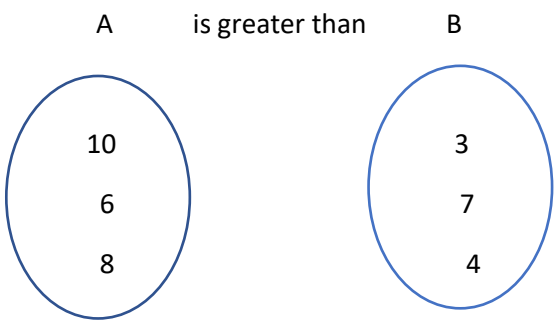
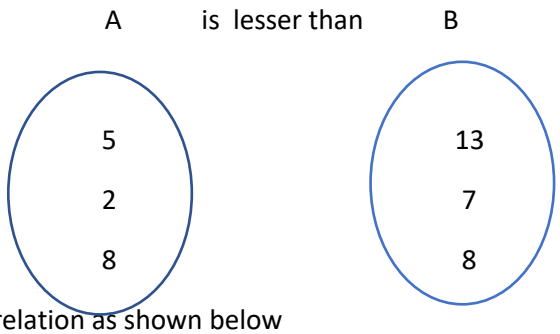
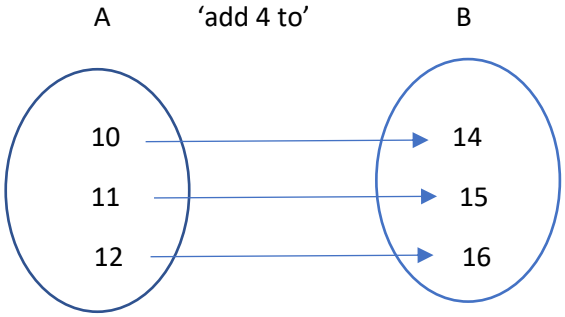
1) Two sets of numbers A and B are shown below and complete the relation by using arrow diagram to show the relation 'is greater than' from set A to set B



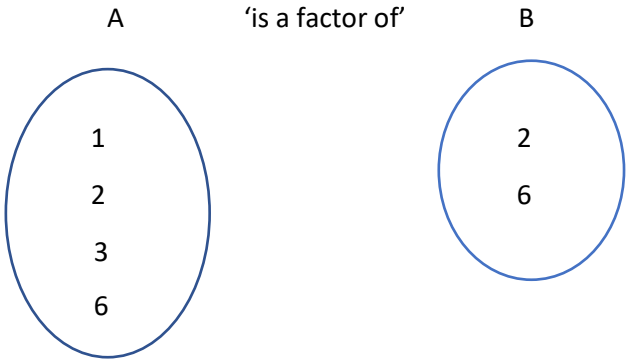
2) Two sets of numbers A and B are shown below and complete the relation by using arrow diagram to show the relation 'is less than' from set A to set B



3) State the type of relation as shown below



4) Map the sets A and B, also State the type of relation

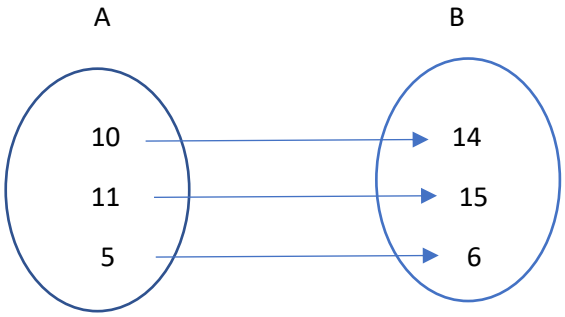


5) Construct an arrow diagram to show the relation ' is a factor of' from

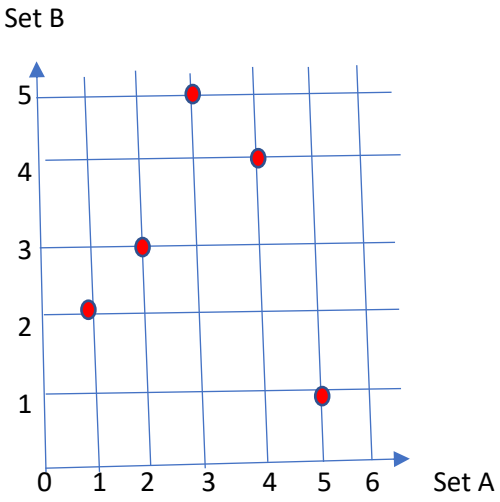
set A = (3, 7, 8, 12}

set B = { 1, 6, 18, 32, 36)

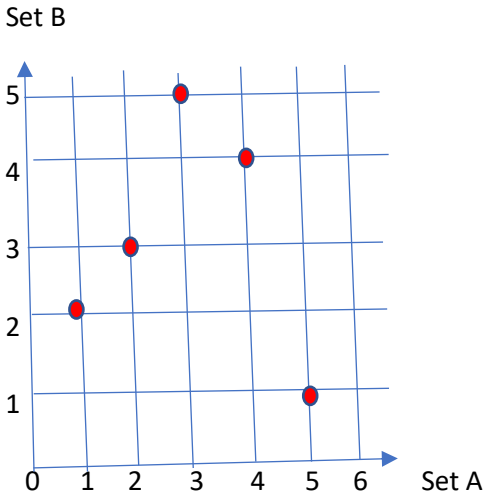
6) List out the ordered pair of the following



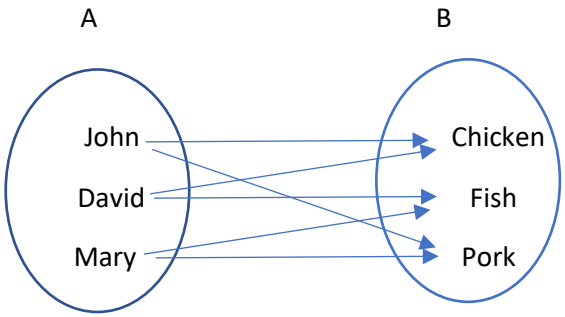
7) List out the ordered pair from the cartesian graph below.



8) State the type of relation as shown in the cartesian graph



9) The figure below shows the relation 'eat' for the two sets as shown
   a) Express the relation as a set of ordered pairs
   b) Draw a cartesian graph of the relation



10) X = { 1, 2, 3, 4, 5, 6 } and Y = { 2, 3, 5}
   a) Show the relation ' is a multiple of ' from set X to Set Y by an arrow diagram
   b) Write down the relation as a set of ordered pairs

11) If A = { 2, 4, 8, 9 } and B = { 4, 7, 9, 3 }

Describe their cartesian product by using tree diagram

12) If A = { 1, 5, 6, 9 } and B = { 2, 3, 5 }

Describe their cartesian product by using tree diagram

13) Given the following sets, A = { 8,9,1 } and B = { 4, 3, 5 }. Find the cartesian product of

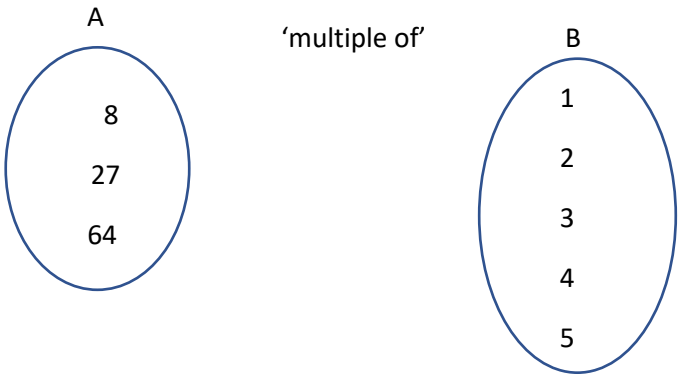
a) A*B b) B*A

14) Draw the arrow diagram if $0 \leq n \leq 5$ for the function f(n)=2n+1 and state the relation.

15) A = { x: x is a natural number, $0 \leq x \leq 5$ }
B = { x: x is a square of the natural number , $0 \leq x \leq 5$ }

i. Draw the arrow diagram to show the relation ' is a multiple of ' between the two sets
ii. List the ordered pairs
iii. Draw the cartesian graph for the relation
iv. State whether the relation is a function or not
v. Find the cartesian product B*A

16)



i. Draw the arrow diagram
ii. List the domain and the object
iii. List the codomain
iv. State the object of 2
v. State the image of 64

17) The ordered pairs below show a relation between the sets X and Y

{ (1, 2), (2, 3), (4, 6), (5, 6), (7, 8) }

i. List the domain
ii. List the codomain
iii. List the range
iv. State the objects of 6
v. State the images of 2

18) If 3 is an object, then find the image of f(x) = x +2

19) Draw a cartesian graph for the ordered pairs (2, 4), (-3, 1), (4, 3), (-2, -2), (-3, 5), (3, -2) and state whether this a function by the vertical line test.

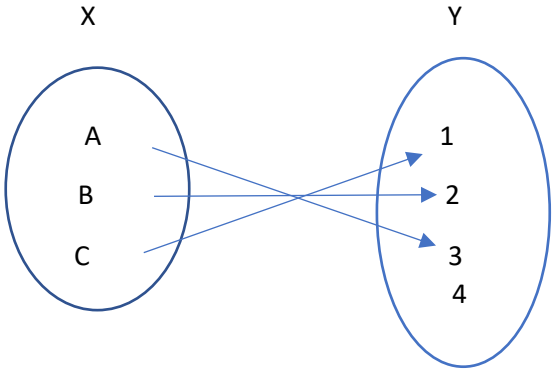
20) Draw a cartesian graph for the ordered pairs (2, 4), (-3, 1), (4, 3), (-2, -2), (-3, 5), (3, -2) and state whether this a function by mapping the arrow diagram.

Function :

A function is a special type of relation where **'each and every member'** of A is related to **'one and only one member'** of B although some members of B may not be related to any member of A. Such kind of relation is called as function or mapping.

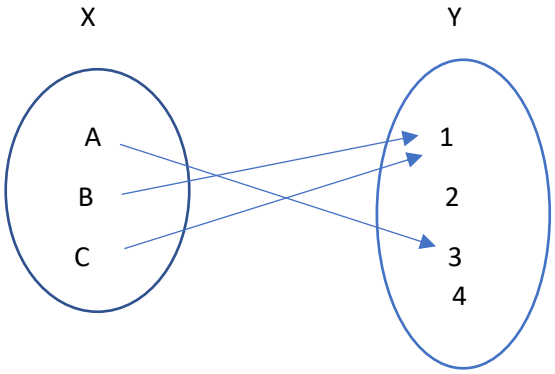
Examples of functions are as follows

i) One to One relation



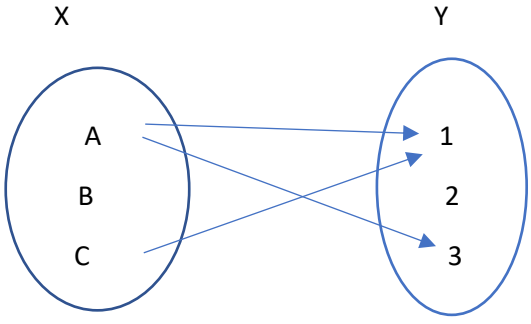
Each and every member of X is related to **one and only member of Y** although some members of Y are not mapped, and the relation is one to one relation. From this, we can conclude that one to one relation is a function.

ii) Many to one relation



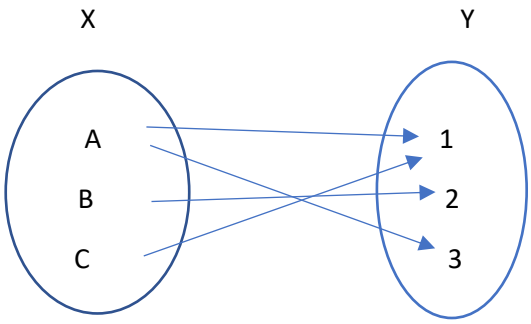
Each and every member of X is related to **one and more member of Y** although some members of Y are not mapped, and the relation is one to one relation. From this, we can conclude that many to one relation is a function.

iii) One to many relation



Some members of X are related to **two members of Y.** Since this relation doesn't satisfy the definition of function, one to many relation is not a function.

iv) Many to many relation



Some members of X are related to **two members of Y** and also **two members of X** are related to **one member of Y**. Hence this is many to many relation. Since this relation doesn't satisfy the definition of function, many to many relation is not a function.

21) If f : x ⟶ 2x + 4, Find

i) f(0) ii) f(2) iii) f(-3) iv) f($\frac{1}{2}$)

22) If f(x) = $3x^2 + 1$, Find

i) f(-1) ii) f(2) iii) f(9)

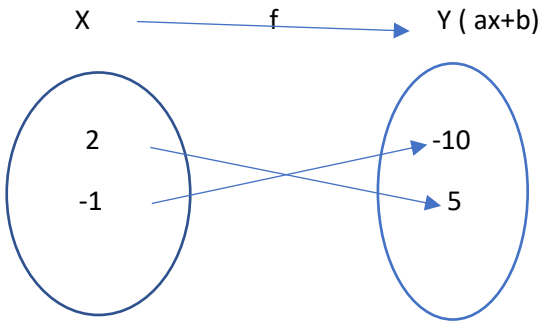
23) Without using the vertical line test, which relations below are functions?
Relation 1 : { (-1, 2), (-4, 51), (1, 2), (8, -51) }
Relation 2 : { (13, 14), (13, 5), (16, 7), (18, 13) }

24) Without using the vertical line test, which relations below are functions?
Relation 1 : { (3, 4), (4, 5), (6, 7), (8, 9) }
Relation 2 : { (3, 4), (4, 5), (6, 7), (3, 9) }

25) For a relation below, x cannot be what value
{ (8, 11), (34, 5), (6, 17), (x, 22) }

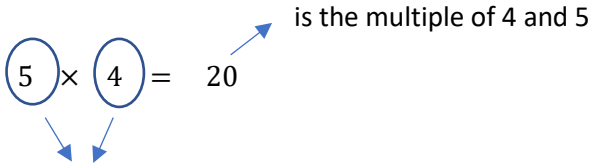
26) For a relation below, x cannot be what value
{ (12, 13), (-11, 22), (33, 10), (x, 22) }

27) The arrow diagram shows the function f: x ⟶ ax + b , Find :
a) The values of a and b
b) f(-3)

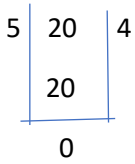


Difference between object and image

For example



- Here, 5 and 4 are the factors of 20 where the name factor is related with the remainder i.e., the remainder has to be zero

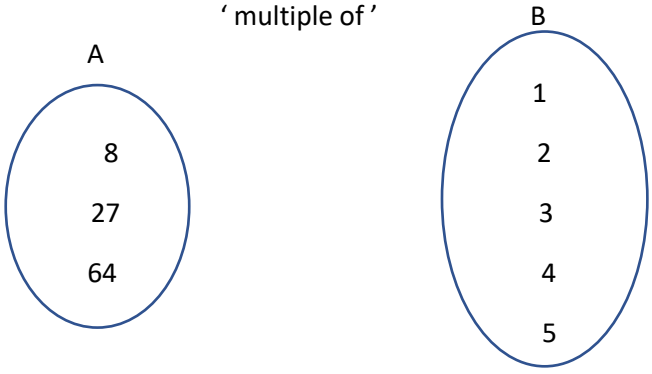


- Here, both the divisor and the quotient acts as a factor since when 20 is divided with them the remainders are zero

- Then, 20 is called as multiple of 4 and 5 because when these numbers are multiplied with 5 and 4 the result is 20. When talking about multiple, no need to consider about the remainder.

Similarly,

28) ‘ multiple of ’

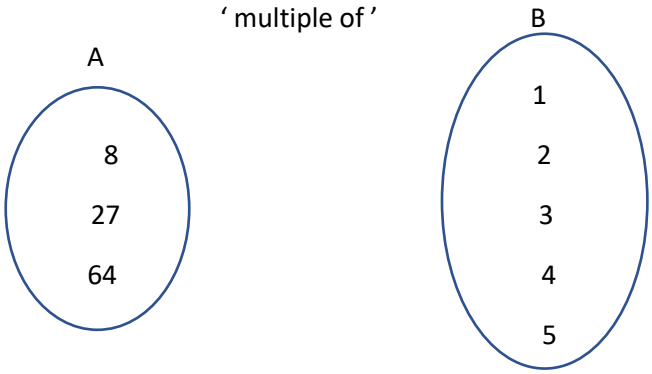


Here, 8 is a multiple of 1, since 1 * 8 = 8.

8 is also a multiple of 2, since 2 * 4 = 8.

8 is not a multiple of 3, since you cannot get 8 when multiplied with any number to 3.

From this,



- Here, 8 is the object of 1, 2 & 4.
- 27 is the object of 1 & 3.
- 64 is the object of 2 and 4.

- 1, 2 & 4 are the images of 8.
- 1 & 3 are the images of 27.
- 2 & 4 are the images of 64.

29) If two functions f(x) = g(x), then, the ordered pairs are also equal i.e., (2 , x) = (y, 4). Find the value of x and y.

30) If two functions are equal, the ordered pairs are also equal i.e.,

(1 , x+y) = (x + 2y , 4) . Find the value of x and y.

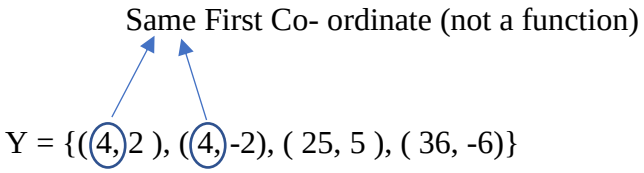
Function Notation :

How to find a function through the set of ordered pairs??????

A function is a relation in which no two different ordered pairs have the same first Co-ordinate.

For example:

A set of ordered pairs are listed below



Therefore, The given relation is not a function.

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

No two same first co-ordinates. So, the given relation is a function.

Function notation is given below.

Input	Output	Equation
X	f(x)	$f(x) = x^2 + 1$

A Function is represented as ‘f’ of ‘x’ or ‘f’ at ‘x’.

Remember!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

f is the name of the function and f(x) is the value of the function.

For example:

In g(x) = 2x + 1,

g is the name of the function whereas g(x) is the value of the function.

Summary of function notation

y = f(x)

f is the name of the function

y is the dependent variable

x is the independent variable

f(x) is the value of the function.

31) Determine the domain and range. Draw a cartesian graph for the same.

$$f(x) = \begin{cases} & x > 0 \\ -2x^2 & x = 0 \\ & x < 0 \end{cases}$$

32) If f is a function and f(x) = $2x^2 + 2x - 2$. Find the values of f(-2), f(0), f(m), f($\frac{1}{2}$)

Domain and range of the functions without using arrow diagrams:

To find the domain and range of a function without using the arrow diagram we need to learn how to write a set builder form of a set

Remember the rule!!!!!!!!!!!!!!!!!!!!

A function should always be finite. So the domain and range of the function has to be chosen properly

For example,

If 'f' is a function and f(x) = x-1.

i) find the values of f(1), f(2), f(3), f(4)

ii) Find the domain and the range?

(Note: Value of x gives you the domain and the value of f(x) gives you the range)

Ordered pair can be written as (x, f(x))

Now for the same question let us find the domain and range among all the real numbers.

iii) If 'f' is a function and f(x) = x-1. Find the domain and the range?

Answer :

- Here values of x are not mentioned as in previous question. In these cases

Let f(x) be some variable 'y'. So, the function will change to

$$y = x - 1$$

here, the values of x give us the domain. From the equation we can say that

Domain of this function = all real numbers

$$D_f = \{ x \in R \}$$

when you shift -1 to the left-hand side, you get the values of x

$$x = y+1$$

Here the values of y or f(x) give us the range. From the equation we can say that the

Range of the function = all real numbers

$$R_f = \{ y \in R \}$$

iv) If g is a function and g(x) = $\frac{2}{x+3}$. Find the domain and the range.

33) The income of a sales employee is 6000 baht and he gets an incentive of 5000 baht for every product that he sells.

i) Write a function for the above data

ii) How many products does he has to sell if his income has to be greater than 40000 baht.

iii) What will be his income if he sells 4 products

34) From the graph below

i) Find the value of f(1), f($\frac{3}{2}$), f(2), f(3), f(4) and f(5)

ii) What is the range of 'x' if f(x) ≤ 4

iii) What is the highest value of f(x) if x ≤ 5

35) If r = {(x,y) | $y = 3x - 1$} plot the graph and consider that r is a function. (Note: put any value for x)