J.E.E. Main/ Advanced Foundation - XI Maths Worksheet

Time: 60 min **Chapter#4 : Principle of Mathematical Induction** **Full Marks:**

Q.1	Let P (n) be the statement n(n + 1) is an even number then find P(6). (1 mark)
Q.2	Prove the following by using the principle of mathematical induction for all $n \in N$: (5 marks) $1.3+2.3^2+3.3^3+...+n.3^n=\frac{(2n-1)3^{n+1}+3}{4}$
Q.3	Prove the following by using the principle of mathematical induction for all $n \in N$: (5 marks) $1+\frac{1}{(1+2)}+\frac{1}{(1+2+3)}+...+\frac{1}{(1+2+3+...n)}=\frac{2n}{(n+1)}$
Q.4	Prove by using the principle of mathematical induction $3^{2n} - 1$ is divisible by 8 for n ∈ N. (3 marks)
Q.5	Prove the following by using the principle of mathematical induction for all $n \in N$: (3 marks) $1+3+3^2+...+3^{n-1}=\frac{(3^n-1)}{2}$
Q.6	Prove by using the principle of mathematical induction for all n∈N. $1.3 + 3.5 + 5.7 + \ldots\ldots\ldots\ldots + (2n-1)(2n+1) = \frac{n(4n^2+6n-1)}{3}$
Q.7	Prove by using the principle of mathematical induction for all nεN: $1 + 3 + 3^2 + \ldots\ldots\ldots\ldots + 3^{n-1} = \frac{3^n - 1}{2}$
Q.8	Prove that the product of two consecutive natural numbers is an even number. (3 marks)
Q.9	Prove the following by using the principle of mathematical induction for all n ∈ N. (3 marks) $(2n+7) < (n+3)^2$
Q.10	Use the principle of mathematical induction to prove that 1+5+9+13+ ……+(4n-3) = n(2n-1), n∈N
Q.11	Prove that : $2.7^n + 3.5^n - 5$ is divisible by 24 for all n∈N.
Q.12	Prove the following by using the principle of mathematical induction for all $n \in N$: (3 marks) $\left(1+\frac{3}{1}\right)\left(1+\frac{5}{4}\right)\left(1+\frac{7}{9}\right)...\left(1+\frac{(2n+1)}{n^2}\right)=(n+1)^2$
Q.13	Prove by using the principle of mathematical induction $3^n < 4^n$ for all n ∈ N. (3 marks)
Q.14	For every positive integer n, prove that $7^n - 3^n$ is divisible by 4.
Q.15	prove by using the principle of mathematical induction for n∈N : $(2n+7) < (n+3)^2$

Q.16	Prove the following by using the principle of mathematical induction for all $n \in N$: (3 marks) $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+...+\frac{1}{2^n}=1-\frac{1}{2^n}$
Q.17	Suppose P(n): n(n+1)(n+2) is divisible by 6. Show that P(1), P(2) and P(3) are true. (1 mark)
Q.18	Let P(n) be the statement $n^2 > 25$, prove that whenever P(k) is true, P(k + 1) is also true. (2 marks)
Q.19	Let $P(n)$ be the statement "$n^2 - n + 41$is prime". Show that $P(1)$, $P(2)$, $P(3)$ are true whereas $P(41)$ is not true. (2 marks)
Q.20	Explain the principle of mathematical induction. (1 mark)