

Functions

Short Notes

Understanding Functions

- a) Relation
- b) Inverse functions
- c) Composite functions

Relation

Relationship of two sets can be represented by

- a) Arrow diagram
- b) Ordered pair
- c) Graph

Arrow Diagram

Diagram below shows two sets A and set B using the arrow diagram

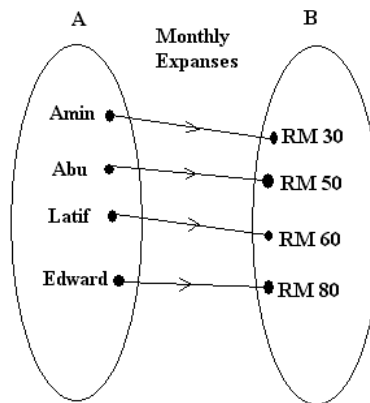
Domain is set A

Co- domain is set B.

The **object** are Amin, Abu, Latif, Edward

The **image** are RM30, RM 50, RM 60, RM 80

Range for the image can be denoted as {RM30, RM 50, RM 60, RM 80}

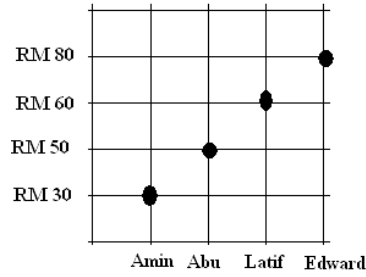


Ordered Pair

{(Amin, RM 30), (Abu, RM 50), (Latif, RM60), (Edward, RM80)}

Graph

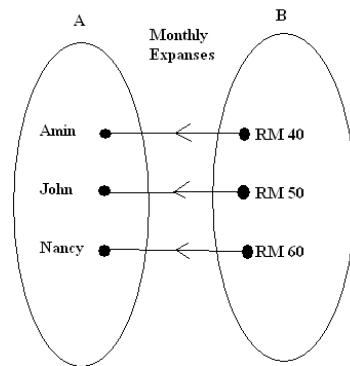
This is the graph representation



There are many types of relations such as

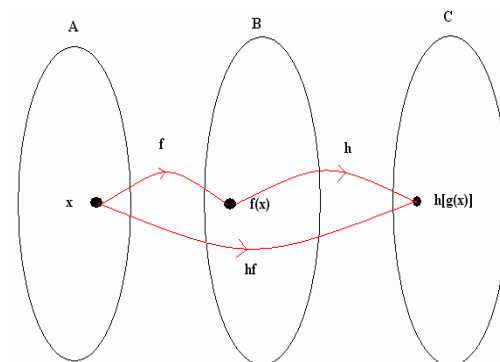
- a) One to one relation
- b) One to many relation
- c) Many to one relation
- d) Many to many relation

Inverse Function



When image is map from the co- domain to the domain, it is called inverse function denoted as f^{-1}

Composite Function



A composite function is a composition of two or more functions. Example above shows that the value x is map to the function f and then h .

The diagram above shows the composite function of $hf(x)$

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PRACTICE 1

Relation

1. The Diagram 1 shows the relation of Set A and Set B using arrow diagram

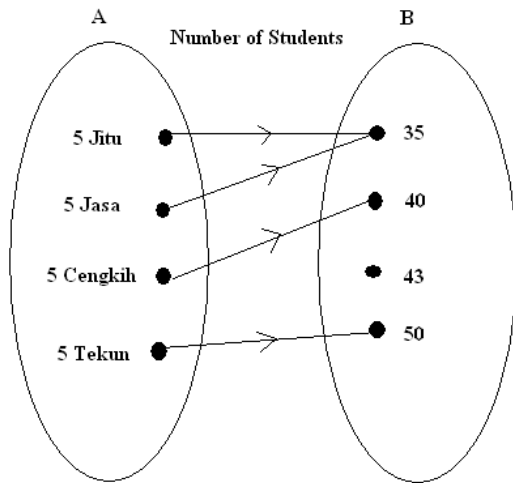


Diagram 1

State the following

- a) Domain = {5 Jitu, 5 Jasa, 5 Cengkih, 5 Tekun}
- b) Co-domain = {35, 40, 43, 50}
- c) Object = {5 Jitu, 5 Jasa, 5 Cengkih, 5 Tekun}
- d) Image = {35, 40, 50}
- e) Range = {35, 40, 50}

2. Mr. James shops at SuperMart. The Diagram 3 shows a graph relations between Set A and Set B

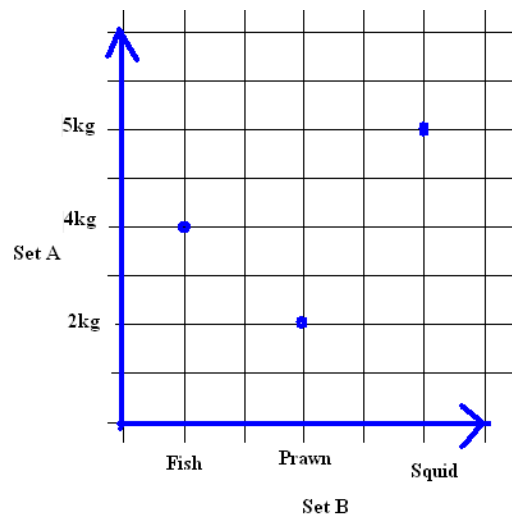


Diagram 2

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State the following

- a) Domain = {Fish, Prawn, Squid}
- b) Co-domain = {3kg, 4kg, 5kg}
- c) Object = {Fish, Prawn, Squid}
- d) Image = {2kg, 4kg, 5kg}
- e) Range = {2kg, 4kg, 5kg}

3. Set A={2, 4, 10, 12} and Set B= {4, 5, 6} can be represented by the ordered pairs {(2,4), (4,6), (10,5), (12, 6)}

Solve

- a) Find the object of Set A = {2, 4, 10, 12}
- b) Determine the object = {2, 4, 10, 12}
- c) The image of 10 = 5
- d) The object of 6 = 12

4. The arrow diagram below shows the relationship of set A and set B

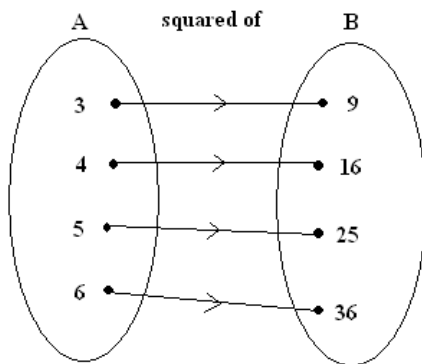


Diagram 3

Find

- a) The image of object 4 = 16
- b) The image of object 6 = 36
- c) The object of image 25 = 5
- d) The object of image 36 = 6

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PRACTICE 2

Function

1. Given the function $f(x) = 2x + 5$

- a) Find the image of object 15
- b) Find the image of object 19
- c) Find the image of object 25

Solution:

- a) $f(15) = 2(15) + 5 = 35$
- b) $f(19) = 2(19) + 5 = 43$
- c) $f(25) = 2(25) + 5 = 55$

2. Given the function $f(x) = x + 7$

- a) Find the object of image 10
- b) Find the object of image 15
- c) Find the object of image 50

(Students Please Try)

3. Determine the value of 'k' given the Diagram 4 below

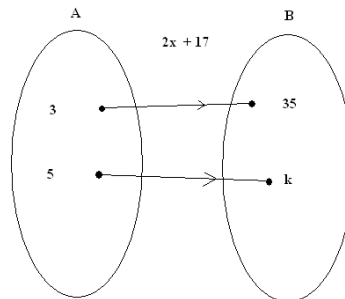


Diagram 4

4. If $h(x) = 2 - x^2$, find the value for

- a) $h(-2)$
- b) $h(-4)$

Solution:

- a) $h(-2) = 2 - (-2)^2$
 $= 2 - 4$
 $= 2$
- b) $h(-4) = 2 - (-4)^2$
 $h(-4) = 2 - 16$
 $= -14$

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5. Given that $g(x) = \frac{2x+4}{3}$. Find the value of 'k' for $g(k) = k$

$$g(k) = \frac{2(k)+4}{3} = k$$

$$\frac{2k+4}{3} = k$$

$$2k+4 = 3k$$

$$3 = 3k - 2k$$

$$k = 3$$

6. Given that that $y(x) = x^2 - 7$. Find the value of 'k' for $y(k) = k$
(Student please try)

7. Calculate the value of $f(x) = |4x + 2|$

- Find the image of object 2
- Find the image of object -3
- Find the image of object 10
- Find the image of object -5

Solution

$$a) f(2) = |4(2) + 2| = 10$$

$$b) f(-3) = |4(-3) + 2| = 10$$

$$c) f(10) = |4(10) + 2| = 42$$

$$d) f(x - 5) = |4(-5) + 2| = 18$$

Note: Any value inside the modulus will yield positive number

8. Given $f(x) = |2x|$

- Find the object of image 10
- Find the object of image 15
- Find the object of image 20

(Student Please Try)

Composite Function

1. Given that $f(x) = 2x + 5$ and $g(x) = x + 1$, find the function

- a) $fg(x)$
- b) $gf(x)$
- c) $ff(x)$
- d) $gg(x)$

Solution

- a) $fg(x) = f(x + 1)$
 $fg(x) = 2(x + 1) + 5$
 $fg(x) = 2x + 2 + 5$
 $fg(x) = 2x + 7$
- b) $gf(x) = g(2x + 5)$
 $gf(x) = 2x + 1 + 5$
 $gf(x) = 2x + 6$
- c) $ff(x) = f(2x + 5)$
 $ff(x) = 2(2x + 5) + 5$
 $ff(x) = 4x + 10 + 5$
 $ff(x) = 4x + 15$

2. Given that $f(x) = \frac{x}{2} + 1$ and $g(x) = 3x - 2$, find the function of

- a) $fgf(x)$
- b) $gff(x)$
- c) $gg(x)$
- d) $ffg(x)$
- e) $ggf(x)$

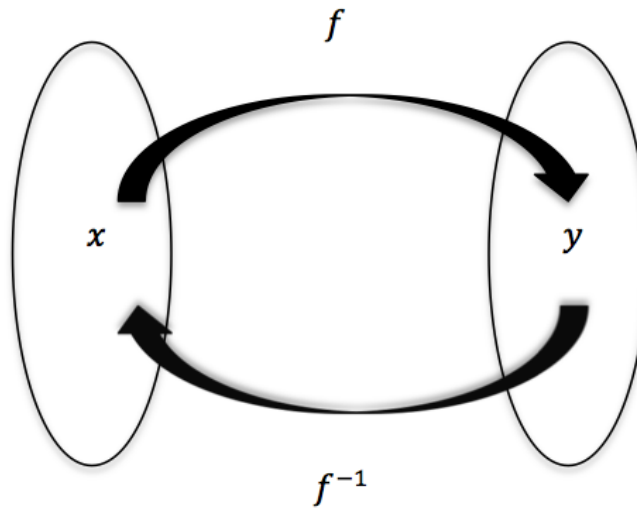
(Student please try)

3. Given that $h(x) = x - 4$ and $g(x) = 3x - 2$. Find the function

- a) $hg(-2)$
- b) $gh(3)$
- c) $hhg(2)$
- d) $ghh(4)$
- e) $gh(-3)$

(Student please try)

Inverse Function



Find the function of $f^{-1}(x)$ given the function f below

a) $f(x) = \frac{2 + 2x}{3}$

Solution:

$$\text{let } y = \frac{2 + 2x}{3}$$

$$3y = 2 + 2x$$

$$2x = 3y - 2$$

$$x = \frac{3y - 2}{2}$$

$$f^{-1}(x) = \frac{3y - 2}{2}$$

b) $f(x) = 2x + 13$

(Student try this)

c) $f(x) = x + 3$

(Student try this)

Complex Function (Tough Questions)

Solving Complex Equation:

REMEMBER FIBS:

FRONT (INVERSE), BACK (SUBSTITUE)

Question

Given $f(x) = 2x + 5$ and $gf(x) = 5x$, Determine the function of $g(x)$

Solution:

$$f(x) = 2x + 5$$

$$\text{Given } f(x) = 2x + 5$$

Let $y = 2x + 5$

$$x = \frac{y - 5}{2}$$

$$f^{-1}(x) = \frac{x - 5}{2}$$

$$g(x) = 5 \left(\frac{x - 5}{2} \right)$$

Question

Given $g(x) = 2x + 5$ and $gf(x) = 5x$, Determine the function of $f(x)$

Solution:

$$g[f(x)] = 2f(x) + 5$$

$$2f(x) + 5 = 5x$$

$$2f(x) = 5x - 5$$

$$f(x) = \frac{5x - 5}{2}$$

Question to solve

1. Given that function $f(x) = x + 7$ and $hf(x) = 2x$, find the function of $h(x)$
2. Given that function $f(x) = \frac{x+3}{4}$ and $hf(x) = 2x$, find the function of $h(x)$
3. Given that function $f(x) = x + 7$ and $fh(x) = 2x$, find the function of $h(x)$
4. Given that function $h(x) = x + 7$ and $hg(x) = 2x$, find the function of $g(x)$
5. Given that function $g(x) = 3x + 7$ and $hg(x) = 1 + 2x$, find the function of $g(x)$