r) = (n - r)!$

Answer: A

4. How many permutations can be made from the letters in the word "BOOK"?

A. 12

B. 24

C. 16

D. 48

Answer: B

5. Which of the following represents the Binomial Theorem?

A. $(x+y)^n = \sum_{k=0}^{n} \binom{n}{k} x^{n-k} y^k$

B. $(x+y)^n = n \times (x+y)$

C. $(x+y)^n = \binom{n}{k} \cdot x \cdot y$

D. $(x+y)^n = n^2 (x+y)^2$

Answer: A

6. What is the value of $\binom{5}{2}$?

A. 5

B. 10

C. 15

D. 20

Answer: B

7. What does the Pigeonhole Principle state?

A. If n pigeons are placed in m holes and $n > m$, at least one hole will contain more than one pigeon.

B. If n pigeons are placed in m holes and $n < m$, every hole must contain at least one pigeon.

C. Each hole must contain exactly one pigeon.

D. Pigeons are evenly distributed among the holes.

Answer: A

10. If $|A| = 10$, $|B| = 15$, and $|A \cap B| = 5$, what is $|A \cup B|$?

A. 15

B. 20

C. 25

D. 30

Answer: B

11. What is a derangement?

A. A permutation where no element appears in its original position.

B. A combination of subsets.

C. An arrangement where all elements are in their original position.

D. The total number of permutations.

Answer: A