

THE ZENITH Questions

For CRT - 08

BY O.P. GUPTA

Max. Marks : 30

INDIRA AWARD WINNER

Time : 60 Minutes

M.+91 9650350480

Topics : **Mathematical Induction**

■ **Advanced MATH Classes**, 1st Floor (Above Master Of Burgers), Opp. HP Petrol Pump, Thana Road, Najafgarh

Q01. (a) Let $P(n)$ be the statement " $3^n > n$ ". What is $P(n+1)$? Is $P(2)$ true?

(b) Let $P(n): 1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$, where n is a positive integer.

Is $P(3)$ true? What about $P(2)$?

[$2 \times 2 = 4$]

Q02. Show that $(ab)^n = a^n b^n$, for every natural number n .

Q03. For all $n \in \mathbb{N}$, show that $a + (a+d) + (a+2d) + \dots + \{a + (n-1)d\} = \frac{n}{2} \{2a + (n-1)d\}$

Q04. Prove that $3^n > 2^n$ for all $n \in \mathbb{N}$.

Q05. Prove that $7^{2n} + 2^{3n-3} \cdot 3^{n-1}$ is divisible by 25, for all $n \in \mathbb{N}$.

[$4 \times 4 = 16$]

Q06. Prove that the sum of the cubes of three consecutive natural numbers is divisible by 9.

Q07. $\forall n \geq 2, n \in \mathbb{N}$, prove that $1 + \frac{1}{4} + \frac{1}{9} + \dots + \frac{1}{n^2} < 2 - \frac{1}{n}$.

OR Show that $\sin x + \sin 3x + \dots + \sin(2n-1)x = \frac{\sin^2 nx}{\sin x} \quad \forall n \in \mathbb{Z}^+$.

[$5 \times 2 = 10$]

INDIRA Award Winner **O.P. Gupta** is author of several popular books on Mathematics for Classes XII and XI. These books can be bought at : www.iMathematicia.com.

Test held on : 06 August, 2017

Hints & Answers Of CRT-08

Q01. (a) $P(n+1) : 3^{n+1} > n+1$, $P(2)$ is true as $9 > 7$.

(b) Both are true.

Q02. See Mathematicia Type B.

Q03. See Mathematicia Type B.

Q04. See Mathematicia Type D.

Q05. See Mathematicia Type C.

Q06. See Mathematicia Type C.

Q07. See Mathematicia Type D.

❖ Dear Student/Teacher,

I would urge you for a little favour. Please notify me about any error (s) which you notice in this (or other Maths) work. It would be beneficial for all the future learners of Maths like us. Any constructive criticism will be well acknowledged.

Please find below my contact info when you decide to offer your valuable suggestions. I am looking forward for a response.

Moreover, I would wish **if you inform your friends/students** about my efforts for Maths so that they may also be benefited.

Let's learn Maths with smile :-)

☞ For any clarification(s), please contact :

O.P. Gupta, Math Mentor

[Maths (Hons.), E & C Engg., Indira Award Winner]

Call or WhatsApp @ +91-9650 350 480 Mail us at : theopgupta@gmail.com

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