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Ans To The Q. NO. 1(a)

Number theory: Number Theory is a branch of mathematics which helps to study the set of positive whole number, say 1, 2, 3, 4, 5, 6, ... which are also called The set of natural numbers and Sometimes called "higher arithmetic". Number Theory helps to study The relationships between different sort of numbers. in number Theory, The numbers are classified into different Types, Such as natural numbers whole numbers, complex numbers, and Soon

The sub-classification of the natural number are given below

* odd Numbers - 1, 3, 5, 7, 9, 11, 13, 15, 17, 19.....

* Even Numbers - 2, 4, 6, 8, 10, 12, 14, 16, 18, 20,

* Square Numbers - 4, 9, 16, 25, 36, 49, 64, 81, 100...

* cube Numbers - 8, 27, 64, 125, 216, 343, 512...

* prime Numbers - 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31
37, 41, 43, 47, 53, 59, 61....

* Composite Numbers - 4, 6, 8, 9, 10, 12, 14, 15, 16, 18
20, 21, 22, 24....

Ans To The Q. NO. 1(b)

Generating Function are a Fundamental concept in mathematics, used for encoding sequences in a compact form and solving combinatorial problems By representing a sequence of numbers as coefficient of a power series, generating function offer a powerful tool for analysing and deriving relationship between sequences. This technique allows mathematicians to manipulate series algebraically, facilitating the discovery of new

patterns and solution is wide array of mathematical disciplines. generating functions transform difficult counting problems into manageable algebraic work. it can be used to easily drive moments.

Ans To The Q. NO. 2(a)

predicate: A predicate is an expression of one or more variables determined on some specific domain. A predicate with variables can be made a proposition by either authorizing a value to the variable or by quantifying the variable

Examples of predicates

* Consider E(x, y) denote "x=y"
* Consider x(a,b,c) denote "a+b+c=0"
* Consider M(x,y) denote 'x is married to y'

Ans To The Q. NO. 2(b)

If n is irrational, Then $\sqrt{n}$ is also irrational.

If n is irrational number, then $\sqrt{n}$ is also irrational.

proof by contradiction.

Suppose n is an irrational number and $\sqrt{n}$ is rational. Then, there exist integers a and b, with b not equal to 0, such that $\sqrt{n} = a/b$, Then $n = a^2/b^2$.

However, Since a^2 and b^2 are integers and b^2 is not equal to 0, n is a rational number

This contradicts the assumption that n was irrational.

Hence $\sqrt{n}$ must be irrational

Ans to The Q. NO. 3

The Sample Standard deviation is defined by a Formula. So any Statement Such as the one above Should be proved by using this Formula. we begin with data Set that fits The description above: all values are identical, and there are n values equal to x_1

we calculate The mean of this dataset and See that it is

$$x_1(x_1 + x_1 + \cdots \cdots x_1)/x_n = nx/x_n = x_1$$

Now when we calculate the individual deviations from the mean, we see that all of these deviation are zero consequently, the variance and also the standard deviation are both equal to zero too.

Ans To The Q. NO. 4

A prime number is a whole number greater than 1 with only two factors - itself and 1 A prime number cannot divided by any other positive interger without leaving a remainder, decimal or fraction. prime numbers are often seen as building blocks by mathematicians is number theory. The fundamental Theorem of arithmetic states that a composite number can be expressed as the product of prime numbers

Examples of prime numbers:

An example of a prime number is 13.

that is because its only divisors are 1 and 13. Dividing a prime number by another natural number results in number left over e.g $13 \div 6 = 2$ remainder 1.

15 is not example of a prime number because it can be divided by 5 and 3 as well as by itself and 1. 15 is an example of a composite number. because it has more than two factors.

Imaginary numbers: Imaginary numbers are the numbers when squared it gives the negative result. in other words. imaginary numbers are defined as the square root of the negative numbers where it does

not have a definite value. it is mostly written in the form of real numbers multiplied by the imaginary unit called 'i' Let us take an example: 5i where 5 is the real number and i is the imaginary unit.

when this number 5i is squared, we will get the negative result as -25 Because the value of i^2 is -1 this means that the $\sqrt{-1} = i$ The notation 'i' is the foundation for all imaginary numbers. The Solution written by using this imaginary number in the form a+bi is known as a complex number

complex numbers are the combination of both real numbers and imaginary numbers. The complex number is of the standard form $a+bi$ where a and b are real numbers

i is an imaginary unit

Real numbers examples: 3, 8, -2, 0, 10

imaginary Numbers examples: $3i, 7i, -2i$

$\sqrt{i}$

Complex Numbers examples: $8+4i, 7-13.6$

$0+25i = 25i, 2+i$