SEK MEN SAINS MUZAFFAR SYAH MELAKA
75450 AYER KEROH MELAKA

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TEACHING & LEARNING

ADDITIONAL MATHEMATICS

FORM 4

FUNCTIONS

NAME:……………………………………………

FORM :…………………………………………..

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LEARNING AREA : FUNCTIONS
Learning Objectives : Understand the concept of relations
Learning Outcomes : Student will be able to

1.1 Represent relation using a) arrow diagram , b) ordered pairs, c)graphs
1.2 Identify domain, co domain, object, image and range of a relation.
1.3 Classify a relation shown on the mapped diagram as : one to one many to one , one to many or many to many

1.1a Representing a relation between two sets by using an arrow diagram

Example 1

Suppose we have set A = { 0,1,2,3 } and set B = { 0,1,2,3,4,5,6} .Let us examine the relations “is one less than “ from set A to Set B . One way to show the relations is to draw an arrow diagram as shown below . The arrows relate the elements in A to the elements in B

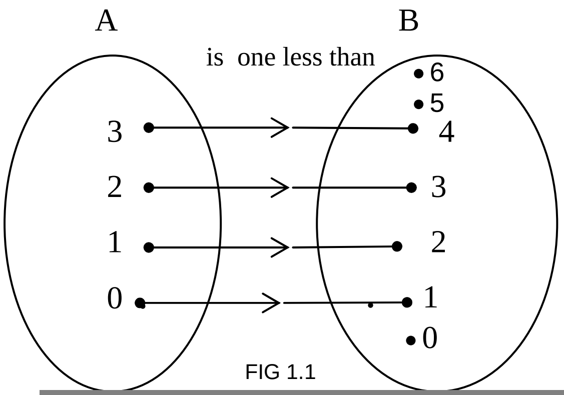
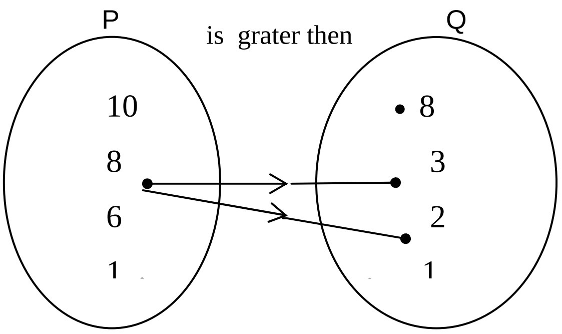
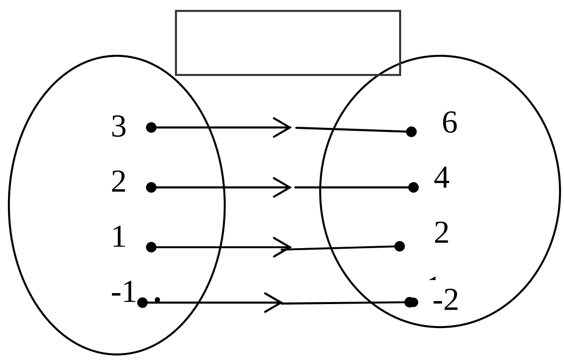


FIG 1.1

In the space below give other example to show a relation

A relation from set A to set B is an association of elements of A with elements of B .

Exercise 1

1 Two set of numbers, P and Q are shown below Complete the arrow diagram to show the relations “ is grater than “ from set P to set Q 	2. What relation from set S to set T is illustrated in diagram below .Write your answer in the box below 
3. Construct an arrow diagram to show the relation “ is a factor of “ from set A ={2,5,7,13 } to set B = {1,4,15,35,40}	4. Construct an arrow diagram to show the relation “ is a multiple of “ from set A ={1,2,3,4,5,6 } to set B = {2,3,5}

1.1(b) Representing a relation between two sets by using an ordered pairs

The relation can also be shown concisely by ordered pairs (1, 2) . The elements in the pair are in order since the first element comes from the first set *A* and the second element comes from the second set *B* .We have *A* = {0,1,2,3} and *B* = {0,1,2,3,4,5,6, If x $\in$ *A* (this means that x is a member of *A*) and y $\in$ *B*, the set of all ordered pairs (*x,y*) is { (0,1),(1,2),(2,3),(3,4)} . This set of ordered pairs defines the relations " is one less than " from set *A* to set *B*

Example 2

1. A = { 1,2,3,4,5,6} and B = {2,3,5 }. Show the relation " is a multiple of" from A to B as a set of ordered pairs **Solution** The ordered pairs ={ (2,2),(3,3),(4,2),(5,5),(6,2),(6,3) }	2. Write down the relation as a set of ordered pairs " is factor of "from set A ={2,5,7,13 } to set B = {1,4,15,35,40} **Solution** The ordered pairs = { (2,4) (2,40), (5,15),(5,35),(5,40),(7,35) }

Exercise 1.1 (b)

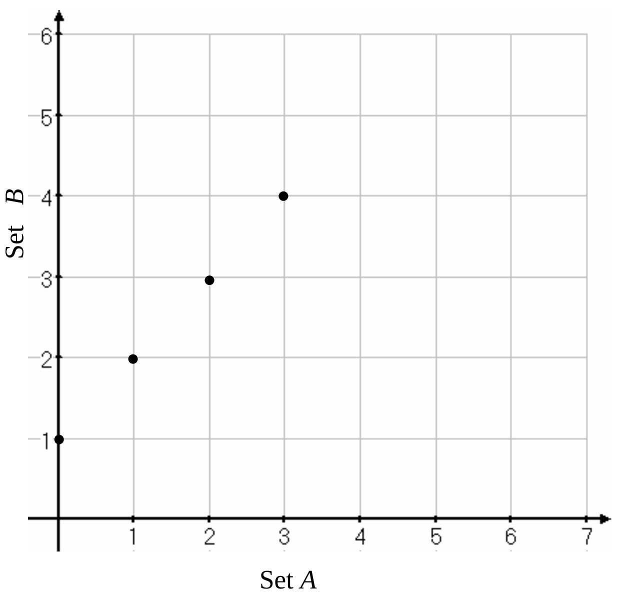
1. A relation between two sets is defined by the set of ordered pairs , { (-1,2),(1,4) ,(3,6) (5,8) , (7,10) } List the elements of the two sets, and describe in words a possible relation between the first set and the second set	2. Given that *A* = {2,4,6,8} and *B* = { 1,2,3,4,5 } If x $\in$ *A* and y $\in$ *B* , list the set of ordered pairs in the relation x " is double " y
3. Given that *X* = { 0,1,2,3 } and *Y* = { 0,1,2,3,4,5,6} If x $\in$ *X* and y $\in$ *Y* , list the set of ordered pairs in the relation x "is one less than " y	4. A relation R is defined by { ($\frac{1}{2}$,8),(1,4),(2,2),(4,1) (8, $\frac{1}{2}$)} List the set of first members of pairs, and set of second members of the pairs . Describe in words a possible relation between the first set and the second set.

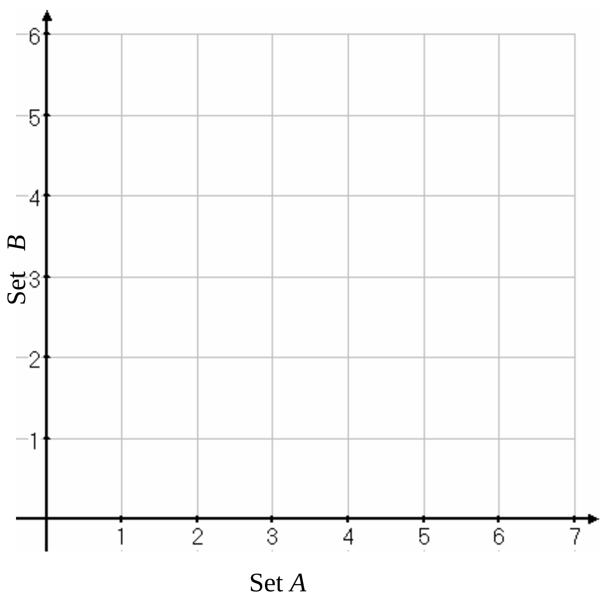
1.1(c) Representing a relation between two sets using a graphs

We can plot an ordered pairs in a Cartesian graph of the relations

Example 3

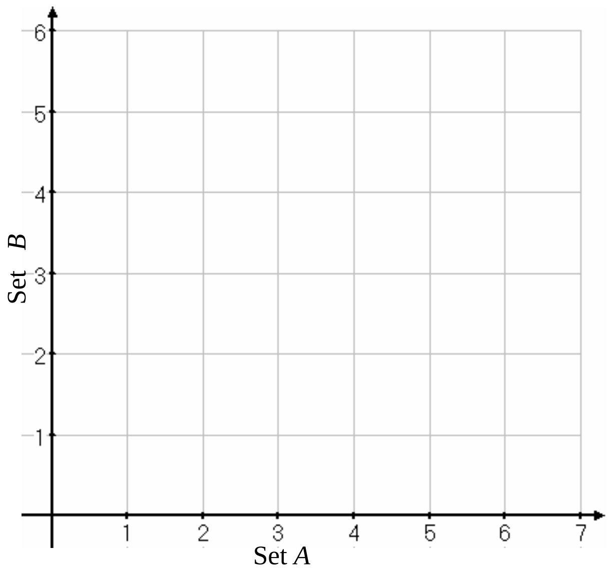
1. We have *A* = {0,1,2,3} and *B* = {0,1,2,3,4,5,6, If x $\in$ *A* and y $\in$ *B*, the set of all ordered pairs (x,y) is (0,1),(1,2),(2,3),(3,4)} we can plot a Cartesian graph to show the relation.	2. Given that *A* = *B* = { 1,2,3,4,5 } If x $\in$ *A* and y $\in$ *B* , and the relation x " less than " y Illustrate the relation by means of a Cartesian graph.



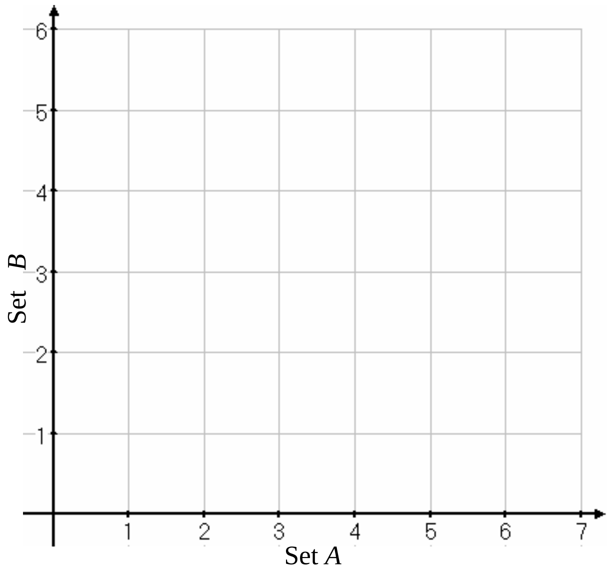


Exercise 1.1(c)

1. Given that A = B = { 1,2,3,4,5,6,}
If x ∈ *A* and y ∈ *B* , and the relation x " is a factor of " y
Illustrate the relation by means of a Cartesian graph



Given that *A* = {2,4,6 } and *B* = { 1,2,3,4,5 }
If x ∈ *A* and y ∈ *B* , and the relation x " is double " y
Illustrate the relation by means of a Cartesian graph



Homework : Textbook Exercise 1.1.1 page 3

1.2 Identifying domain, codomain, object, image and range of a relation.

Domain is the set of x-coordinates of the set of points on a graph or the set of x-coordinates of a given set of ordered pairs. The value that is the input in a function or relation
Range is the y-coordinates of the set of points on a graph, or the y-coordinates of a given set of ordered pairs. The range is the output in a function or a relation. A graph of a relation (a set of ordered pairs) is given below. (Fig 1.2)

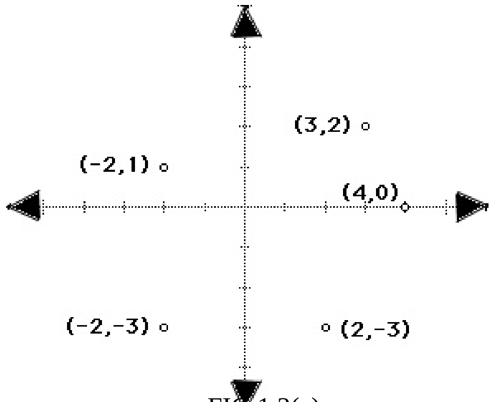


FIG 1.2(a)

Note that the five points on the graph have the ordered pairs

{(-2,1),(3,2),(4,0),(2,-3),(-2,-3)}.

The **domain** of this relation is the set {-2,2,3,4}. Notice that although -2 is an x-coordinate twice, we need only list it in the domain once.

The **range** of this relation is the set {-3,0,1,2}. Notice that although -3 is a y-coordinate twice, we need only list it in the range once.

For the ordered pair (– 2 , 1) the **object** is – 2 and the **image** is 1 so the objects are -2,2,3,4 and the images are -3,0,1,2

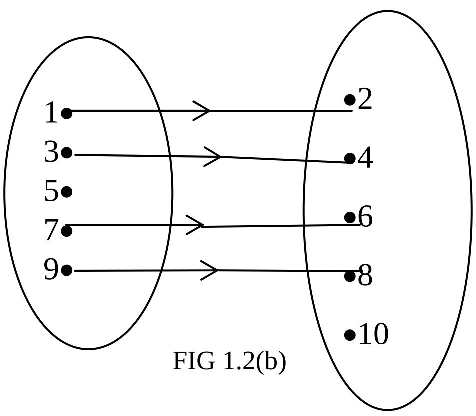
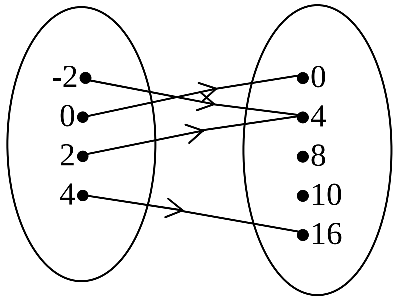
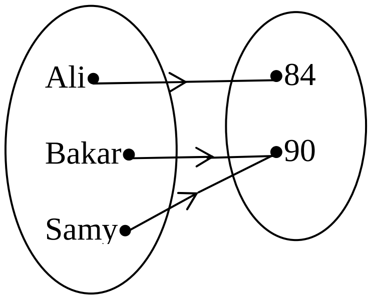


FIG 1.2(b)

Refer to figure 1.2 (b)
The codomain is the set { 2,4,6,8,10 }
The domain is the set { 1,3,5,7,9,}
The range is the set { 2,4,6,8,}
The images are 2,4,6,8
The object s are 1,3,7,9

Exercise 1.2

Complete the table below based on the diagram given

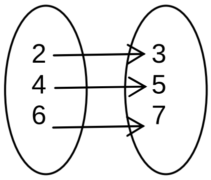
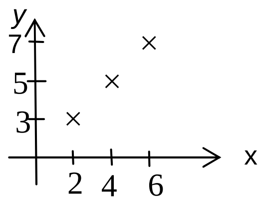
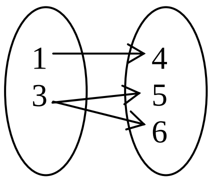
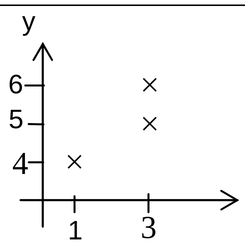
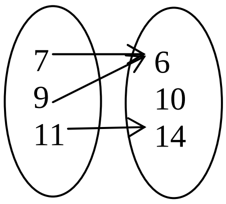
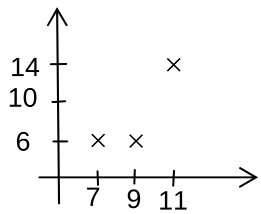
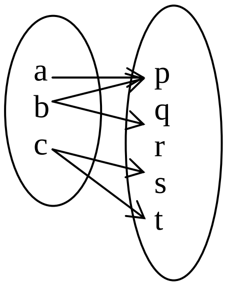
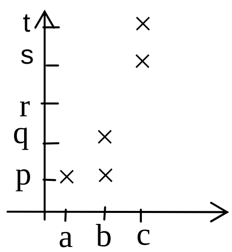
1 					2. 				
Domain	Codomain	Object	Image	Range	Domain	Codomain	Object	Image	Range

Homework : Textbook Exercise 1.1..2 page 4

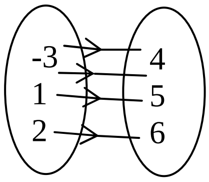
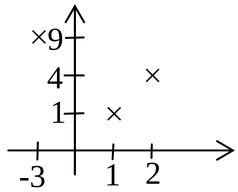
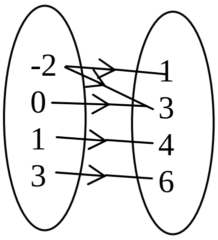
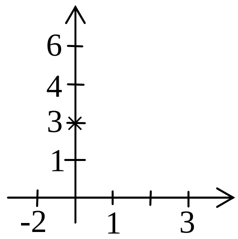
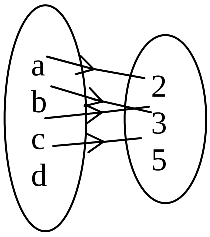
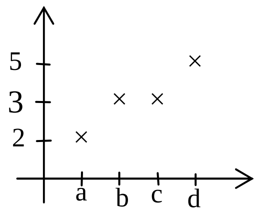
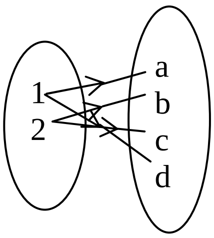
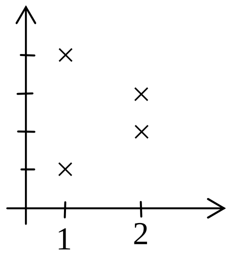
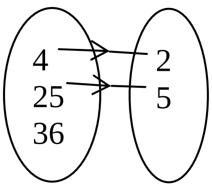
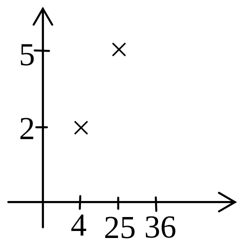
1.1.3 Classifying a relation

Example 3

Observe the table below and list the characteristic of each relation .

Relations	Arrow diagrams	Ordered pairs	Graph
One to one		{(2,3),(4,5), (6,7)}	
One to many		{(1,4),(3,5), (3,6)}	
Many to one		{(7,6),(9,6), (11,14)}	
Many to many		{(a,p),(b,p),(b,q),(c,s),(c,t)}	

Exercise 1.2
Complete the table below and determine the type of relations

Bil	Arrow diagram	Ordered Pairs	Graf	Relation
1				One to one
2		{(-2,1),(-2,3) (0,3)(1,4),(3,6)}		
3		{(a,2),(b,3) (c,3),(d,5)}		
4				
5		{(4,2),(25,5)}		

Homework : Textbook Exercise 1.1..3 page 5 and Skill Practice 1.2 page 6

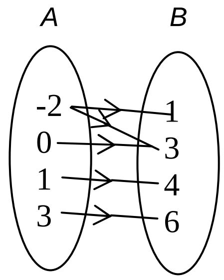
2.0 Learning Objective : Understand the concept of functions
Learning outcomes : Student will be able to
2.1 Recognise functions as a special relation
2.2 Express functions using functions notation
2.3 Determine domain,object,image and range of a function
2.4 Determine the image of a function given the object and vice versa.

2.1 Recognising functions as a special relation

Note: A special type of relations between two set *A* and *B* can exist when each and every members of *A* is related to one and only one member of *B,* although some of the member of *B* may not related to any member of *A* This type of relation is known as a function. Itis important to relise that a function is a relation but a relation may or may not be a function . In other words, a function is a special type of relation

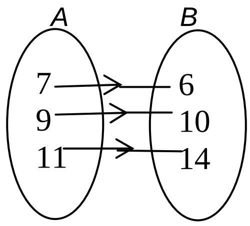
Example 4
Determine which of these relations is a functions

a)



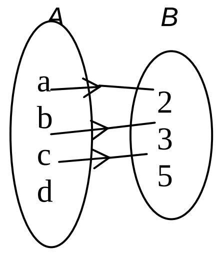
Not a function – 2 has two images

b)



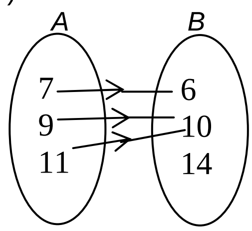
A function because each member in *A* is related to member in *B*

c)



Not a function
No image for d

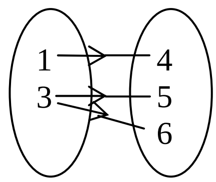
d)



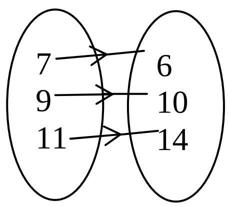
A function although 9 and 11 in A are both linked to 10

Exersice 2.1
1) Determine which of this relations is a functions

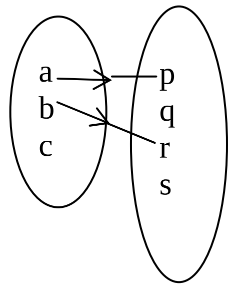
a)



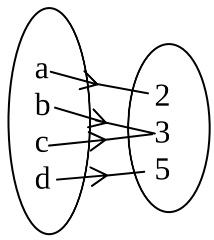
b)



c)



d)



Let's think

Which type of relations ; one to one , one to many, many to one and many to many is a a function.
Discuss it.

Homework : Textbook Exercise 1.2.1 page 7

2.2 Expressing function using function notation

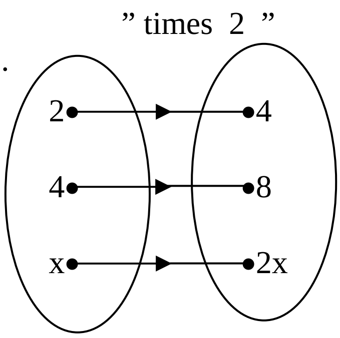
We have learnt that relations is also a *function* or *mapping* as each and every member of set *A* is linked to one and only one member of set *B* . Symbolically , we write $f : x \to x + 2$ which means that " the function *f* maps x onto " x + 2 " . In functional notation, we write $f(x) = x + 2$. $f(x)$ is read as ' function of *x* '.
The set of elements in *A* for the mapping is known as the domain while the set of images in *B* is known as the range . In functional notation, if $f(x) = x + 2$ and x =3 , then $f(3) = 3 + 2 = 5$ (3 is an object while 5 is the image)

Homework : Textbook Exercise 1.2..2 page 8

2.3 Determining domain,object,image and range of a function

Example 5

1.

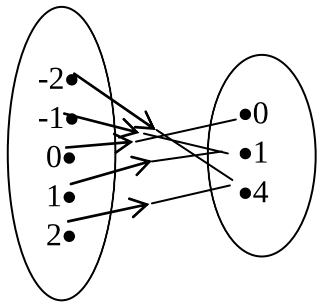
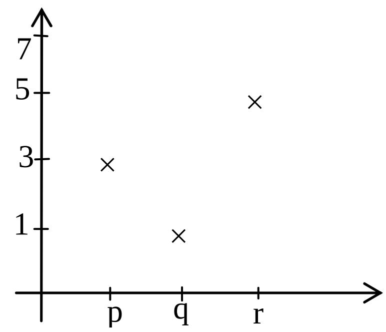


$f : x \longrightarrow 2x$

$f(x) = 2x$

Object	Images
x	*f*(x)
2	*f*(2) = 2(2) = 4
3	*f*(3) = 2(3) = 6
- 1	*f*(-1) = 2(-1)= - 2
a	*f*(*a*)= 2(*a*) = 2*a*
a + 1	*f*(*a*+1)= 2(*a*+1) = 2*a* + 2
x^2	*f*(x^2) = 2x^2
x^3	*f*(x^3) = 2x^3
x^2 - 1	*f*(x^2 – 1) = 2(x^2 -1) = 2x^2-2

Example 6

Bil	Functions	Functions notations
1		$f : x \to x^2$ *f*(x) = x^2 *f*(-2) = 4 *f*(2) = 4 *f*(0) = 0
2	{ (1,4), (2,8), (3,12)}	$f : x \to 4x$
3		*f*(*p*) = 3 *f*(*q*) = 1 *f*(*r*) = 5

Exerise 2.2
Complete the folowing table

Functions	*x* value	Calculations image
a) *f* : x → 2x + 1	-2	f(-2) = 2(-2)+1= -3
	0	f(0) = 2(0)+1 = 1
	1	
b) *g*; x → $\frac{2x+3}{7}$	2	
	-3	
	5	
c) *h* : x → 4x - x^2	-4	
	4	
	-2	

2.4 Determining the image of a function given the object and vice versa

A Find the image for each of the following functions.

a) Given that $f(x) = 2x^2 - 4x + 5$, find the image For each of the following .		b) Given that $f(x) = (x^2 - 2)^2 (x + 1) - 10$, find the image for each of the following.	
(i) $f(-1) = 2(-1)^2 – 4(-1) + 5$ $= 2+4+5$ $= 11$	ii) $f(2)$	i) $f(0)$	ii) $f(2)$
iii) $f(\frac{2}{3})$	iv) $f(-4)$	v) $f(-1)$	vi $f(-3)$

B . Find the object for each of the following functions

c) Given that $f(x) = 2x + 6$, find the object when the image is,		d) Given that $f(x) = \frac{2x+8}{5}$, find the object when the image is,	
(i) 2	ii) - 5	i) *5*	ii) *- 3*
iii) $\frac{7}{3}$	iv) $-\frac{3}{5}$	v) $\frac{8}{9}$	$-\frac{3}{2}$

C.

a) Given $h : x \to 3x - 12$, Find i) the object when the image is 6 ii) the object which mapped to it's self **Solution** : (i) (ii)	b) Given that $f(x) = 4 - 2x$, find the value m If $f(m) = 10$

Homework : Textbook Exercise 1.2.4 page 10

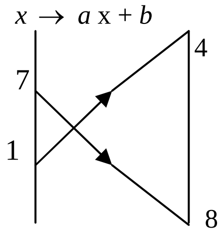
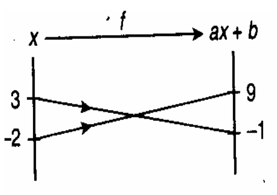
D. (i) The diagrams below shows part of the mapping f(x): x $f(x) :\mapsto ax + b$

Find

(i) the values of a and b

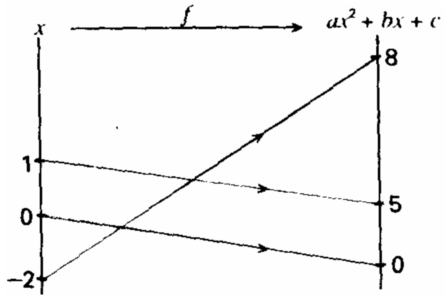
(ii) the image of 3 under f

(iii) the object whose image is -4

	Calculations		
	the values of *a* and *b*	the image of 3 under *f*	the object whose image is -4
a) 			
b) 			

(ii)

a)

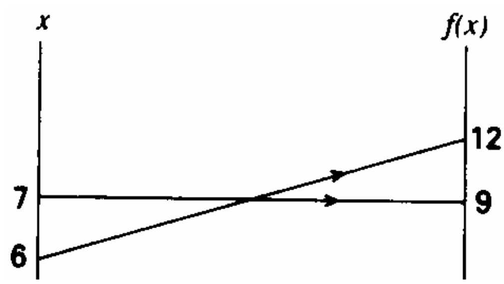


The diagram above shows part of the mapping $f(x) :\mapsto ax^2 + bx + c$. Find

(a) f(x) .

(b) the image of - 4 under f

b)



The diagram above shows part of the mapping $f : x \to \dfrac{72}{ax + b}$. Find ,

(i) the values of a and b

(ii) the image of 10 under f

(iii) the object of 4

Example 6

a) A function *f* is defined by $f : x \to \frac{12}{ax+b}, x \neq -\frac{b}{a}$ Given that *f*(4) = -3 and *f* (10) = 6, Calculate a) the value of a and b b) the value of x for which *f*(*x*) = -*x*	b) A function *f* is defined by $f\text{: x} \to \frac{a}{x} + b, x \neq k$ Given that *f*(2) and *f*(5) = -1 a) state the value of k b) find the value *a* and *b* c) find *f*(4)

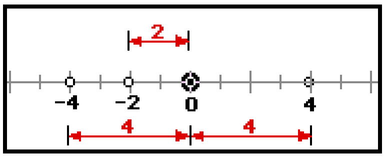
Homework : Textbook skill Practice 1.2 page 10

Absolute Valued Function

Note :

f(x) = $|x|$ is called absolute valued function. The **absolute value** of a number is the distance the number is from zero on the number line. We write the *absolute value of -2* as | -2 |.

The absolute value of a number is found by determining how many units the number is from zero. Since distance is always thought of as positive, the absolute value of any number is positive. For example, -2 is 2 units from zero, so | -2 | = 2. In the picture below, you can see that | 4 | = 4 and | -4 | = 4, because both 4 and -4 are 4 units from zero on the number line.



In equalities of a bsolute Valued Function

(i) $|x| < k \Rightarrow -k < x < k$

(ii) $|ax+b| < k \Rightarrow -k < ax + b < k$

(iii) $|ax+b| > k \Rightarrow ax + b < -k \text{ or } ax + b > k$

Example 10

a) Given that f(x) = $\lvert 3x-2 \rvert$, find the value of i) f(2) ii) f ($\frac{1}{2}$)	b) Given that f : x $\to \lvert 3x-5 \rvert$. Find the domain of the following functions i) f(x) ≤ 4 ii) f(x) > 3

Exercise 2.4

a) Given that f (x) = $\lvert x^3 - 4 \rvert$, find i) f(3) ii) f(-2)	b) Given that f :x = $\lvert 2x - 8 \rvert$. Find the domain of the following functions i) f(x) $\leq$ 2 ii) f(x) > 4

Example 11:
Sketch the following function . Hence, state the range that match with the domain given .

a) a) f : x $\rightarrow$ $\lvert x+3 \rvert$ -1 $\leq$ x $\leq$ 2	b) f: x $\rightarrow$ $\lvert x \rvert$ -3 -1 $\leq$ x $\leq$ 3	c)) f: x $\rightarrow$ $\lvert x-2 \rvert$ + 1 -2 $\leq$ x $\leq$ 3

2.5 Exercise
Sketch the following function . Hence, state the range that match with the domain given .

a) f : x $\rightarrow$ $\lvert x-2 \rvert$ for -1 $\leq$ x $\leq$ 2	b) g : x $\rightarrow$ $\lvert 2x+1 \rvert$ - 2 for -1 $\leq$ x $\leq$ 2	c) h : x $\rightarrow$ $\lvert 4-x^2 \rvert$ for -1 $\leq$ x $\leq$ 3

Homework

1. Sketch the graph of function *f:x* $\mapsto$ $\lvert$ 2x-3 $\rvert$ for 0 $\leq$ x $\leq$ 4. Hence state the range that match with the domain given	2. . Sketch the graph of function $\rightarrow$ $\lvert$ 2x-5 $\rvert$ for 0 $\leq$ x $\leq$ 6 . Find the value of *x* if f(x) $\leq$ 4.

3. Given that f(x) = $\lvert 7 - 2x \rvert$ for $0 \le x \le 8$. find the range that match to the domain given.	4. A function *f* is defined by $f : x \to \lvert 3x-5 \rvert$ a) find *f*(4) , *f*(10) and *f*(-5) b) if *f* (*a*) = 26, find the possible value of *a*

Learning Objective : Understand the concept of composite functions.

Learning Outcomes : Student will be able to

3.1 Determine composition of two functions.

3.2 Determine the image of composite functions given the object and vice versa.

3.3 Determine one of the functions when the composite function and the other function are given.

3.0 Understanding the concept of composite functions.

Note : 1. Composite functions is a function composed of two or more algebraic functions.

2. Functions can be combined to give a composite function. If a function *f* is followed by a function *g* , we obtain the composite function *g f* . In general $gf \neq fg$.

f followed by g followed by h is donated by hgf . The order is relevant and important.

3.1 Determine composition of two functions.

Example 3. 1 Determining the composite functions.

a) Two functions f and g are defined by $f : x \to x - 2$ and $g : x \to x^2 - 1$. Obtained expressions for fg , gf	b) Two functions f and g are defined by $f : x \to 5x - 2$ and $g : x \to x^2 - x$ Find i) $f^2 g^2$ ii) g^2

Exercise 3.1

a) Two functions f and g are defined by $f : x \to x^2 + 1$ and $g: x \to \frac{4}{x}$. Find i) gf and g^2 ii) fg and f^2	b) Two functions f and g are defined by $f : x \to x^2 + 6$ and $g : x \to 3x + 4$. Find the values of x if $gf(x) = fg(x)$

Homework : Textbook Exercise 1.3.1 page 13

3.2 Determining the image of composite functions given the object and vice versa.

Example 3.2

Two functions f and g are defined by $f : x \to x^2 + 1$ and $g: x \to \frac{4}{x}$. Find *i)* gf (2) and g^2 (4) ii) fg (-4) and f^2 (3)	*j)* Two functions f and g are defined by $f : x \to 2x + 6$ and $g : x \to ax + b$ Given that $fg(1) = 10$ and $gf(2) = 8$. Calculate the values of a and b

Exercise 3.2

c) Two functions f and g are defined by $f : x \to x - 2$ and $g : x \to x^2 - 1$. Obtained expressions for fg (2) , gf (-2) , $f^2(2)$, $g^2(8)$	d) Two functions f and g are defined by $f : x \to ax - b$ and $g : x \to 2x - 5$. Given that $fg(1) = 10$ and $gf(2) = 8$. Calculate the values of a and b

Note : It is common to express $ff(x)$ (x) as f^2 (x) , $fff(x)$ as $f^3(x)$ etc.

Homework : Textbook Exercise 1.3.2 page 14

Example 3.2(ii) The function g is defined by g:x $\rightarrow \dfrac{1+x}{1-x}, x \neq 1$. Express in their simplest forms each of the following functions

a) $g^2(x)$	b) $g^3(x)$	c) $g^4(x)$	c) $g^{16}(x)$

Exercise 3.2(ii) The function g is defined by f: x $\rightarrow \dfrac{5}{x}, x \neq 0$ Express in their simplest forms each of the following functions

a) $f^2(x)$	b) $f^3(x)$	c) $f^4(x)$	d) $f^{31}(x)$

3.3 Determining one of the functions when the composite function and the other function are given .

Example 3.3

a) If g(x) = $\frac{1}{2}(x-1)$ find the function f such that g f (x) = $\frac{2x+1}{3}$,	b) If $f(x) = x + 1$ find the function g such that $g\,f(x) = x^2 + 2x + 12$

Exercise 3.3

a) If f (x) = x + 4 find the function g such that f g(x) = $\frac{2(x-1)}{x-2}, x \neq 2$ [Ans g(x) : $\frac{2(3-x)}{x-2}, x \neq 2$]	b) if f(x) =x^2 + 1 and $g\,f$ (x) = $x^4 + 2x^2 + 9$. Find the function g . [Ans g(x)=x^2 + 8]
c) Given that hg(x) = 2x + 1 and h(x) = $\frac{x}{4}$. Find the function g.	d) Given that fg(x) = 5 – x and f(x) = 8x +3. Find the function g

Homework : Textbook Exercise 1.3.3 page 15 and Skill Practice 1.3 page 16.

Learning objective 4.0 Understand the concept of inverse functions.

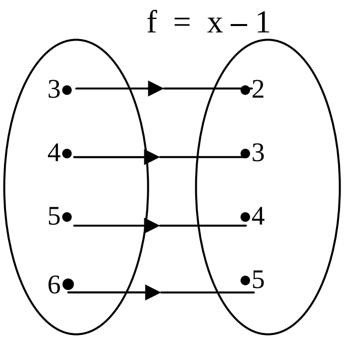
Learning outcomes : Student will be able to:
- 4.1 Find the object by inverse mapping given its image and function.
- 4.2 Determine inverse functions using algebra.
- 4.3 Determine and state the condition for existence of an inverse function.

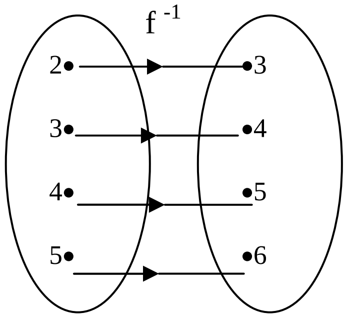
4.0 Understanding the concept of inverse functions.

Suppose f is a function “multiply by 3” .If. this function is applied to x, then the images of x is 3x What function should we apply to 3x in order to get back to x ?.This function which maps the image back to its initial value is known as the inverse function of f, and it is denoted by f^{-1}. Symbolically we write $f(x) = 3x$ and $f^{-1}(x) = \frac{3}{x}$

If f is a many – to – one function, then its inverse is not a function but a one- to- many relation. Only one – to – one functions will give one – to – one inverse functions.

4.1 Finding the object by inverse mapping given its image and function.



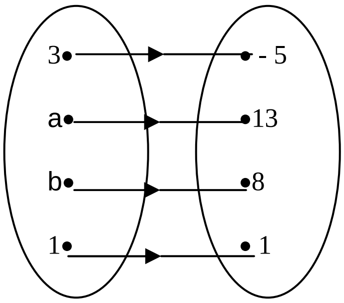


$f(x) = x - 1$
$f(3) = 2$
$f(4) = 3$
$f(5) = 4$

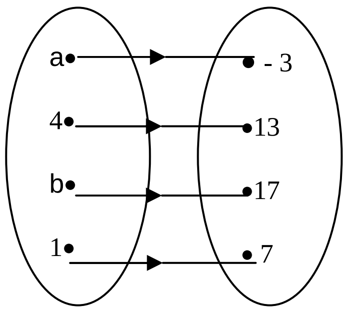
$f^{-1}(2) = 3$
$f^{-1}(3) = 4$
$f^{-1}(4) = 5$
$f^{-1}(5) = 6$

Example 4.1
Find the value of *a* and *b* in the following diagram by the inverse mapping

a) $f\ x : x \mapsto 4 - 3x$

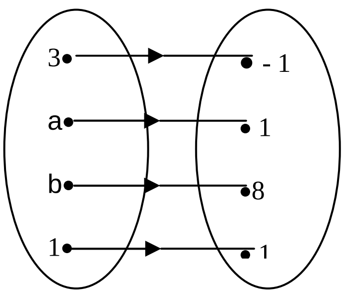


b) $f\ x : x \mapsto 2x + 5$

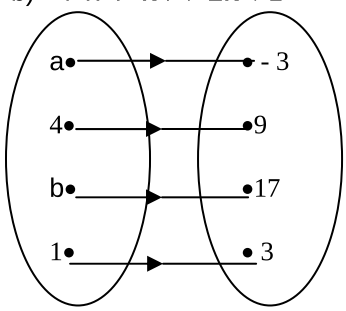


Exercise 4.1

a) $f\ x : x \mapsto 2 - x$



b) $f\ x : x \mapsto 2x + 1$



Homework : Textbook Exercise 1.4.1 page 17

4.2 Determining inverse functions using algebra

Example 4. 2 (i)

a) Find the inverse function for the function $f : x \rightarrow 3x + 4$ then find $f^{-1}(2)$	b) Given $f : x \rightarrow \frac{3x+1}{x-2}$, $x \neq 2$. Find $f^{-1}(x)$, $f^{-1}(4)$, $f^{-1}(-2)$ and $f^{-1}(\frac{1}{3})$

Exercise 4.2

a) Given $h : x \rightarrow \frac{3-x}{2}$, find $h^{-1}(x)$, $h^{-1}(3)$ and $h^{-1}(\frac{1}{4})$	b) Given that $f : x \rightarrow \frac{hx+k}{x-2}, x \neq 2$ and its inverse function $f^{-1} : x \rightarrow \frac{2x-9}{x-4}, x \neq 4$. Find the value of h and k.

Homework : Textbook Exercise 1.4.2 page 18

Example 4.2(i) :

a) A function *f* is defined by $f : x \rightarrow x + 3$. Find (i) ff^{-1} (ii) the function g such that $gf : x \rightarrow x^2 + 6x + 2$. (i) $f f^{-1}$ ii) function g	b) A function *f* is defined by $f : x \rightarrow x + 2$. Find the function g such that $gf: x \rightarrow x + 9$
A function f is defined by $f: x \rightarrow 2x-1$. . Find the function g such that i) $f g : x \rightarrow 7 - 6x$ ii) $g f: x \rightarrow \frac{5}{2x}$	

4.3 Determining and stating the condition for existence of an inverse function.

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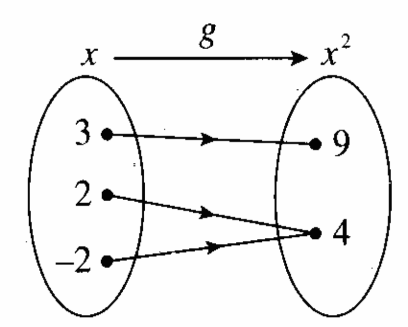
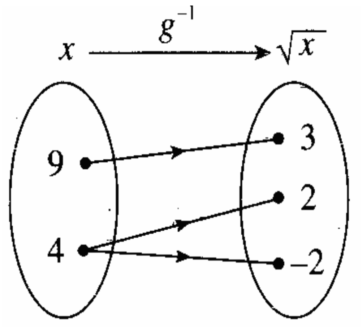


(a)



(b)

Diagram (a) shows function $g(x) = x^2$, which is not a one to one function. Reversing the arrows, you do not have a one to one function.. In general, for a function f to have an inverse function, f must be a one to one function.
Note : **If *f* is a many – to – one function, then its inverse is not a function but a one – to – many relation. Only one – to – one function will give one- to-one functions**

Remember : IF A FUNCTION *F* IS ONE TO ONE, THEN THE INVERSE FUNCTION f^{-1} DOES EXIST !!!!!

Example 4.3
Determine whether the inverse of the following function is a function or not .

a) $f(x) = (x+1)^2$	b) $g(x) = \frac{1}{x} - 4$, $x \neq 0$

Exercise4.3 : Determine whether the inverse of the following function is a function or not

a) $f(x) = 3 + \frac{8}{x}$, $x \neq 0$	b) $g(x) = \frac{x^2}{4}$

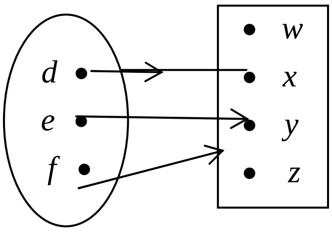
Homework : Textbook Exercise 1.4.3 page 20 and Skill Practice 1.4

SPM Questions

P = { 1, 2, 3} Q = {2, 4, 6,8,10} SPM 2003 Paper 1 Based on the above information, the relation between P and Q is defined by the set of ordered pair { (1, 2) , (1,4),(2,6), (2,8) } State (a) the image of 1, (b) the object of 2 [2 m] 2. Given that $g : x \to 5x + 1$ and $h : x \to x^2 - 2x + 3$, find (a) $g^{-1}(3)$ (b) $hg(x)$ [4m] [ans a) 2, 4 b) 1 2. a) 2/5 b) $25x^2 + 2$	

SPM 2004

1. Diagram 1 shows the relation between set P and set Q.



State

(a) the range of the relation

(b) the type of the relation. [2 m

2. Given the functions h : x $\rightarrow 4x + m$

and $h^{-1} : x \rightarrow 2kx + \frac{5}{8}$,where *m* and *k* are constants, find the value of m and of k [3 m]

3. Given the function h(x) = $h(x) = \frac{6}{x}, x \neq o$

and the composite function hg(x) = 3x, find

a) g(x)

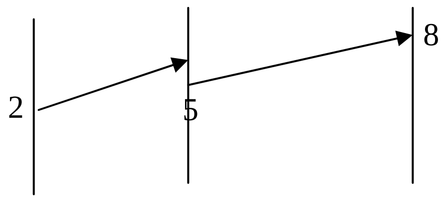
b) the value of x when *g h* (x) = 5 [4 m]

1a) x , y b) many to one .

2 (a) m = -5/2 , k = 1/8

3 (a) g(x) = 2/x (b) x = 15

2005



In diagram, the function *h* maps *x* to *y* and the function *g* maps *y* to *z*

Determine

(a) $h^{-1}(5)$ (b) *g h*(2) [ans (a) 2 , b) 8]

2. The function w is defined as

w(x) = $\frac{5}{2 - x}, x \neq 2$ Find

(a) $w^{-1}(x)$ (b)) $w^{-1}(4)$ [3 mark]

3. The following information refers to the function h and g

$h(x) : x \rightarrow 2x - 3$ $g : x \rightarrow 4x - 1$

Find gh^{-1}