Self-Assessment Quiz
Discrete Mathematics
Recursion and Recurrence Relations

Instructions: This is a **self-assessment quiz**. It is **not graded**. Select the most appropriate answer for each question. Answers are provided at the end for self-checking.

Multiple Choice Questions

Q1. The process of defining an object in terms of smaller versions of itself is called:

    (A) Induction

    (B) Recursion

    (C) Iteration

    (D) Enumeration

Q2. A recursive definition always consists of:

    (A) A rule and a formula

    (B) A base case and a recursive step

    (C) A sequence and a series

    (D) A function and its inverse

Q3. Which of the following is a base case for the factorial function?

    (A) $n! = n(n-1)!$

    (B) $1! = 1$

    (C) $0! = 1$

    (D) $n! = (n+1)!$

Q4. If a function is defined recursively, then:

    (A) It never refers to itself

    (B) It refers to smaller input values

(C) It has no base value

(D) It must be linear

Q5. Given $f(0) = 3$ and $f(n+1) = 2f(n) + 3$, what is $f(1)$?

(A) 6

(B) 7

(C) 9

(D) 12

Q6. A recurrence relation expresses:

(A) A term directly as a formula

(B) A term using its previous terms

(C) Only the first term of a sequence

(D) A constant function

Q7. Which of the following defines the Fibonacci sequence?

(A) $F_n = 2n$

(B) $F_n = F_{n-1}$

(C) $F_n = F_{n-1} + F_{n-2}$

(D) $F_n = n!$

Q8. The initial conditions in a recurrence relation are needed to:

(A) Solve integrals

(B) Find unique values of the sequence

(C) Prove continuity

(D) Reduce computation time

Q9. Which recurrence relation represents $b_n = 5^n$?

(A) $b_n = b_{n-1} + 5$

(B) $b_n = 5b_{n-1}$

(C) $b_n = b_{n-1}^5$

(D) $b_n = 5 + b_{n-1}$

Q10. If $S(n)$ is the sum of first n positive integers, then the recursive definition is:

(A) $S(n) = nS(n-1)$

(B) $S(n) = S(n-1) - n$

(C) $S(n) = n + S(n-1)$

(D) $S(n) = 2n + S(n-1)$

Q11. A recursively defined function must eventually reach:

(A) A maximum value

(B) A base case

(C) A closed form

(D) An infinite loop

Q12. Which of the following is an example of recursion?

(A) Solving a quadratic equation

(B) Factorial computation

(C) Matrix addition

(D) Linear search

Q13. In the Fibonacci sequence, $F_0 = 1$ and $F_1 = 1$. What is F_2?

(A) 1

(B) 2

(C) 3

(D) 0

Q14. The purpose of a recursive definition is to:

(A) Avoid mathematical formulas

(B) Define complex objects using simpler ones

(C) Replace functions with graphs

(D) Eliminate base cases

Q15. A recurrence relation with order 2 depends on:

(A) One previous term

(B) Two previous terms

(C) Only the first term

(D) All previous terms

Answer Key (For Self-Assessment)

Q1. B

Q2. B

Q3. C

Q4. B

Q5. C

Q6. B

Q7. C

Q8. B

Q9. B

Q10. C

Q11. B

Q12. B

Q13. B

Q14. B

Q15. B