

Elementary Number theory

- Divisibility and the Division Algorithm
- Prime Numbers and Factorization
- the Fundamental Theorem of Arithmetic

It states that - every integer greater than 1 is ~~is~~ can be uniquely identified as a product of prime numbers.

$$2 =$$

$$6 = 2 \times 3$$

→ Greatest-common divisor -

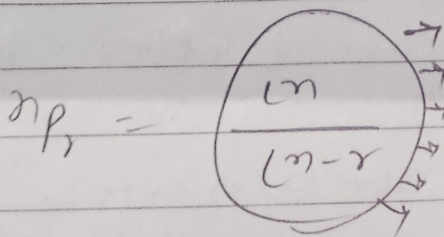
→ modular Arithmetic and congruence.
Two numbers are congruent - modulo n if their difference is divisible by n .

$a - b$ is divisible by n | ex. $a = 17, b = 5$
 $a \equiv b \pmod{n}$ | $n = 3$.

→ Diophantine equations

$a^2 + b^2 = p^2$ (Pythagorean triples)

(Pythagorean triples)



Permutation

Arrangement of object is called permutation.

$a, b, c \rightarrow$

All permutation taking all three objects

$(abc) (acb) (bac) (bca) (cab) (cba)$

$= 6$

All permutations taking two objects

$(a,b) (b,a) (a,c) (c,a) (b,c) (c,b) = 6$

$${}_nP_r = \frac{n!}{n-r!}$$

Where n = total number of object

r = number of object for permutation

$${}_3P_2 = \frac{3!}{3-2!} = \frac{3 \times 2 \times 1}{1} = 6$$

Find #) ${}_6P_3$ (2) ${}_nP_2 = 12$ $n = ?$

Types of Permutation

(n^r)

• Permutation with Repetition

• Permutation with no repetition $\rightarrow$ ~~not~~

• Permutation with Multi-sets.

$\rightarrow$ Q. How many ways can 2 letters be arranged from A, B, C (No repetition)

$\rightarrow$ How many 2 digit numbers can be formed using digits 1, 2, 3 (no repetition)

$\rightarrow$ How many ways can 4 students sit on 4 chairs

$\rightarrow$ How many different words can be formed using letters of the word "cat"

with Repetition

22

Page No.
Date:

LEVEL $\rightarrow$ $L = 2$ times
 $E = 2$ times

$V = 1$ times

permutd. $\rightarrow \frac{L^m}{L!L!} = \frac{25}{12 \times 12} = \frac{420}{4} = 30$

MA THEMATICS

111

$12 \times 12 \times 12$

$M = 2$
 $A = 2$
 $T = 2$

STATISTICS

10

$S = 3$
 $T = 3$
 $I = 2$

ENGINEERING

$E = 3$
 $N = 3$
 $G = 2$
 $I = 2$

111
 $12 \times 12 \times 12$