RELATIONS

A = {a, b, c}
B = {antman, batman, catwoman, captainamerica, ironman}
A x B = {(a, antman), (a, batman), ...(c, ironman)}

① R = {(x, y) : x is the first letter of y, x ∈ A, y ∈ B}

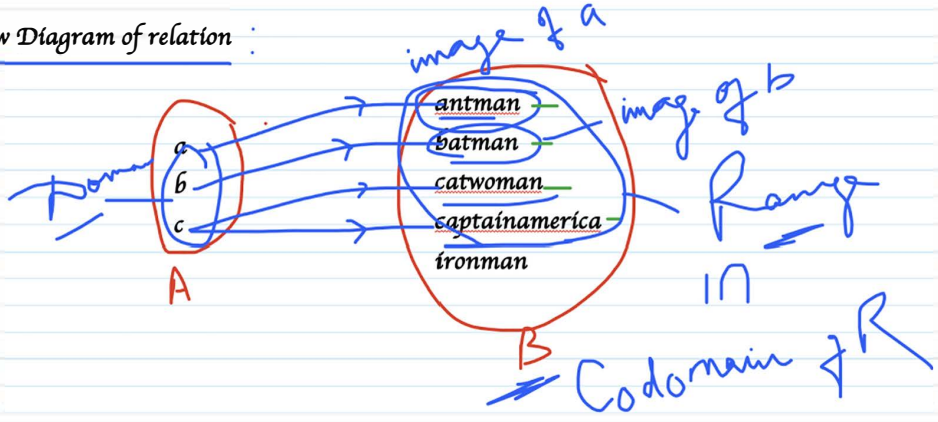
② R = {(a, antman), (b, batman), (c, catwoman), (c, captainamerica)}

R ⊆ A x B

Ways to represent Relation

1. Set-builder form
2. Roster method
3. Diagramatic/Arrow Diagram

3. Arrow Diagram of relation :



- A relation R from a non-empty set A to a non-empty set B is a subset of the A x B.
- The subset R is derived by describing a relationship b/w 1st element & 2nd element of ordered pairs of A x B
- The second element is called the image of the first element
- The set of all first elements of the ordered pairs of R ---> Domain

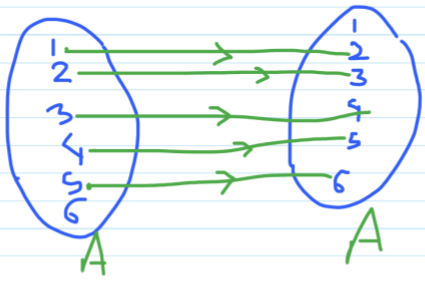
The set of all 2nd elements of R is called Range of R

Range of R = {antman, batman, catwoman, captainamerica}

ex - A = {1, 2, 3, 4, 5, 6}

R from A -> A by R = {(x, y) | y = x+1}

1. Represent the relation using arrow diagram ✓
2. Write down Domain, Range, & codomain of R



R = {(1,2), (2,3), (3,4), (4,5), (5,6)}

Domain = {1, 2, 3, 4, 5}

Range = {2, 3, 4, 5, 6}

Codomain = A = {1, 2, 3, 4, 5, 6}

ex - A = {1, 2, 3}, B = {3, 4}. Find the number of relations from A to B

3 2

R is subset of AxB. $n(A \times B) = 3 \times 2 = 6$

R is a set of cardinality 6. R is a set of 6 ordered pairs(elements)

Number of subsets of R = $2^6 = 64$

ex - Write the relation R = {(x, x^3) : x is a prime number < 10} in Roster form.

A = {x : x is prime, x < 10}

A = {2, 3, 5, 7}

R = {(x, x^3) : x ∈ A}

R = {(2, 8), (3, 27), (5, 125), (7, 343)}

ex- $A = \{1,2,3,5\}$, $B = \{4, 6, 9\}$. Define a relation R from A to B by
$R = \{(x,y) : \text{the difference of } x \text{ \& } y \text{ is odd}; x \in A, y \in B\}$
Write R in roster form.

$A \times B = 12$

$R = \{(1,4), (1, 6), (2, 9), (3, 4), (3, 6), (5, 4), (5, 6)\}$