$f: A \longrightarrow B$.

$A \longleftarrow B : g$

$f \circ g = g \circ f =$ identity

$\boxed{g = f^{-1}}$

$f: \mathbb{Z} \longrightarrow \mathbb{Z}$

$f(x) = 2x+1$

$y = 2x+1$

$\boxed{\dfrac{y-1}{2} = x}$

$\boxed{f^{-1}(x) = \dfrac{x-1}{2}}$

Computer Representation of Sets.

$\{1,2,3\}$

$\downarrow$

$\{1,3,2\}$

Set

unordered

Union

intersection

lement

ce

in Comp difference

Let $a_1, a_2, \ldots a_n$ be the arbitrary ordering of the elements of U.

$$f : N \longrightarrow U \quad \text{where } N = \{1, \ldots n\}$$

$$f(i) = a_i$$

Now, to represent a subset A of U with the bit string of length n, we follow:

→ i^{th} bit in this string is 1, if $a_i \in A$ and 0 if $a_i \notin A$.

example $U = \{1, 2, 3, 4, \ldots 10\}$

and give arbitrary ordering is in increasing order.

$f(i) = a_i = i$:

$f(1) = 1$
$f(2) = 2$
$f(3) = 3$
$- - - -$
etc
$f(10) = 10$

$U = \{1, 2, \ldots, 10\}$ ✓
$A = \{1, 3, 5, 7, 9\}$ ✓
$B = \{2, 4, 6, 8, 10\}$ ✓
$C = \{1, 2, 3, 4, 5\}$ ✓

Q: What bit string represents the subset of all odd integers in U, the subset of all even integers in U, and the subset of integers not exceedi 5 in U.

A: The bit string that represents the set of odd integers in U (i.e. $\{1, 3, 5, 7, 9\}$), has a one bit in first, 3rd, 5th, 7th, 9th positions and zero bit elsewhere

It is: 1 0 1 0 1 0 1 0 1 0

Similarly! the bit string ~~represent~~ representation of set of even integer in U, is:

0101010101 $\longleftrightarrow$ $\{2,4,6,8,10\}$

And

1111100000 $\longleftarrow$ $\{1,2,3,4,5\}$

\# $U = \{1,2,\dots 10\} \leftrightarrow 1111111111$

$A = \{1,3,5,7,9\} \longleftrightarrow 1010101010$

$B = \{2,4,6,8,10\} \longleftrightarrow 0101010101$

$C = \{1,2,3,4,5\} \longleftrightarrow 1111100000$

$A^c = \underline{0101010101} = B$

simply

replaci 1 by 0
0 by 1

$\cup$

$\boxed{\wedge}$

A ∪ B: $\{1,3,5,7,9\} \cup \{2,4,6,8,10\}$

$1010101010 \vee 0101010101$

(Join/wedge)

$= 1111111111$

$\Rightarrow \cup$

$1 \vee 0 = 1$
$1 \vee 1 = 1$
$0 \vee 0 = 0$
$0 \wedge 0 = 0$
$1 \wedge 0 = 0$
$1 \wedge 1 = 1$

A ∩ C: $A\{1,3,5,7,9\} \cap \{1,2,3,4,5\}$

$1010101010 \wedge 1111100000$

(meet)

1010100000

$\downarrow$

$\{1, 3, 5\}$

Graphs of function

CD. $\rightarrow$ 1960

#

Cryptography

Error Correction

3000

(A, f)

$(f: A \longrightarrow B)$

A function f from A to B can be represented as a subset of $A \times B$.

if $f : A \rightarrow B$, then

$$f = \{(a, b) : a \in A,\ b = f(a)\}$$

$$\{(a, b) : a \in A,\ b \in B\}$$

Ex:

$$A = \{1, 2, 3, 4\}$$

$$B = \{1, 2, \ldots, 20\}$$

$$f : A \rightarrow B$$

$$(x \rightarrow x^2)$$

$$f(x) = x^2$$

$f(1) = 1$

$f(2) = 4$

$f(3) = 9$

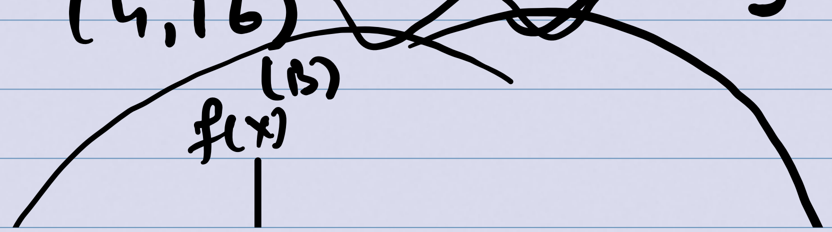
$f(4) = 16$

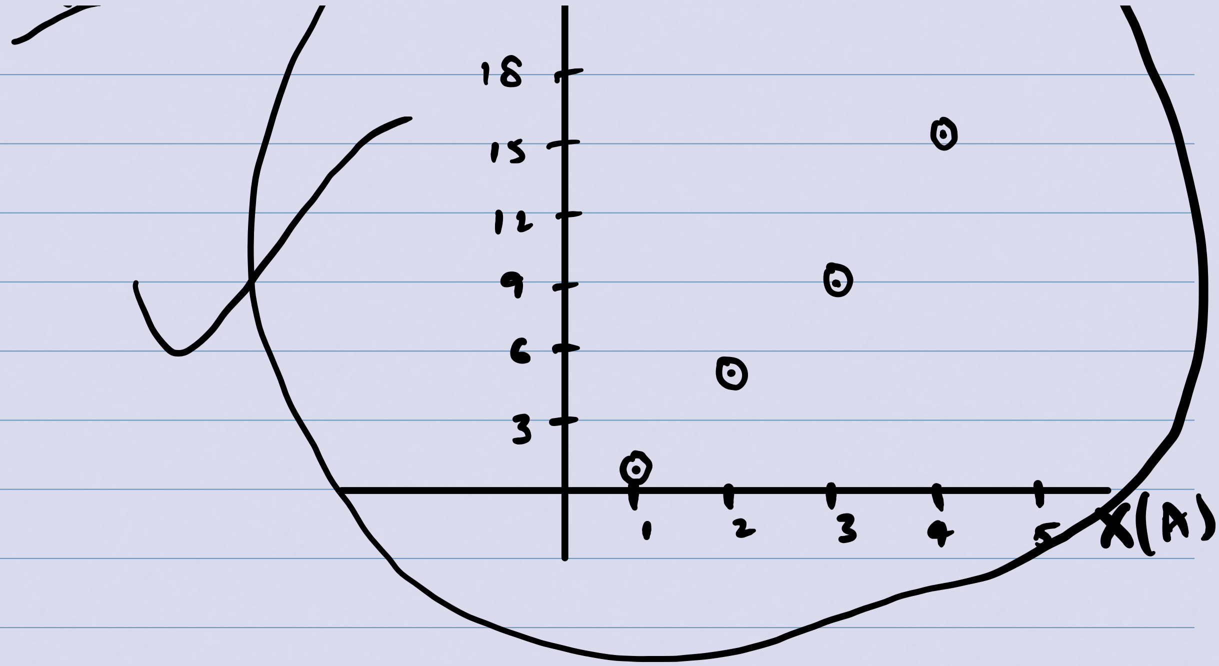
$$f = \{(1,1), (2,4), (3,9), (4,16)\}$$

$\{\ \}$

$(\ )$

Graph





Ceiling and Floor functions.

Floor function: assigns to the real no. x, the largest integer, that is less than or equal to x. It is denoted by $\lfloor x \rfloor$

$$\lfloor 3.5 \rfloor = 3$$

$x = 3.5$

Ceiling function - assigns

the smallest integer that is greater than or equal to x

$\lceil x \rceil$

$\boxed{\lceil 3.5 \rceil = 4}$

$\lceil 4 \rceil = 4$

$3.5 \leq 4, 5, 6, 7$

[illegible]