

1. What is the cardinality of the power set of a set with n elements?

- a) n
- b) $2n$
- c) 2^n
- d) $n!$

Answer: c) 2^n

Explanation: The power set of a set with n elements has 2^n elements.

2. Which type of relation allows an element to relate to itself?

- a) Symmetric
- b) Reflexive
- c) Transitive
- d) Antisymmetric

Answer: b) Reflexive

Explanation: A relation R on a set A is reflexive if $(a, a) \in R$ for all $a \in A$.

3. In how many ways can you arrange n distinct objects in a row?

- a) $n!$
- b) 2^n
- c) $2n$
- d) n^n

Answer: a) $n!$

Explanation: $n!$ denotes the factorial of n , representing the number of permutations of n distinct objects.

4. Which type of function maps distinct elements of the domain to distinct elements of the codomain?

- a) One-to-one
- b) Onto
- c) Into
- d) Bijective

Answer: a) One-to-one

Explanation: A function is one-to-one (injective) if distinct elements in the domain map to distinct elements in the codomain.

5. What is the inverse of a function?

- a) A function that reverses the order of the elements
- b) A function that maps elements of the codomain to elements of the domain
- c) A function that squares its input
- d) A function that has no inverse

Answer: b) A function that maps elements of the codomain to elements of the domain

Explanation: The inverse of a function f maps elements of the codomain back to elements of the domain such that $f(f^{-1}(x)) = x$ for all x in the codomain.

6. Which theorem proving technique establishes the truth of a statement by assuming the opposite and demonstrating a contradiction?

- a) Mathematical induction
- b) Proof by contradiction
- c) Propositional logic
- d) Recursion

Answer: b) Proof by contradiction

Explanation: Proof by contradiction assumes the negation of what is to be proved and demonstrates a logical inconsistency to establish the original statement's truth.

7.What is the order of a group?

- a) The number of elements in the group
- b) The number of subgroups of the group
- c) The highest power of the elements in the group
- d) The number of elements in the cyclic subgroup

Answer: a) The number of elements in the group

Explanation: The order of a group is the number of elements it contains.

8.What is a necessary condition for a subgroup to be normal?

- a) It contains the identity element.
- b) It is a cyclic group.
- c) Its left cosets are equal to its right cosets.
- d) It is a proper subset of the original group.

Answer: c) Its left cosets are equal to its right cosets.

Explanation: A subgroup H of a group G is normal if and only if its left cosets are equal to its right cosets, i.e., $aH = Ha$ for all a in G .

9. What is the property that distinguishes a field from a ring?

- a) Closure under addition and multiplication
- b) Existence of additive inverses
- c) Existence of multiplicative inverses
- d) Commutativity under multiplication

Answer: c) Existence of multiplicative inverses

Explanation: In a field, every nonzero element has a multiplicative inverse, while in a ring, this is not necessarily the case.

10. Which logic operation returns true if and only if both operands are true?

- a) Conjunction
- b) Disjunction
- c) Negation
- d) Implication

Answer: a) Conjunction

Explanation: Conjunction (AND) returns true only if both operands are true; otherwise, it returns false.

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