

Next Topic :

# Binary Codes

Pattern of 0's, 1's



# Codes:

What comes to your mind  
when hear the word “Code”?



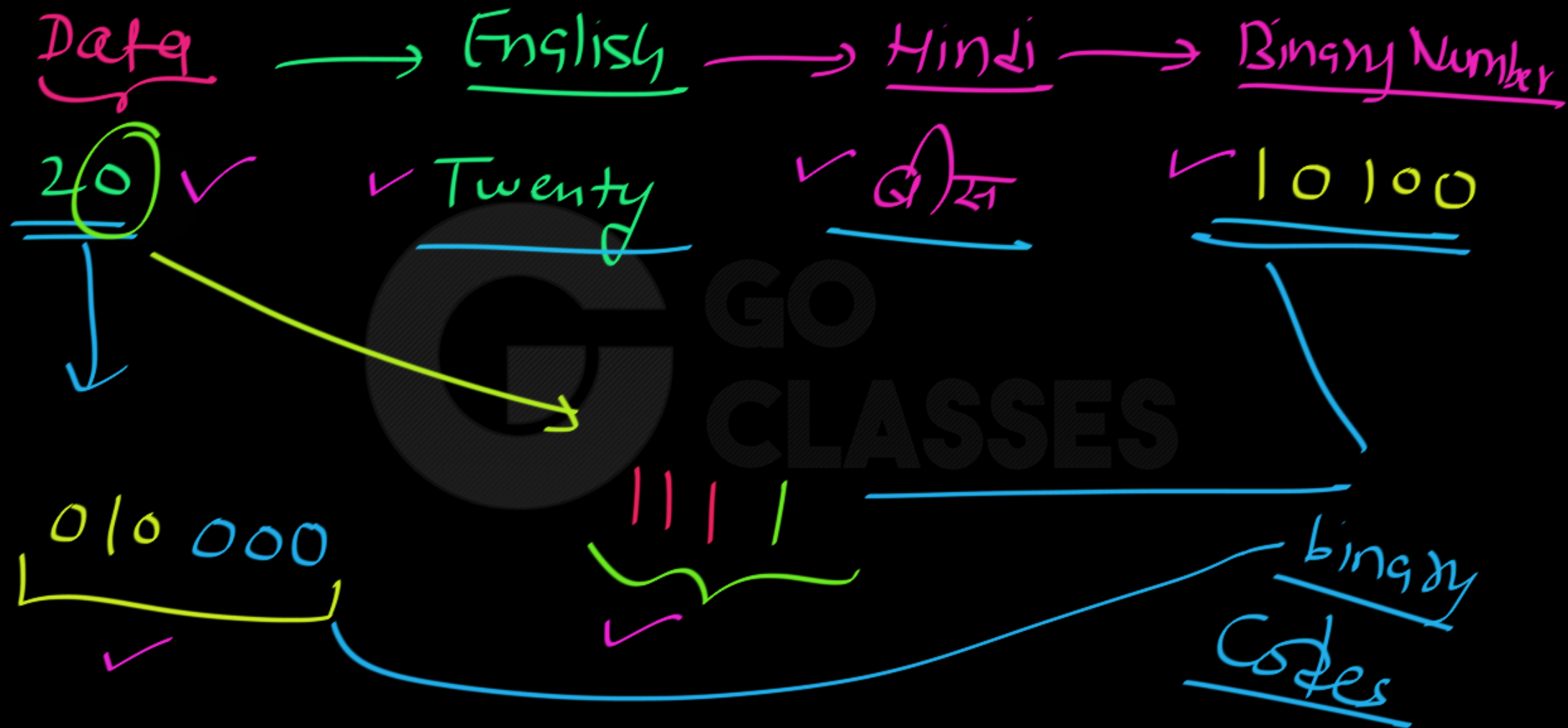
Data D  $\xrightarrow{\text{Coding}}$  Data D  
in some Representation I in Rep 2.

EIGHT  
English

3176  
Hindi

- In communications and information processing, code is a system of rules to convert information—such as a letter, word, sound, image, or gesture—into another form or representation, sometimes shortened or secret, for communication through a channel or storage in a medium.



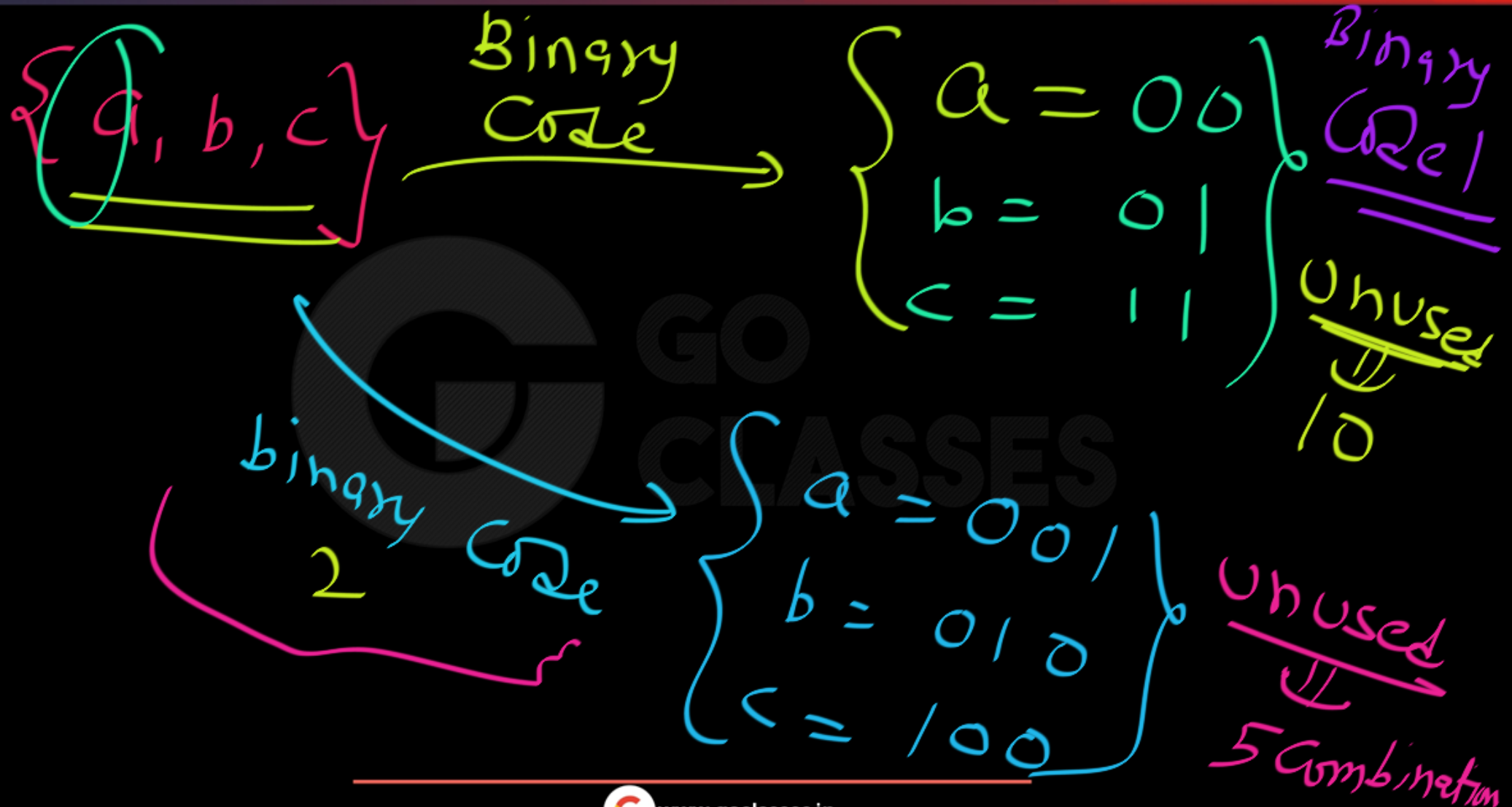


# Binary Codes:

# Introduction

Pattern of 1's, 0's ✓







Data:

abc

Binary Code 1:

00 00 01 11

Binary Code 2: 001001010100





Discrete set of elements:

finite

$\{a_1, a_2, \dots, a_n\}$

binary codes

00/0...

100/-...

minimum = 4  
bits

$$n = \lceil \log_2 m \rceil$$



Using  $n$  bits

$2^n$  elements

$m$

$$n \geq \log_2 m$$

Ex:  $\{a, b, c, d, e\}$  binary code

$$\underline{m = 5}$$

$$2^n \geq m$$

$$2^n \geq 5$$

$$\min. \text{ bits} = 3$$

$$\frac{n}{11}$$

$$n \geq \log_2 5$$



$$\frac{1}{5} \approx \boxed{2.14\ldots}$$

$$\frac{1}{6} \approx \boxed{2.1\ldots}$$

Decimal Digits

Binary number

Binary Codes

GO Code

$m = 10$   
Binary Code  
 minimum  
# bits = 4

0	0000	00000 00001
1	0001	00000 00010
2	0010	00000 00100
3	0011	00000 01000
4	⋮	⋮
5	⋮	⋮
6	⋮	⋮
7	⋮	0010000000
8	⋮	1000000000
9	⋮	⋮

5322

Go  
Code

binary number

2

0000 / 00000 000000 / 000 00000000 / 00

00000 00 / 00





Go Code

0000 / 00000

S

Data

Channel

wifi / Air /  
medium

1-bit Error

Most Common Error

Catches  
Easily





