PRINCIPLE OF MATHEMATICAL INDUCTION

1. For every natural number *n*

(A) (B)

(C) $n \geq 2^n$ (D) $n \leq 2^n$

2. For each $n \in N$, the correct statement is

(A) $2^n < n$ (B) $n^2 > 2n$

(C) $n^4 < 10^n$ (D) $2^{3n} > 7n + 1$

3. For natural number *n*, $2^n (n-1)! < n^n$, if

(A) $n < 2$ (B) $n > 2$

(C) $n \geq 2$ (D) Never

4. If *n* is a natural number then $\left(\frac{n+1}{2}\right)^n \geq n!$ is true when

(A) $n > 1$ (B) $n \geq 1$

(C) $n > 2$ (D) $n \geq 2$

5. For positive integer *n*, $10^{n-2} > 81n$, if

(A) $n > 5$ (B) $n \geq 5$

(C) $n < 5$ (D) $n > 6$

6. $x(x^{n-1} - na^{n-1}) + a^n(n-1)$ is divisible by $(x-a)^2$ for

(A) $n > 1$ (B) $n > 2$

(C) All $n \in N$ (D) None of these

7. If $P(n) = 2 + 4 + 6 + \ldots + 2n$, $n \in N$, then $P(k) = k(k+1) + 2 \Rightarrow P(k+1) = (k+1)(k+2) + 2$ for all $k \in N$. So we can conclude that $P(n) = n(n+1) + 2$ for

(A) All $n \in N$

(B) $n > 1$

(C) $n > 2$

(D) Nothing can be said

8. For every natural number *n*, $n(n+1)$ is always

(A) Even (B) Odd

(C) Multiple of 3 (D) Multiple of 4

9. The statement $P(n)$ "$1 \times 1! + 2 \times 2! + 3 \times 3! + \ldots + n \times n! = (n+1)! - 1$" is

(A) True for all $n > 1$

(B) Not true for any *n*

(C) True for all $n \in N$

(D) None of these

10. The remainder when 5^{99} is divided by 13 is

(A) 6 (B) 8

(C) 9 (D) 10

11. For all positive integral values of *n*, $3^{2n} - 2n + 1$ is divisible by

(A) 2 (B) 4

(C) 8 (D) 12

12. If $n \in N$, then $x^{2n-1} + y^{2n-1}$ is divisible by

(A) $x + y$ (B) $x - y$

(C) $x^2 + y^2$ (D) $x^2 + xy$

13. If $n \in N$, then $7^{2n} + 2^{3n-3} . 3^{n-1}$ is always divisible by

(A) 25 (B) 35

(C) 45 (D) None of these

14. If $n \in N$, then $11^{n+2} + 12^{2n+1}$ is divisible by

(A) 113 (B) 123

(C) 133 (D) None of these

15. For every natural number *n*, $n(n^2 - 1)$ is divisible by

(A) 4 (B) 6

(C) 10 (D) None of these

16. For every positive integer *n*, $2^n < n!$ when

(A) $n < 4$ (B) $n \geq 4$

(C) $n < 3$ (D) None of these

17. For every positive integral value of *n*, $3^n > n^3$ when

(A) $n > 2$ (B) $n \geq 3$

(C) $n \geq 4$ (D) $n < 4$

18. For natural number *n*, $(n!)^2 > n^n$, if

(A) $n > 3$ (B) $n > 4$

(C) $n \geq 4$ (D) $n \geq 3$

19. Let $P(n)$ denote the statement that $n^2 + n$ is odd. It is seen that $P(n) \Rightarrow P(n+1)$, P_n is true for all

(A) $n > 1$ (B) n

(C) $n > 2$ (D) None of these

20. If p is a prime number, then $n^p - n$ is divisible by p when n is a

(A) Natural number greater than 1

(B) Irrational number

(C) Complex number

(D) Odd number

21. When 2^{301} is divided by 5, the least positive remainder is

(A) 4 (B) 8

(C) 2 (D) 6

22. $10^n + 3(4^{n+2}) + 5$ is divisible by $(n \in N)$

(A) 7 (B) 5

(C) 9 (D) 17