



# MATHS

# BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

# **RELATION AND MAPPING**

# Examples

**1.** If (3x + 2y, 12) = (5, 2x-3y), find the value of x and y.



**2.** If A = {1, 2, 3}, find

A imes A



 $A \times A \times A$ .



$$A imes (B \cup C) = (A imes B) \cup (A imes C)$$

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**5.** If A = {1, 3}, B = {3, 5} and C = {5, 10}, show that,

 $A imes (B \cap C) = (A imes B) \cap (A imes C)$ 

6. If A = {1, 2, 3}, B = {2, 3, 4}, C = {1, 3, 4} and D = {2, 4, 5}, show that, $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$ 



7. Let P = {x:x is a prime natural number is less than 9} and Q = {2, 4},

then find  $P \times Q$ .

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**8.** The cartesian product A imes A has 16 elements and its three terms are

(1, 2),(2, 3) and (3, 4), find A.



9. If  ${\mathbb R}$  is the set of all real numbers, what does the cartesian product

 $\mathbb{R} \times \mathbb{R}$  represent?



**12.** If  $X \times Y = \{(1, 2), (4, 3), (5, 2), (1, 4), (4, 2), (5, 4), (1, 3), (4, 4), (5, 3)\}$ , find X

and Y.

13. If n(A imes B) = 8 and four terms of cartesian product A imes B are (1,

4),(3, 5),(4, 4),(2, 4), find the remaining four terms of  $A \times B$ .



14. If n(A imes A) = 9 and two terms of the set A imes A are (1, 2) and (3, 1),

then determine the remaining terms of  $A \times A$ .

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15. If A is a non-empty set and  $A \times B = A \times C$ , then prove that, B = C.



16. If  $A imes B \subseteq C imes D$  and  $A imes B 
eq \phi$ , then show that,  $A \subseteq C$  and

 $B \subseteq D.$ 

#### 17.

 $A = \{x \colon x \in \mathbb{N} \land x \leq 2\} ext{ and } B = \{x \colon x \in \mathbb{Z} \land -1 < x < 3\}, ext{ find } A imes B.$ 

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18. Let A = {a, b, c} and B = {1, 2, 3} be two sets. State with reasons which

of the following is a relation form A to B:

$$R = \{(a,2), (a,3), (b,1), (c,3), (b,2)\}$$

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19. Let A ={a,b,c} and B ={1,2,3} be two sets. State with reasons which of

the following is a relation form A to B:

$$S = \{(a,3), (b,1), (c,2), (2,a)\}$$

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**20.** Let A = {3, 4, 5, 6, 7} and B = {8, 9, 10, 11, 12} be two given sets and R be the relation from A to B defined by,  $(x, y) \in R \Rightarrow x$  divides y. Write R as a set of ordered pairs. Also find its domain and range.

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21. A relation R from the set A = {3, 4, 5, 6} to the set B = {2, 6, 7, 10} is

defined as follows:

 $(x,y)\in R\Rightarrow x$  is relatively prime to Y

Find R and  $R^{-1}$  as sets of ordered pairs.

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22. A relation R is defined from set A = {1, 2, 3, 4} to set B= {5, 6, 7, 8} as

follows:

 $xRy \Rightarrow x+y=8$ 

Find  $R^{-1}$  , the inverse relation of R. Also find the domain and range of  $R^{-1}$ .



**23.** Let R be the relation on the set A of first twelve natural numbers defined by,

 $R = \{(x,y) : x+2y = 12 \, ext{ and } \, x,y \in A \}$ 

Find R as the set of ordered pairs. Also find its domain and range.



**24.** Let R be the relation defined on the set of natural numbers  $\mathbb{N}$  by,

 $(x,y)\in R\Rightarrow 2x+3y=20\, ext{ and }\,x,y\in\mathbb{N}$ 

Find R and  $R^{-1}$ , the inverse relation of R, as sets of ordered pairs.

25. Find the range and domain of the relation R defined below:

 $R = \{(2x - 5, x - 3) : x \text{ is an even natural number less than 12}\}$ 

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**26.** Let  $\mathbb{Z}$  be the set of integers and let R be the relation on  $\mathbb{Z}$  defined as

$$R=ig\{(x,y)\mid x,y\in\mathbb{Z} ext{ and } x^2+y^2=100ig\}$$

Find R as the set of ordered pairs. Also find its domain and range.

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**27.** Let A =  $\{1, 2, 3, 4\}$  and B = $\{3, 6, 9\}$ . If f is the rule associating elements

of A to elements of B, such that f(1) = 3, f(3) = 6, f(4) = 3. Examine

whether f defines a mapping or not.

**28.** Let X = {1, 3, 5, 7} and Y={2, 4, 6, 8}. If f be the rule associating elements of X to elements of Y, such that f(1) = 4, f(3) = 2, f(5) = 8, f(3) = 6, f(7) = 4. State whether f defines a function of X into Y or not.



**29.** Let A={-1, 0, 1} and B = {1, 2, 3, 4}. If f is the rule associating elements of A to elements of B, such that f(-1) = 2, f(0) = 1 and f(1) = 4. Does f define a mapping?

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**30.** Let A = {-1, 0, 1, 2, 3} and  $f: A \to \mathbb{Z}$  be given by  $f(x) = x^2 - 5x + 7$ , where  $\mathbb{Z}$  is the set of integers. Find the range of f.

**31.** Let A = {-1, 0, 1, 2, 3} and  $f: A \rightarrow Z$  be given by  $f(x) = x^2 - 5x + 7$ ,

where Z is the set of integers. Find

pre-images of 1, 4 and 7 under f.

**32.** Functions f and g are defined as follows:

$$f\!:\!R-\{1\} o\mathbb{R}, ext{ where } f(x)=rac{x^2-1}{x-1} ext{ and } g\!:\!\mathbb{R} o\mathbb{R},$$

Where g(x) = x+1,  $\mathbb{R}$  being the set of real numbers. Is f = g? Give reasons

for your answer.

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33.

$$A = igg\{ \ -1, \ -2, 0, 1, rac{5}{2}, 3 igg\}, B = \{ \ -6, \ -5, 0, 1, 4, 9 \} ext{ and } f {:} A o B$$

Let

defined by  $f(x) = 2x^2 - 3x - 5$ . Find f(A). Is f(A) = B?

**34.** Let  $\mathbb{Q}$  be the set of rational numbers and  $f \colon \mathbb{Q} \to \mathbb{Q}$ , be defined by,

 $f(x) = 2x^2 - 11x + 16$ . Find  $\{x : f(x) = 4\}$ .



**35.** If A = {1, 2, 3, 4, 5, 6}, show that the relation  

$$f = \{(x, y) : x + y = 7\}$$
, for all  $x, y \in A$   
defines a mapping from A to itself but the relation  
 $g = \{(x, y) : x + y > 8\}$  does not define a mapping in set A.  
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**36.** Let A ={1, 2, 3, 4} and  $\mathbb{R}$  be the set of real numbers. If  $f: A \to \mathbb{R}$  be defined by  $f(x) = x^2 - 1$ , find f as a set of ordered pairs and determine its range.

**37.** Show that, f = {(1, -6),(2, -1),(3, 4),(4, 9)} defines a mapping. If this mapping is described by the rule f(x) = ax + b, then what values should be assigned to a and b ?

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**38.** Let  $\mathbb{Z}$  be the set of integers and f be a subset of  $\mathbb{Z} \times \mathbb{Z}$ , such that,

$$f=\{(xy,x+y)\!:\!x,y\in\mathbb{Z}\}$$

Is f a function from  $\mathbb{Z}$  into  $\mathbb{Z}$ ? Give reasons for your answer.

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**39.** Let  $\mathbb{R}$  and  $\mathbb{Q}$  be the set of real numbers and rational numbers respectively and  $f: \mathbb{R} \to \mathbb{R}$  be defined as follows:

$$f(x) = egin{cases} 5, & ext{when} \quad x \in \mathbb{Q} \ -5, & ext{when} \quad x 
ot \in \mathbb{Q} \end{cases}$$
Find  $f(3), f(\sqrt{3}), f(3.6), f(\pi), f(e) ext{ and } f(3.36),$ 



**40.** Let  $\mathbb{R}$  and  $\mathbb{Q}$  be the set of real numbers and rational numbers respectively and  $f: \mathbb{R} \to \mathbb{R}$  be defined as follows:  $f(x) = x^2$  Find pre-image of (9).

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**41.** Let  $\mathbb{R}$  be the set of real numbers and  $f\colon \mathbb{R} o \mathbb{R}$  be given by,  $f(x) = \log_e x.$  Does f define a function ?

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**42.** Let  $\mathbb{R}$  and  $\mathbb{R}^+$  be the sets of real numbers and positive real numbers respectively. If  $f: \mathbb{R}^+ \to \mathbb{R}$  be defined by  $f(x) = \log_e x$ , find (a) range of f (b)  $\{x: f(x) = 1\}$ . Also show that, f(xy)=f(x)+f(y).





43. Find the image set of the domain of each of the following functions

$$f\!:\!\mathbb{R} o\mathbb{R}\;\; ext{given by},\,f(x)=\sin x, ext{ for all }\;\;x\in\mathbb{R},$$

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:

44. Find the image set of the domain of each of the following functions :  $g\colon\mathbb{R} o\mathbb{R}$  defined by,  $g(x)=x^2+2, ext{ for all } x\in\mathbb{R}, ext{ where } \mathbb{R} ext{ is the set}$  of real numbers.

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45. Does the equation y = 2x-9 represent y as a function of x ? If so, find

the domain of definition and range of the function.

46. If 
$$f(x) = x^2 - 5x + 7$$
, find f(2), f(-2), f(x+h),  
 $f(x^2 + 2)$  and  $\frac{f(x+h) - f(x)}{h}$ .

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**47.** If F(x) = x + |x - 1|, find F(3) and F(-3).

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**48.** If f(x) = 2|x| - 3[x] where [x] denotes greatest integer in x not

exceeding the value of x, find the value of f(2.5) and f(-2.5).

**49.** If  $\phi(x)=2^{mx+1}$  , show that

 $\phi(a). \phi(b). \phi(c) = 4. \phi(a+b+c).$ 

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**50.** If  $f(x-2) = 2x^2 + 3x - 5$ , find f(x) and prove that f(-1) = 0.

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**51.** If 4f(x) + 3f(-x) = 7 - 3x, find f(x).

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52. If  $f(x) = e^{x+a}$ ,  $g(x) = x^{b^2}$  and  $h(x) = e^{b^2x}$ , find the value of  $\frac{g[f(x)]}{h(x)}$ .

53. If  $y=f(x)=rac{lx+m}{nx-l}$  , express f(y) in the simplest form in x.

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54. If 
$$f(x)=rac{1-x}{1+x},\,$$
 prove that  $figgl\{figgl(rac{1}{x}iggr)iggr\}=rac{1}{x}[x
eq 0]$ 

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55. If 
$$f(x) = rac{1-x}{1+x}, ext{ prove that}$$
 $figg[figg\{figg(rac{1}{x}igg)igg\}igg] = -f(x)$ 

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56. A function F(x) is defined as follows:

$$F(x) = egin{cases} 1+2x & ext{when} & x \leq 1 \ 3-2x & ext{when} & x > 1 \end{cases}$$

Determine F(0), F(-1.5), F(1), F(2.6) and F(x+2).



**57.** If f(x)f(y) = f(x) + f(y) + f(xy) - 2 for all real values of x and y and f(2) = 5, find f(4) and  $f\left(\frac{1}{4}\right)$ .

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58. Find the domain of definition of the following functions :

 $\frac{x^2+x+5}{x^2-6x+8}$ 

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59. Find the domain of definition of the following functions :

$$\sqrt{x^2+x-12}$$

60. Find the domain of definition of the following functions :

$$\frac{1}{\sqrt{x^2 - 4x}}$$
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62. Find the domain of definition of the following functions :

 $\frac{x}{\log(1+x)}$ 

**63.** Find the domain of definitions of each of the following functions :

$$f(x) = \cos^{-1} 2x$$
  
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64. For what values of x is the function  $f(x) = \frac{\sin x}{\cos x - \sin x}$  not defined ?
  
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65. If  $f(x) = \frac{|x|}{x}$  and c be a non-zero real number, show that  $|f(c) - f(-c)| = 2$ .
  
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**66.** Find the domain of definition of  $f(x) = \log_e \cdot \frac{1-x}{1+x}$ . Further show

that,

$$f(x_1)+f(x_2)=figg(rac{x_1+x_2}{1+x_1x_2}igg), x_1,x_2\in(\,-1,1)$$

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67. Find the ranges of the following functions :

$$\cos x \Big( -rac{\pi}{2} \leq x \leq rac{\pi}{2} \Big)$$

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68. Find the ranges of the following functions :

 $\frac{1}{2-\sin 3x}$ 

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69. Find the ranges of the following functions :

$$y=rac{x}{1+x^2}$$



73. The taxi fare is Rs. 3.50 for 1 km or less from start and Rs. 1.50 per km

or any fraction thereof, for additional distance. If the fare be Rs. Y for a

distance of x km, express y as a function of x.



#### 75. Find the domain of definition of

 $\log_e. rac{2+x}{2-x}$ 

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**76.** Find the sum and difference of identify function and modulus function.

**77.** The function f satisfies the equation, f(x+y) = f(x) + f(y). Show that

(a) f(0) = 0

(b) f(x) os an odd function

(c) If x is an integer and f(1) = a then, f(x)=ax.

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**78.** Let  $f(x) = Ax^2 + Bx + C$  where A, B, C are three real constants, if f(x) is integer for integral values of x, then prove that each of 2A, (A+B) and C is an integer. Conversely, if each of 2A, (A+B), C is an integer then f(x) will be integer for integral values of x.

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**79.** Determine the product function of the identify function and modulus function.

**80.** Find the quotient function of dividing the identify function by the modulus function.

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**81.** Two real function f and g are defined respectively by  $f(x) = \sqrt{x-3}$  and  $g(x) = \sqrt{x^2 - 9}$ . Find each of the following functions :

f+g

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82. Two real function f and g are defined respectively by  $f(x) = \sqrt{x-3}$  and  $g(x) = \sqrt{x^2-9}$ . Find each of the following functions :

ff



**83.** Two real function f and g are defined respectively by  $f(x) = \sqrt{x-3}$  and  $g(x) = \sqrt{x^2 - 9}$ . Find each of the following functions :

gg

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**84.** Two real function f and g are defined respectively by  $f(x) = \sqrt{x-3}$  and  $g(x) = \sqrt{x^2 - 9}$ . Find each of the following functions :

f-g

**85.** Two real function f and g are defined respectively by  $f(x) = \sqrt{x-3}$  and  $g(x) = \sqrt{x^2-9}$ . Find each of the following functions :

fg

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86. Two real function f and g are defined respectively by  $f(x) = \sqrt{x-3}$  and  $g(x) = \sqrt{x^2 - 9}$ . Find each of the following functions :  $\frac{f}{g}$ Watch Video Solution

87. Two real functions  $f: [5, \infty) \to \mathbb{R}$  and  $g: [-5, \infty) \to \mathbb{R}$  are defined respectively by  $f(x) = \sqrt{x-5}$  and  $g(x) = \sqrt{x+5}$ , find the function f+g and f-g.

**88.** Two real valued functions f and g are defined respectively by  $f(x) = \log_e(1-x)$  and g(x) = [x], find the following functions : f+g

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**89.** Two real valued functions f and g are defined respectively by  $f(x) = \log_e(1-x)$  and g(x) = [x], find the following functions : f-g

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**90.** Two real valued functions f and g are defined respectively by  $f(x) = \log_e(1-x)$  and g(x) = [x], find the following functions :

fg



**91.** Two real valued functions f and g are defined respectively by  $f(x) = \log_e(1-x)$  and g(x) = [x], find the following functions :  $\frac{f}{g}$ 

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92. Two real valued functions f and g are defined respectively by  $f(x) = \log_e(1-x)$  and g(x) = [x], find the following functions :  $\frac{g}{f}$ 

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**93.** If  $f(x) = e^x$  and  $g(x) = \log_e x$ , then find (f+g)(1) and fg(1).

94. Find the domain of domain of definitions of the real function f(x)

defined below :

$$f(x)=rac{1}{\sqrt{x+[x]}}$$

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**95.** Find the domain of domain of definitions of the real function g(x)

defined below :

$$g(x)=rac{1}{\sqrt{x-[x]}}$$

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96. Find the range of each of the following functions :

$$3-|x-3|$$

97. Find the range of each of the following functions :



**100.** Draw the graph of the identity function, I(x) = x, for all  $x \in \mathbb{R}$ .





105. Sketch the graph of the function :

$$y=f(x)=egin{cases} -x, & ext{when} & x\leq 0\ x, & ext{when} & x>0 \end{cases}$$

From the graph examine the continuity of f(x) at x = 0.



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**107.** A function f(x) is defined as follows:

 $f(x) = egin{cases} 1, & ext{when x is an integer} \ 0, & ext{when x is not an integer} \end{cases}$ 

Draw the graph of the function and from the graph find its points of

discontinuity (if any).

108. Draw the graph of the function defined below and from the graph

find its point of discontinuity (if any) :

$$f(x) = \left\{egin{array}{cccc} 2x+6, & ext{when} & -3 \leq x \leq 0 \ 6, & ext{when} & 0 < x < 2 \ 2x-6, & ext{when} & 2 \leq x \leq 5 \end{array}
ight.$$

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**109.** Draw the graph of the function  $f(x) = \frac{x^2 - 1}{x - 1}$  and from the graph examine whether f(x) is continuous at x = 1 and x = 2.

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110. A function f(x) is defined as follows :

$$f(x) = egin{cases} x-1, & ext{when} \quad x>0 \ -rac{1}{2}, & ext{when} \quad x=0 \ x+1, & ext{when} \quad x<0 \end{cases}$$





111. Let 
$$f: R \to R$$
 and  $g: R \to R$  is define by

 $f(x)=2x+3 \, ext{ and } \, g(x)=3x-2$  , then find  $(f\circ g)(x)$ 

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**112.** Draw the graph of the function y = [x], where [x] denotes the greatest integer not greater than x.




**Multiple Choice Question** 

**1.** If (a +b, 3a - 2b) = (-9, -2), then a and b are\_\_\_

A. 2 and 1 respectively

B. -1 and 2 respectively

C.1 and 2 respectively

D. -4 and -5 respectively

#### Answer: D

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**2.** If A = {1, 2, 4}, B = {2, 4, 5}, C = {2, 5}, then  $(A - B) \times (B - C)$  is\_\_\_\_\_

A. {(1,4)}

B. {(1,2),(1,5),(2,5)}

C. (1,4)

D. none of these

## Answer: A



## Answer: C

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**4.** If A = {a,b} and B = {1,2,3} then  $(A imes B) \cap (B imes A) =$ 

A.  $\{(a, 1), (a, 2), (b, 3)\}$ 

B. 
$$\{(b, 1), (b, 2), (b, 3)\}$$
  
C.  $\{(a, 1), (b, 1), (a, 3)\}$ 

D.  $\phi$ 

Answer: D

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**5.** Let A and B be two sets containing respectively m and n distinct elements. Then number of different relations can be defined from set A to set B is \_\_\_\_

A.  $2^{m+n}$ 

 $\mathsf{B.}\, 2^{n^m}$ 

 $\mathsf{C}.\, 2^{m^n}$ 

 $\mathsf{D.}\, 2^{mn}$ 

Answer: D

**6.** If  $R = \{(3,9), (3,12), (4,8), (4,12), (5,10), (6,12)\}$  be a given

### relation, then domain of R =

A. {3, 4, 5, 6}

B. {8, 9, 10, 12}

C. {3, 5}

D. none of these

Answer: A

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7. If  $R = \{(3,9), (3,12), (4,8), (4,12), (5,10), (6,12)\}$  be a given

relation, then range of R =

A. {3, 4, 5, 6}

B. {8, 9, 10, 12}

C. {3, 10, 12}

D. none of these

#### Answer: B

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 $A=\{1,2,3,4,5,6,7,8,9\}$ given by  $\ xRy \Leftrightarrow y=3x$  , then R =

A. {(3,1),(6,2),(8,2),(9,3)}

B. {(3,1),(6,2),(9,3)}

C. {(3,1),(2,6),(3,9)}

D. none of these

#### Answer: D



9. Let R be a relation from set A do a set B, then\_\_\_\_

A. 
$$R = A \cup B$$
  
B.  $R = A \cap B$   
C.  $R \subseteq A imes B$ 

D.  $R\subseteq B imes A$ 

## Answer: C

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**10.** Total number of relations that can be defined on set A = {a,b,c} is \_\_\_\_

 $\mathsf{A.}\ 2^9$ 

 $\mathsf{B.}\,2^6$ 

 $C. 2^8$ 

# Answer: A



11. State which of the following is the total number of relations from set A = {1,2,3} to set B = {4,5} ? A.  $2^3$ B.  $2^4$ C.  $2^5$ D.  $2^6$ 

Answer: D

12. Let the relation R on set A = {1,2,3,4,5} be defined as follows:

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

Then state which one is true in each of the following two cases

A. 5 R 2

 $B.2 \not R 2$ 

C.1R3

D.1R2

Answer: D

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**13.** Let the relation R on set A = {1,2,3,4} be defined as follows:

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

Then state which one is true in each of the following two cases viz

# A. 2 K 1

B.3R2

C. 1 K 4

D.4R3

Answer: C

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14. Let  $\mathbb R$  be the set of real numbers and the mapping  $f:\mathbb R o\mathbb R$  be defined by  $f(x)=\sin x$  (for all  $x\in\mathbb R$ ), then the range of f is\_\_\_\_\_

A. 
$$\{f(x)\in\mathbb{R}\colon -\infty\leq f(x)\leq\infty\}$$

- $\texttt{B.}\left\{f(x)\in\mathbb{R}\colon-\infty\leq f(x)\leq1\right\}$
- $\mathsf{C}.\left\{f(x) \in \mathbb{R} \colon -1 < f(x) < 1\right\}$
- $\mathsf{D}.\left\{f(x)\in\mathbb{R}\colon-1\leq f(x)\leq1\right\}$

#### Answer: D

15. The total number of relation from the set  $\{p,q\}$  to the set  $\{e,f\}$  is-

A. 16

B. 32

C. 56

D. 4

#### Answer:

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16. Let  $A = \{0, 1, 2, 3, 4\}$  and  $\mathbb{Z}$  be the set of integers. If the mapping  $f: A \to \mathbb{Z}$  be defined by  $f(x) = x^2 - 5x + 2$ , state which of the following is the pre-image of 2?

B. there is no pre-image of 2

C. 1 and 4

D. 0

Answer: D

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17. If  $A = \{-2, 1, 0, -1, 2\}, B = \{-6, -5, -3, 0, 3\}$  and the mapping  $f: A \to B$  is defined by  $f(x) = 2x^2 + x - 6$ , state which of the following is the image of (-2) ?

A. 0

B. 3

C. -3

D.-5

Answer: A

18. Let,  $\mathbb Z$  be the set of integers and the mapping  $f\colon \mathbb Z o \mathbb Z$  be given by  $f(x)=2x-1,\,\,$  state which of the following sets is equal to the set  $\{x\colon f(x)=3\}$  ?

A. {3}

B. {2}

C. {0}

D. {-1}

### Answer: B

**19.** If 
$$f(x+2) = 2x^2 - 3x + 5$$
 then f(1) =

B. 5

C. 10

D. none of these

Answer: C

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**20.** If  $f(x) = 4^x$  then  $f(\log_4 x)$  =

A. 4

B.x

 $\mathsf{C.}\,4^x$ 

 $\mathsf{D.}\,x^4$ 

Answer: B

21. The total number of relation from the set {1, 6, 7}} to the set {1, 5}
isA. 66
B. 64
C. 32
D. 16

#### Answer:

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22. State for which of the following, the two functions  $f(x)=x ext{ and } \phi(x)=\,+\,\sqrt{x^2}$  are identical.

A.  $0 < x < \infty$ 

B. 
$$-\infty < x < \infty$$

 $\mathsf{C}.\, 0 \leq x < \infty$ 

D.  $-\infty < x \leq 0$ 

Answer: C

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23. If f(x) = 3x - 9, state which of the following is the value of  $f(x^2 - 1)$ : A.  $3x^2 - 9$ B.  $3x^2 - 12$ C.  $x^2 - 10$ D.  $3x^2 - 10$ 

Answer: B

**24.** If f(x-1) = 7x - 5 find f(x) and f(x+2).

A. 7x+2

B. 7x-12

C. 8x-4

D. 7(x+1)

Answer: A

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25. If 2f(x) + 3f(-x) = 15 - 4x, state which of the following is the value of [f(1)+f(-1)].

A. 5

B. 7

 $\mathsf{C.}-6$ 

## Answer: D



26. If 3f(x) + 2f(-x) = 5(x-2), state which of the following is the value of f(0) :

 $\mathsf{B.}-2$ 

C. 2

D. 1

Answer: B

27. If  $f(x) = \log_3 x$  and  $\phi(x) = x^2$ , state which of the following is the value of  $f{\phi(3)}$ :

A. 0

B.1

C. 2

D. 3

### Answer: C

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**28.** The domain of definition of the function  $f(x) = \sqrt{x+3}$  is :

A.  $(-\infty,3)$ 

 $\mathsf{B.}\,(\,-\infty,\,3]$ 

 $\mathsf{C}.\left(3,\infty
ight)$ 



Answer: D



Very Short Answer Type Questions

1. Define and write the cartesian product of two sets P=(a,b,c) and Q =

{2,3}. Is P imes Q = Q imes P true?

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**2.** If 
$$A = \{2, 3\}, B = \{3, 4\}$$
 and  $C = \{4, 6\}$ , find

 $(A \times B) \cup (B \times C)$ 



 $(A imes B) \cap (B imes C)$ 

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**4.** If  $A = \{1, 4\}, B = \{4, 3\}, \text{ and } C = \{3, 6\}$ , show that,

 $A imes (B \cup C) = (A imes B) \cup (A imes C)$ 

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5. If  $A = \{1, 2, 3\}, B = \{2, 3, 4\}, S = \{1, 3, 4\}$  and  $T = \{2, 4, 5\},$ 

then verify that,

 $(A imes B) \cap (S imes T) = (A \cap S) imes (B \cap T).$ 



**6.** If  $A = \{a, b\}, B = \{m, n\}$  and  $C = \{p, q\}$ , show that,

 $A imes (B \cap C) = (A imes B) \cap (A imes C)$ 

**7.** If A = (0,1), find

A imes A

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**8.** If A = (0,1), find

A imes A imes A

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**9.** The total number of relation from the set  $\{7,8\}$  to the set  $\{2,3,6,5\}$ 

is-

A. 6

B. 256

C. 16
D. 64
Answer:
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<b>10.</b> Find all the relations from the set $A = \{1,2\}$ to the set $B = \{3\}$ .
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<b>11.</b> If R is the relation "is greater than" from A = {1,2,3,4,5} to B = {1,3,4} ,
write R as the set of ordered pairs. Also find $R^{-1}$ .
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12. Let S = {a,b,c,d,e} and R be a relation on S defined by,

$$R = \{(b,a), (b,d), (d,b), (d,d), (e,b)\}$$
 ,

find the domain



find the range.

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14. Let S = {a,b,c,d,e} and R be a relation on S defined by,

$$R = \{(b, a), (b, d), (d, b), (d, d), (e, b)\}$$
 ,

find the inverse of R.

**15.** A relation R is defined on the set A = {2,3,4,6} as follows:

 $(x,y) \in R \Rightarrow x ext{ and } y ext{ are relatively prime.}$ 

Write R as a set of ordered pairs. Also find Dom. (R) and Range (R).



17. Find  $R^{-1}$  in each of the following cases :

 $R=\{(x,y)\!:\!x\in\mathbb{N},y\in\mathbb{N} ext{ and }2x+y=10\}$ 

**18.** Let A = {2,3,4,5} and B = {8,9,10,11} and let R be a relation from A to B defined by,  $xRy \Rightarrow$  "x divides y". Find R as a set of ordered pairs and also find its domain and range.



**20.** What is the difference between a mapping and a relation? Is every relation a mapping?



**21.** Let, the function  $f \colon \mathbb{R} o \mathbb{R}$  be defined by,

 $egin{aligned} f(x) &= egin{cases} 1 & ext{when} & x \in \mathbb{Q} \ -1 & ext{when} & x 
otin \mathbb{Q} \end{aligned} ext{ Find} \ f(2), fig(\sqrt{2}ig), f(\pi), f(2.23), f(e) \end{aligned}$ 



**22.** Let, the function 
$$f:\mathbb{R} \to \mathbb{R}$$
 be defined by,

$$f(x) = egin{cases} 1 & ext{when} & x \in \mathbb{Q} \ -1 & ext{when} & x 
ot 
ot \mathbb{Q} & ext{find} \end{cases}$$

range of f

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23. Let, the function 
$$f:\mathbb{R} o\mathbb{R}$$
 be defined by, $f(x)=egin{cases} 1 & ext{when} & x\in\mathbb{Q} \ -1 & ext{when} & x
otin \mathbb{Q} \end{cases} ext{ find}$ 

pre-image of 1 and (-1)

**24.** Find the domain for which the function  $f(x)=3x^2-2x$  and g (x) =

9x - 6 are equal.



25. Let C be the set of complex numbers and the function

 $f\!:\!\mathbb{R} o\mathbb{R},g\!:\!C o C$  be defined by  $f(x)=x^2$  and  $g(x)=x^2$  state

with reason whether f = g or not.

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26. Functions f and g are defined as follows:

 $f\colon \mathbb{R}-\{2\} o \mathbb{R},$  where  $f(x)=rac{x^2-4}{x-2}$  and  $g\colon \mathbb{R} o \mathbb{R},$  where g(x) = x+2.

State with reasons whether f = g or not.

27. Let f be a subset of  $\mathbb{Z} imes \mathbb{Z}$  such that  $f = \{(xy, x-y) \colon x, y \in \mathbb{Z}\}$  Is

f a mapping from  $\mathbb{Z}into\mathbb{Z}.$  Give reasons for your answer.

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**28.** 
$$A = \{-2, -1, 0, 1, 2\}, B = \{5, 7, 11\}$$
 and

 $f\colon A o B, where f(x)=x^2-x+5$ ,then find the image of 2.

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**29.** Let A = {-2,-1,0,1,2} and  $f:A \to \mathbb{Z}$  be defined by f(x) = 2x+1 for all

 $x \in A$ . Find f as a set of ordered pairs and find its range.



**30.** Let A = {0,1,2,3,4} and  $f\colon A o \mathbb{Z}$  be defined by  $f(x) = x^2 - 5x + 2,$ 

find

# the range of f.

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**31.** Let A = {0,1,2,3,4} and 
$$f \colon A o \mathbb{Z}$$
 be defined by  $f(x) = x^2 - 5x + 2$ ,

find

pre-images of (-2), 1 and 2.

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**32.** Let 
$$A = \left\{ -2, -1, 0, 1, \frac{3}{2}, 2 \right\}, B = \{ -6, -5, -3, 0, 3, 4 \}$$

and  $f\colon A o B$  be defined by  $f(x)=2x^2+x-6.$  Find f(A). Is f(x) = B?

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33. Let t the function  $f\colon \mathbb{R} o \mathbb{R}$  be defined by, $f(x) = a^x (a > 0, a 
eq 1).$  Find

# range of f





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**35.** Let  $A = \{0, 1\}, B = \{2, 6\}$ , and  $f: A \to B$  be given by, f(x) = 6 - 4x and  $g: A \to B$  be given by,  $g(x) = x^2 - 5x + 6$ .

State whether f = g or not.

36. Find the image set of the domain of each of the following functions





37. Find the image set of the domain of each of the following functions

 $f \colon \mathbb{R} o \mathbb{R}$  defined by, f(x) = cosecx for all  $x \in \mathbb{R}$ 

 $(\pi 
eq n\pi, n \in \mathbb{Z})$ 

:

:

:

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38. Find the image set of the domain of each of the following functions

 $f \colon \mathbb{R} o \mathbb{R}$  defined by, f(x) = tan x for all  $x \in \mathbb{R}$ 

39. Find the image set of the domain of each of the following functions

$$g\!:\!\mathbb{R} o\mathbb{R}$$
 given by  $g(x)=x^2+3~~ ext{for all}~~x\in\mathbb{R}$ 

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:

:

40. Find the image set of the domain of each of the following functions

 $h\!:\!\mathbb{R}^+ o\mathbb{R}$  defined by  $h(x)=\log_e x, \;\; ext{for all}\;\; x\in\mathbb{R}^+$  where  $\mathbb{R}^+$  is

the set of positive real numbers.

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**41.** Show that,  $f = \{(1, 1), (-1, -5), (2, 4), (3, 7)\}$  defines a mapping. If this mapping is described by the rule f(x) = px+q, then what

valued should be assigned to p and q?



**42.** If the mapping  $\{(1, 2), (-1, 6), (2, 3), (3, 6) \text{ is descibed by the} \}$ 

rule  $f(x) = ax^2 + bx + c$  , then find the assigned values of a, b and c.

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**43.** Let f be subset of  $\mathbb{Z} imes \mathbb{Z}$  such that  $f = \{(xy, x - y) \colon x, y \in \mathbb{Z}\}$  is f

a mapping from  $\mathbb{Z}$  into  $\mathbb{Z}$ . Give reasons for your answer.

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44. If  $A = \{1, 2, 3, 4, 5\}$ , show that the relation  $f = \{(x, y) : x + y = 6\}$  for all  $x, y \in A$ , defines a mapping from A to itself, but the relation  $g = \{(x, y) : y < x\}$  does not defines a mapping in set A.

45. Let  $A = \{1,2,3,4\}$  and  $B = \{7,8,9\}$ , then which of the following relations

is a mapping or not from set A to set B?

 $R_1 = \{(1,7), (2,8), (1,8), (4,9)\}$ 

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46. Let  $A = \{1,2,3,4\}$  and  $B = \{7,8,9\}$ , then which of the following relations

is a mapping or not from set A to set B?

 $R_2 = \{(1,7), (2,7), (3,7), (4,7)\}$ 

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47. Let  $A = \{1,2,3,4\}$  and  $B = \{7,8,9\}$ , then which of the following relations

is a mapping or not from set A to set B?

 $R_3=\{(1,8),(2,9),(3,8),(4,8)\}$ 

**48.** Let  $A = \{1,2,3,4\}$  and  $B = \{7,8,9\}$ , then which of the following relations

is a mapping or not from set A to set B?

 $R_4 = \{(1,7), (2,8), (3,7), (4,8)\}$ 



**49.** Let 
$$f: R \to R$$
 and  $g: R \to R$  is define by

$$f(x)=2x+3 \, ext{ and } g(x)=3x-2$$
, then find  $(g\circ f)(-1)$ 

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50. Given y = 4 for all real values of x, Can y be regarded as a function of

x? Give reasons.


**51.** The volume of an open tank with a square base of side x m is  $40m^3$ .

Express its total surface area as a function of x.



**52.** Given f(x) = 3x - 9, find f(-1), f(3), f(x+h) and  $f(x^2 - 1)$ .



**53.** If f(x-1) = 7x - 5 find f(x) and f(x+2).

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**54.** If  $f(x + 3) = 2x^2 - 3x - 1$ , find the value of f(x+1).

**55.** Given  $f(x + 2) = x^2 - 6x + 2$ , find f(0), f(2), f(-2) and f(x).



56. If 
$$2f(x) + 3f(-x) = 15 - 4x$$
 , prove that,  $f(x) = 3 + 4x$ .

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57. If 3f(x) + 2f(-x) = 5(x-2) then the value fo f(1) is-

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58. If 
$$f(x)=2x^2-3x+5, ext{ find f(a+h) and } rac{f(a+h)-f(a)}{h}$$

59. If 
$$\phi(x)=rac{1-x}{1+x}$$
, show that,  $\phi(\cos 2 heta)= an^2 heta.$ 

**60.** If 
$$f(x)=5^x$$
 , then prove :

f(x+2) = 25f(x)

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**61.** If 
$$f(x) = 5^x$$
 , then prove :

$$f(x+y) = f(x). f(y)$$

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**62.** If 
$$f(x) = 5^x$$
 , then prove : $rac{f(x+1)}{f(x-1)} = 25$ 

**63.** If 
$$f(x) = 5^x$$
 , then prove :

$$f(\log_5 x) = x$$

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64. If 
$$f(x)=a.$$
  $\displaystyle rac{x-b}{a-b}+b.$   $\displaystyle rac{x-a}{b-a}$ , show that, $f(a)+f(b)=f(a+b).$ 

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65. If  $\phi(x) = \log_e x$  , then show:

$$\phi(e^x) = x$$

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**66.** If 
$$\phi(x) = \log_e x$$
 , then show:

 $\phi(x^m)=m\phi(x)$ 

67. If 
$$\phi(x) = \log_e x$$
, then show:

$$\phi(xy)=\phi(x)+\phi(y)$$

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**68.** If 
$$\phi(x) = \log_e x$$
, then show:

$$\phiigg(rac{x}{y}igg)=\phi(x)-\phi(y)$$

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**69.** If  $f(x) = e^{px+q}$  [p and q are constants], show that,

$$f(a).\ f(b).\ f(c) = f(a+b+c).\ e^{2q}$$

70. If f(x) = |x| - 2x , find f(-1),f(1) and f(-h).



73. If 
$$g( heta) = rac{1- an heta}{1+ an heta}$$
 , find the value of  $g\Big(rac{\pi}{4}- heta\Big).$ 

74. If 
$$f(x) = \log_e . \ rac{1+x}{1-x}$$
 , show that  $figg(rac{2x}{1+x^2}igg) = 2f(x).$ 



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77. If f(x) = 4[x] - 3|x|, find f(3.5) and f(-3.5).

**78.** If  $\mathbb R$  is the set of real numbers and f(x) = |x|, g(x) = x, find the

product function fg.

**79.** Find the value of [-3] + [-3.6] - |2.6| + |-3|.

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80. If 
$$f(x) = \frac{x-1}{x+1}$$
, then the value of  $f(2x)$  in terms of  $f(x)$  is-

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Short Answer Type Question

**1.** If  $A \times B = \{(1, 2), (3, 4), (5, 2), (1, 4), (3, 2), (5, 4)\}$ , find  $B \times A$ .



**2.** If  $P \times Q = \{(2, -1), (3, 0), (2, 1), (3, 1), (2, 0), (3, -1)\}$ , find P

and Q.



 $A = \{x \colon x \in \mathbb{N} \land 1 < x \leq 3\} ext{ and } B = \{x \colon x \in \mathbb{Z} \land \ -2 < x < 2\},$ 

#### find $B \times A$ .

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**4.** Let 
$$f: R \to R$$
 and  $g: R \to R$  is define by

 $f(x)=2x+3 \, ext{ and } g(x)=3x-2$ , then find  $(g\circ f)(-2)$ 

5. Let  $A=\{x\colon x\in\mathbb{Z}\land -1< x\leq 1\}, B=\{x\colon x\in\mathbb{N}\land 1< x<5\}$ and C={x:x is an odd positive integer x and  $1< x\leq 6$ }, then show that,  $(A imes B)\cup (A imes C)=A imes (B\cup C)$ 



**6.** If A={1,2,3} and B={6,7} find the number of subsets of the set  $A \times B$ .

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7. The cartesian product P imes P has 9 elements, If its two elements are

(-3,-2) and (-2,-1), find the remaining terms of  $P \times P$ .



**8.** Let  $A = \{x : x \in \mathbb{N} \text{ and } x \text{ is a prime number in [10,19]} \}$  and B = {2,3},

find  $A \times B$ .

**9.** Two sets A and B have 4 common elements. If n(A) = 6 and n(B) = 7,

then find the values of  $n(A \times B)$  and  $n[(A \times B) \cap (B \times A)]$ .

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10. In each of the following cases state whether the given statement is

true or false :

If A = {1,2,3}, B = {4,5}, then,  $A imes (B \cup \phi) = \phi$  where  $\phi$  is the null set.

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11. In each of the following cases state whether the given statement is

true or false :

If X = {a,b,c} and Y = {c,a,b}, then X imes Y = Y imes X

**12.** In each of the following cases state whether the given statement is true or false :

If A = {3,4,5} and B = {1,2}, then  $A imes (B \cap \phi) = \phi$  where  $\phi$  is the null set.

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13. In each of the following cases state whether the given statement is

true or false :

If A={1,0,-1}, then the value of n(A imes A imes A) = 9.

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14. For any three sets A,B and C prove that, A imes (B - C) = (A imes B) - (A imes C).

15. If n(A imes B imes C) = 60, n(B) = 4, n( C) = 3, find the value of n(A).

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16. Write the following relations as the sets of ordered pairs :

A relation R on the set A of first six natural numbers defined by,

 $(x,y)\in R\Rightarrow x$  is relatively prime to y.

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17. Write the following relations as the sets of ordered pairs :

A relation R defined on the set of natural numbers  $\mathbb{N}$  by,

 $(x,y)\in R\Rightarrow 2x+y=10$  for all  $x,y\in\mathbb{N}.$ 

**18.** Write the following relations as the sets of ordered pairs :

A relation R defined on the set A={2,3,4,5,6} by

 $aRb \Rightarrow |a-b|$  is divisible by 3.

**19.** A relation R on the set of natural numbers  $\mathbb{N}$  is defined as follows:

 $R=\{(x,y),x+5y=20,x,y\in\mathbb{N}\}, ext{ find the domain and range of R}.$ 

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**20.** Let  $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$  and a relation R on A is given by,

$$R = \{(x,y) \colon x \in A, y \in A \, ext{ and } \, 2x+y = 12 \}$$

Find R and  $R^{-1}$  as sets of ordered pairs. Also find domains and ranges of R and  $R^{-1}$ .

21. Find the domain and range of each of the following relations :

$$R_1 = \left\{ \left(a, rac{1}{a}
ight) {:} 0 < a < 5 ~~ ext{and a is an integer} 
ight.$$

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22. Find the domain and range of each of the following relations :

 $R_2 = \{(x, y) : x \text{ and } y \text{ are integer and } xy = 4\}$ 

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23. Find the domain and range of each of the following relations :

$$R_3=\{(x,y)\colon x\in\mathbb{N},y\in\mathbb{N} ext{ and }2x+y=41\}$$

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24. Find the domain and range of each of the following relations :

$$R_4=ig\{(x,y)\!:\!x \hspace{0.1cm} ext{and}\hspace{0.1cm}y \hspace{0.1cm} ext{are integers and}\hspace{0.1cm}x^2+y^2=25ig\}$$

**25.** Find the domain and range of each of the following relations :

 $R_5 = \{(x-5,2x-7): x ext{ is an odd natural number less than 10} \}$ 

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26. Find the domain and range of each of the following relations :

 $R_6 = ig\{ ig(x, x^2 - 31ig) : x ext{ is a prime number less than 12} ig\}$ 

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27. Find the domain and range of each of the following relations :

 $R=\{(x,y)\!:\!x \; ext{ is an integer and } |x|<3 \; ext{and } y=|x-3|\}$ 

28. Find the domain and range of each of the following relations :

$$S = \{(x,y) \colon x,y \in \mathbb{N} \, ext{ and } \, x+3y = 12 \}.$$



29. A right circular cylinder is inscribed in a sphere of radius r.

Express the volume v of the cylinder as a function of its height x.

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**30.** A right circular cone is inscribed in a sphere of radius a.

Express the volume v of the cone as a function of its slant height x.



**31.** A rectangle of area y  $cm^2$  is inscribed in a circle of radius 25 cm. If

the length of a side of the rectangle be x cm, find y in terms of x.

**32.** If 
$$F(x) = \frac{(x-b)(x-c)}{(a-b)(a-c)} + \frac{(x-c)(x-a)}{(b-c)(b-a)} + \frac{(x-a)(x-b)}{(c-a)(c-b)}$$
,

show that F(0)=1.

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33. If 
$$f(x)=rac{x-1}{x+1}, ext{ show that } rac{f(a)-f(b)}{1+f(a)f(b)}=rac{a-b}{1+ab}$$

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34. If 
$$f(x)=rac{1}{1-x}, ext{ show that, } f[f\{f(x)\}]=x$$

**35.** If 
$$y = f(x) = \frac{ax - b}{bx - a}$$
, prove that  $f(x)$ .  $f\left(\frac{1}{x}\right)$  is independent of

х.



**36.** If 
$$y = f(x) = rac{px+q}{rx-p}$$
, show that x = f(y).

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**37.** If 
$$y = f(x) = \frac{3x-5}{2x-m}$$
 and  $f(y) = x$ , find the value of m.

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**38.** If  $y = f(x) = \frac{x-3}{2x+1}$  and z = f(y), express z as a function of x.

**39.** If 
$$F(x) = rac{4x-5}{3x-4}$$
, prove that F{F(x)} = x.

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**40.** If 
$$f(x) = (a - x^n)^{\frac{1}{n}}$$
, where  $a > 0$  and n is a positive integer, show that  $f[f(x)] = x$ .

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**41.** If 
$$\phi(x) = rac{1-x}{1+x}$$
 prove that  $\phi\{\phi(x)\} = x$ 

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**42.** If 
$$\phi(x) = rac{1-x}{1+x}$$
 prove that  $\phi\{\phi(\cot heta)\} = \cot heta$ 

**43.** If  $f(x) = \tan^{-1} x$ , find the relation by which f(x),f(y) and f(x+y) are connected.



).





**46.** Find the values of x for which the following functions are undefined:

 $rac{x}{x+2}$ 

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**47.** Find the values of x for which the following functions are undefined:

 $\sqrt{4x-4x^2-1}$ 

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48. Find the values of x for which the following functions are undefined:

x

 $\sin x$ 

49. Find the values of x for which the following functions are undefined:

$$\frac{x^2+x-6}{2x^2-x-6}$$

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50. Find the values of x for which the following functions are undefined:

$$\sqrt{x^2-4x+3}$$

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**51.** If the maximum and minimum value of  $f(x)=a+b \sin x$  be 7 and 1

respectively, find the values of  $f\left(\frac{\pi}{6}\right)$ .

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52. If 
$$f(x) = ax^2 + bx + c$$
 and  $f(x+1) = f(x) + x + 1$  is an

identify, find the values of a and b.

53. If  $f(x) = x^2 + ax + b$  and f(1) = 1, f(2) = 2, find the value of f(3).

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**54.** If the function  $f:\mathbb{R} \to \mathbb{R}$  is given by f(x) = x for all  $x \in \mathbb{R}$  and the

function  $g:\mathbb{R}-\{0\} o\mathbb{R}$  is given by  $g(x)=igg(rac{1}{x}igg), ext{ for all } x\in\mathbb{R}-\{0\}, ext{ then find the function f+g and f-g}.$ 

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**55.** If two real functions f and g are defined respectively by  $f(x) = \sqrt{x+1}$  and  $g(x) = \sqrt{x-1}$ , then the find the values of  $\frac{f}{g}(1)$  and  $\frac{g}{f}(1)$ . Also find the domain of definitions of  $\frac{f}{g}$  and  $\frac{g}{f}$ .



**59.** Given  $f(x) = \cos(\log x)$ , find the value of

$$f(x).\;f(y)-rac{1}{2}igg[figg(rac{x}{y}igg)+f(xy)igg]$$

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**60.** If  $f(x) = \sin x$ ,  $g(x) = x^2$  and  $h(x) = \log x$ , find  $h[g\{f(x)\}]$ .

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Long Answer Type Questions

1. Find the domain of definitions of each of the following functions :

$$\sqrt{6-x}$$

2. Find the domain of definitions of each of the following functions :

$$\frac{x-2}{x^2-3x+2}$$

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3. Find the domain of definitions of each of the following functions :

$$\sqrt{2+x-x^2}$$

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4. Find the domain of definitions of each of the following functions :

$$\sqrt{12-x-x^2}$$

5. Find the domain of definitions of each of the following functions :

$$\frac{x^2}{1+x^2}$$

ი



8. Find the domain of definitions of each of the following functions :

 $\frac{1}{\sin x - \cos x}$ 



9. Find the domain of definitions of each of the following functions :

1. Find the domain of definitions of each of the following functions :  

$$\frac{1}{\sqrt{(x-2)(3-x)}}$$
10. Find the domain of definitions of each of the following functions :  

$$\sin^{-1} 2x$$
11. Find the domain of definitions of each of the following functions :  

$$f(x) = \frac{\sqrt{3x-7}}{\sqrt[6]{x+1}-2}$$
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12. Find the domain of the following functions :

$$f(x)=\log_{100x}.\left(rac{2\log_{10}x+2}{-x}
ight)$$

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13. Find the ranges of the following functions :

$$y=\sqrt{4-x^2}[-2\leq x\leq 2]$$

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14. Find the ranges of the following functions :

$$y=rac{x^2}{1+x^2}$$

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15. Find the ranges of the following functions :

 $y=\sin x[0\leq x\leq \pi]$ 

16. Find the ranges of the following functions :

$$y=rac{x}{x^2-5x+9}$$

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17. Find the ranges of the following functions :

$$y=rac{3x-5}{x^2-1}[x
eq 1]$$

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18. Find the ranges of the following functions :

y = sinx + cosx

19. Find the ranges of the following functions :

$$y = rac{1}{3 - \cos 2x}$$

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20. Find the ranges of the following functions :

$$y = an x \Big( -rac{\pi}{2} < x < rac{\pi}{2} \Big)$$

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**21.** If f(x) is a quadratic function and f(1) = 5, f(-1) = 11 and f(2) = 8, find the

value of f(-2).



**22.** If P(x) be a quadratic function and roots are 3,5` find P(x).

23.

$$F(x)=rac{a}{x}+b+cx \,\, ext{and} \,\, F(1)=5, F(-2)=2 \,\, ext{and} \,\, F(-1)=\, -\, 3$$

, find the value of F(-3).

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**24.** If 
$$f(n+1) = \frac{2f(n)+1}{2}$$
,  $n = 1, 2, 3, ...$  and  $f(1) = 2$  then find

the value of f(101).

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25. The taxi fare is Rs. 3 for 1 km or less from starting point and Rs. 1.20 per km or any fraction thereof, for additional distance. If the fare be Rs.Y for a total journey of x km, express y as a function of x.



lf

26. Find the domain of definition of

$$f(x) = \sqrt{x+1} + \sqrt{4-x}$$

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$$\phi(x) = \cos^{-1} \cdot rac{x-4}{3} + \log(5-x)$$

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**28.** The function f(x) is defined in  $0 \le x \le 1$ , find the domain of definition of

f(2x-1)

**29.** The function f(x) is defined in  $0 \le x \le 1$ , find the domain of definition of

 $f(x^2)$ 

**30.** If two real functions f(x) and  $\phi(x)$  are defined respectively by  $f(x) = \sqrt{x-2}$  and  $\phi(x) = x+3$ , then find each of the following

functions :

 $\frac{1}{f}$ 

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**31.** If two real functions f(x) and  $\phi(x)$  are defined respectively by  $f(x) = \sqrt{x-2}$  and  $\phi(x) = x+3$ , then find each of the following functions :

 $\overline{\phi}$ 

**32.** If two real functions f(x) and  $\phi(x)$  are defined respectively by  $f(x) = \sqrt{x-2}$  and  $\phi(x) = x+3$ , then find each of the following functions :

 $f+\phi$ 

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**33.** If two real functions f(x) and  $\phi(x)$  are defined respectively by  $f(x) = \sqrt{x-2}$  and  $\phi(x) = x+3$ , then find each of the following functions :

 $f\phi$
**34.** If two real functions f(x) and  $\phi(x)$  are defined respectively by  $f(x) = \sqrt{x-2}$  and  $\phi(x) = x+3$ , then find each of the following functions :

 $rac{f}{\phi}$ 

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35. Find the domain of definition of the function defined by,  $f(x)=rac{1}{\log_e(2-x)}+\sqrt{x+3}$ 

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36. Find the domain of definition of each of the following functions :

$$f(x)=rac{1}{\sqrt{x+[x]}}$$

37. Find the domain of definition of each of the following functions :

$$g(x)=rac{1}{\sqrt{x-|x|}}$$

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38. Find the domain of definition of each of the following functions :

$$h(x)=\sqrt{x+[x]}$$

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**39.** Find the domain of definition of each of the following functions :

$$\phi(x)=\sqrt{x-[x]}$$

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40. Find the range of each of the following functions :

$$f(x)=2-\left|x-2\right|$$

41. Find the range of each of the following functions :

$$g(x)=rac{1}{\sqrt{x+[x]}}$$

-

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**42.** Find the range of each of the following functions :

$$h(x)=rac{|x-3|}{x-3}$$

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**43.** Draw the graphs of the constant functions :

$$f(x)+2 = 0$$

**44.** Draw the graphs of the constant functions :

$$f(x) = 0$$



45. Draw the graphs of the constant functions :

f(x) - 3 = 0

From the drawn graph find in each case the domain and the range of the functions.

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**46.** Let 
$$f: R \to R$$
 and  $g: R \to R$  is define by

 $f(x)=2x+3 \, ext{ and } g(x)=3x-2$ , then find  $(g\circ f)^{-1}(x)$ 

**47.** Sketch the graph of f(x) = |x| . From the graph find the domain and range of f(x).



**48.** A function f(x) is defined as follows :

$$f(x) = x$$
, when  $x > 0$ 

 $= -x, ext{ when } x < 0$ 

$$= -1$$
, when  $x = 0$ 

Sketch the graph of f(x) and from the graph examine its continuity at x

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**49.** Sketch the graph of  $f(x) = \frac{|x|}{x}$ , f(0)=1. From the graph examine

the continuity of f(x) at x = 0.

**50.** Draw the graph of the function  $\frac{x^2 - 4}{x + 2}$  and from the graph examine the continuity of the function at x = - 2.



**52.** A function  $\phi(x)$  is defined as follows :

 $\phi(x)=2, \;\; ext{when x is an integer}$ 

= 0, when x is not an integer

Draw the graphs of the function and from the graph find the points of discontinuity of  $\phi(x)$ .

53. Draw the graph of the following signum function :

$$egin{aligned} f(x) &= 1, & ext{when} \quad x > 0 \ &= 0, & ext{when} \quad x = 0 \ &= -1 & ext{when} \quad x < 0 \end{aligned}$$

Find the domain and range of f(x) from the graph.

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**54.** Sketch the graph of the function  $f(x) = \frac{4}{x}$ . From the graph examine the continuity of f(x) at x = 0.

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55. Draw the graph of the function  $f(x)=2\sqrt{x}(x\geq 0).$ 

56. A function f(x) is defined as follows :

$$f(x) = x$$
, when  $x < 1$   
=  $x + 1$ , when  $x > 1$   
=  $\frac{3}{2}$ , when  $x = 1$   
Draw the graph of f(x) and examine its continuity at  $x = \frac{1}{2}$  and  $x = 1$ .

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57. A function f(x) is defined as follows :

$$f(x)=\ -x, \ \ ext{when} \ \ x<0$$

$$x=2, ext{ when } 0\leq x<2$$

 $x=4-x, \hspace{0.2cm} ext{when} \hspace{0.2cm} x\geq 2$ 

Draw the graph of the function and from the graph examine whether

f(x) is continuous at x = 0 and x = 2 or not.

58. Draw the graph of the function :

$$f(x)=1+2x, \hspace{0.2cm} ext{when} \hspace{0.2cm} x\leq 1$$

 $=3-x, \hspace{0.2cm} ext{when} \hspace{0.2cm} x>1$ 

From the graph examine whether f(x) is continuous at x = 1 or not.



59. Sketch the graph of the function :

$$f(x)=0, \hspace{0.2cm} ext{when} \hspace{0.2cm} x<1$$

= x - 1, when  $x \ge 1$ 

From the graph examine whether f(x) is continuous at x = 1 or not.

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60. Draw the graph of the function y = x + |x| in the interval  $-2 \leq x \leq 2.$ 

**61.** Draw the graph of the function y = |x - 1| + |x + 1| and examine

whether f(x) has any point of discontinuity.



**62.** Without using graph paper, draw a sketch graph of the function y = |x| + |x - 2| and find its points of discontinuity, if there be any.

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**63.** Sketch the graph of f(x) = |x - 4| - 2. From the graph examine

whether f(x) is continuous at x = 4 or not.



**65.** Without using graph paper draw the graph of the following function :

$$g(x)=x, \hspace{0.2cm} ext{when} \hspace{0.2cm} x < 0$$

$$=x^2$$
, when  $0 \le x \le 1$ 

1, when x > 1

Examine the continuity of g(x) at x = 0 and x = 1 from the graph.

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**66.** Let  $A = \{1, 3, 5, 7\}$  and  $B = \{p, q, r\}$ .Let R be a relation define by  $R = \{(1, p), (3, r), (5, q), (7, p), (7, q)\}$ , find the domain and range of R.

67. 
$$A = \{-2, -1, 0, 1, 2\}, B = \{5, 7, 11\}$$
 and

 $f\colon A o B, where f(x)=x^2-x+5$ ,then find the image of 1.

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**68.** Draw the graph of the function y = x-[x],where [x] denotes the greatest integer in x not greater than x. From the graph find the points of discontinuity of the function.

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**69.** A function f is define by  $f(x) = 3x^3 + 4$  . Write the values of

f(-1)

70. 
$$A = \{-2, -1, 0, 1, 2\}, B = \{5, 7, 11\}$$
 and

 $f \colon A o B, where f(x) = x^2 - x + 5$ ,then find the image of 0.

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**71.** A function f is define by f(x)=2x-3 . Write the values of f(-2)

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72. 
$$A = \{-2, -1, 0, 1, 2\}, B = \{5, 7, 11\}$$
 and

 $f \colon A o B, where f(x) = x^2 - x + 5$ ,then find the image of -2.



Multiple Correct Answer Type

1. If  $f(x) = x^2 - 3x + 4$ , then the value of x which satisfy the relation f(x) = f(2x + 1) are\_\_\_\_ A. 2 B. -1 C.  $\frac{2}{3}$ D. 0

#### Answer: B,C

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2. If  $y = f(x) = rac{3x-5}{x^2-1} (x 
eq -1)$  then the range of function will be

A. 
$$y \leq rac{1}{2}$$

 $\mathsf{B}.\,y\leq 2$ 

$$\mathsf{C}.\,y \geq rac{9}{2}$$
 $\mathsf{D}.\,y \geq rac{2}{9}$ 

Answer: A,C

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**3.** If 
$$f(a) = rac{a^2+a-6}{2a^2-a-6}$$
 then for what value/values of a,f(a) will be

undefined ?

#### A. -3

B. 2

C. 
$$\frac{-3}{2}$$
  
D.  $-\frac{2}{3}$ 

Answer: B,C

**4.** If  $R=\{(x,y)\colon x\in\mathbb{N},\,y\in\mathbb{N}\, ext{ and }\,2x+y=10\}$ , then  $R^{-1}=\,?$ 

A. (8,1)

B. (6,2)

C. (4,3)

D. (2,4)

Answer: A,B,C,D

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5. If  $R^{-1}=\{(x,y)\!:\!x\in\mathbb{N},y\in\mathbb{N}\, ext{ and }x+y=8\}$  then R = ?

A. (7,1)

B. (6,2)

C. (5,3)

D. (1,4)

### Answer: A,B,C



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**2.** If  $R=\{(x,y)\!:\!x\in\mathbb{N},\,y\in\mathbb{N}\, ext{ and }x+2y=8\}$ , then the number of

elements of R will be\_\_\_\_

**3.** Let n(A) = 4 and n(B) = 2 onto mapping  $A \rightarrow B$  are  $A = \{1,2,4\}$ ,  $B = \{2,4,5\}$  and  $C = \{2,5\}$ , then find the number of terms of  $(A - B) \times (B - C)$  are\_\_\_\_



4. Let n(A) = 4 and n(B) = 5 and if in the case of one-one mapping  $A \to B$  n(A) = 3,n(B) = 4, then the value of  $n(A \times A \times B) = 6K$ . Find K.

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5. If A and B two finite sets such that |A|=2 and |B|=5, then the number of

mapping A 
ightarrow B are  $2^{2 imes K}$ , find K.

**1.** Two sets A = {1,2,3} and B = {2,4}

find  $A \cup B$ .

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**2.** If  $A = \{1, 2, 3\}$  and  $B = \{2, 4\}$ .Let  $R = \{a < b\}$ ,then write R in

roster form.

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Comprehension Type



by g(x) = min(fx),0), h(x) = max(f(x),0)

 $f\!:\!\mathbb{R} o\mathbb{R}$  will be\_\_\_\_

A. decreasing

B. odd

C. increasing

D. even

### Answer: B

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2. Let 
$$f: \mathbb{R} \to \mathbb{R}$$
 be defined by  
 $f(x) = -x^3 + x, g: [-1, 1] \to \mathbb{R}$  and  $h: [-1, 1] \to \mathbb{R}$  is defined  
by g(x) = min(fx),0), h(x) = max(f(x),0)  
Range of g(x) will be\_\_\_\_

A. [-1,-1]



D. none of these

#### Answer: C

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3. Let  $f: \mathbb{R} \to \mathbb{R}$  be defined by  $f(x) = -x^3 + x, g: [-1, 1] \to \mathbb{R}$  and  $h: [-1, 1] \to \mathbb{R}$  is defined by  $g(x) = \min(fx), 0), h(x) = \max(f(x), 0)$ Number of roots of the  $g(x) = -\frac{1}{2}$  is\_\_\_\_\_ A. 0 B. 1

C. 2

D. infinite

### Answer: A



**4.** 
$$A = \{-2, -1, 0, 1, 2\}, B = \{5, 7, 11\}$$
 and

 $f \colon A o B, where f(x) = x^2 - x + 5$ ,then find the image of -1.



Which one will be both the odd and even function ?

A. h(x) + g(x) B. h(x).g(x)

C. h(x) - g(x)

D. |h(x)| - |g(x)|

### Answer: B



$${f 6.}\,f(x)=egin{cases}x^2 & {
m when} & x<0\ x & {
m when} & 0\leq x<1\ rac{1}{x} & {
m when} & x\geq 1\ \end{bmatrix}$$
 Value of  $figg(rac{1}{2}igg)$  is\_\_\_\_\_

# A. 1

$$\mathsf{B}.\,\frac{1}{2}$$

C. 2

D. 0

## Answer: B

$${f 7.}\,f(x)= egin{cases} x^2 & ext{when} & x < 0 \ x & ext{when} & 0 \leq x < 1 \ rac{1}{x} & ext{when} & x \geq 1 \ \end{cases}$$
 Value of  $fig(\sqrt{3}ig)$  is\_\_\_\_

A.  $\sqrt{3}$ 

B. 1

C. 0

D. 
$$\frac{1}{\sqrt{3}}$$

### Answer: D



$${f 8.}\,f(x)=\left\{egin{array}{ccc} x^2 & ext{when} & x<0\ x & ext{when} & 0\leq x<1\ rac{1}{x} & ext{when} & x\geq 1 \end{array}
ight.$$

Value of f(-2) is\_\_\_\_\_

A. 0

B. 1

C. 4

D. 2

# Answer: C

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$${f 9.}\,f(x)=\left\{egin{array}{ccc} x^2 & ext{when} & x<0\ x & ext{when} & 0\leq x<1\ rac{1}{x} & ext{when} & x\geq 1 \end{array}
ight.$$

Value of f(1) is\_\_\_\_

A. 1

B. 2

C. 3

D. none of these

Answer: A

$${f 10.}\ f(x)= egin{cases} x^2 & ext{when} & x<0\ x & ext{when} & 0\leq x<1\ rac{1}{x} & ext{when} & x\geq 1 \end{cases}$$
 Value of  $fig(-\sqrt{3}ig)$  is\_\_\_

A. 3

B. 1

C.  $\sqrt{3}$ 

D. none of these

Answer: D





**1.** If 
$$f(x+2) = 2x^2 - 3x + 5$$
, then find  $f(2)$ 



**2.** If 
$$f(x) = 3x^2 + 2x - 5$$
, then find  $f(0)$