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MATHS

BOOKS - V PUBLICATION

RELATIONS AND FUNCTIONS

Questionbank

1. If $(x+1, y-2) = (3, 1)$, find the values of x and y.

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2. If $P = \{a, b, c\}$ and $Q = \{r)$, form the séts $P \times Q$ and $Q \times P$. Are these two products equal?

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3. Let $A = \{1, 2, 3\}$,$B = \{3, 4\}$ and $C = \{4, 5, 6\}$.

Find

$A \times \left(B \bigcap C\right)$

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4. Let $P = \{1, 2\}$.Find $P \times P \times P$

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5. If R is the set of all real numbers, what do the cartesian products $R \times R$ and $R \times R \times R$ represent?

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6. If $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of x and y.

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7. If $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$, find A and B

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8. If the set A has 3 elements and the set B = {3,4,5}, then find the number of elements in $(A \times B)$.

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9. If G = {7,8} and H ={5,4,2}, find $G \times H$ and $H \times G$

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10. State whether each of the following statetments is true or false. If the statement is false, rewrite the given statement correctly. If P = {m,n} and Q = {n,m}, then $P \times Q$ ={(m,n),(n,m)}

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11. If A = { - 1, 1}, find $A \times A \times A$.

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12. If $A \times B$={(a,x), (a,y),(b,x),(b,y)} Find A and B

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13. Let $A = \{1, 2\}$,$B = \{1, 2, 3, 4\}$,$C = \{5, 6\}$ and

$D = \{5, 6, 7, 8\}$.Verify that

$A \times \left(B \bigcap C\right) = (A \times B) \bigcap (A \times C)$

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14. Let A = {1,2} and B = {3,4}. Write $A \times B$. How many subsets will $A \times B$ have? List them.

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15. Let A and B are two sets such that n (A) = 3 and n (B) = 2. If (x,1), (y,2), (z,1) are in $A \times B$, find A and B, where x,y and z are distinct elements.

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16. The Cartesian product $A \times A$ has 9 elements among which are found (-1,0) and (0,1). Find the set A and the remaining elements of $A \times A$

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17. Let $A = \{1, 2, 3, 4, 5, 6\}$ be a set. Defined a relation R from A to A by $R = \{(x, y) / y = x + 1\}$

Represent the relation R using an arrow diagram.

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18. $A = \{1, 2, 3, \ldots\ldots, 14\}$. R is a relation from A to A defined by $R = \{(x, y) : 3x - y = 0, x, y \in A\}$. Write the domain, range,co-domain of ,R.

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19. A relation R on set natural numbers is defined by $R = \{(x, y) : y = x + 5$,x is a natural number less than 4, $x, y \in N\}$

Write the relation in roster form.

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20. A = {1,2,3,5} and B = {4,6,9}. Define a relation R from A to B by R = {(x,y): the difference between x and y is odd: $x \in A, y \in B\}$. Write R in roster

from.

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21. Shows a relationship between the sets P and Q. write this relation roster from. What is its domain and range ?

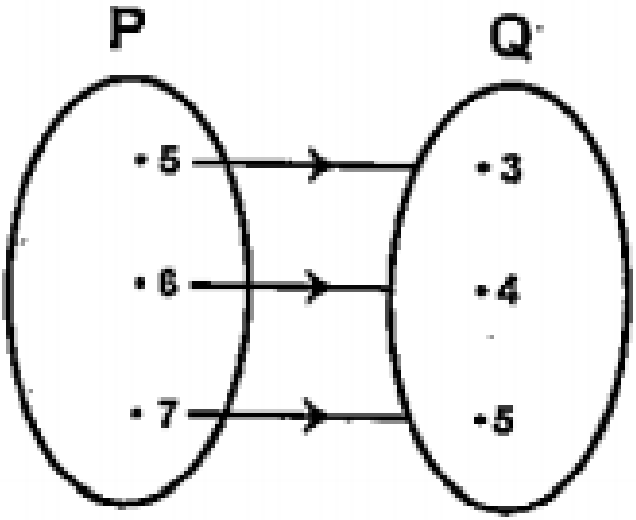

Fig 2.7

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22. Let $A = \{1, 2, 3, 4, 6\}$.Let R be the relation on

A defined by $R = \{(a, b) : a, b \in A, b$ is

exactly divisible by a}

Find the domain of R.

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23. Determine the domain and range of the

relation R defined by

$R = \{(x, x + 5) : x \in \{0, 1, 2, 3, 4, 5\}\}$

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24. Write the relation $R = \left\{\left(x, x^3\right) : x$ is a prime

number less than 10} in roster form.

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25. Let A = {x,y,z) and B = {1,2}. Find the number of relations from A to B

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26. Let R be the relation on Z defined by R = { (a,b): a,b $\in$ Z, a - b is an integer}. Find the domain and range of R

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27. Let N be the set of natural numbers and the relation'R be defined on N such that $R = \{(x, y) : y = 2x, x, \dot{y} \in N\}$ What, is the domain, codomain and range of R? Is this relation a function?

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28. Examine each of the following relations given below and state in each case, giving reasons whether it is a function or not?

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

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

iii) $R = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7)\}$

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29. Le't N be the set of natural numbers. A real valued function is defined as $f: N \to N$ by $f(x) = 2x + 1$. Using this definition, complete the table given below:

x	1	2	3	4	5	6	7
y	f(1) = ...	f(2) = ...	f(3) = ...	f(4) = ...	f(5) = ...	f(6) = ...	f(7) = ...

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30. Draw the graph of the function $f: R \to R$ defined by $f(x) = x^3, x \in R$.

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31. Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two

functions defined over the set of non-

negative real numbers. Find $(f + g)(x)$, $(f - g)(x)$,$(fg)(x)$ and $\left(\frac{f}{g}\right)(x)$

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32. Let $f(x) = \sqrt{x}$ and $g(x) = x$ be two

functions defined over the set of non-

negative real numbers. Find $(f + g)(x)$, $(f - g)(x)$,$(fg)(x)$ and $\left(\frac{f}{g}\right)(x)$

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33. Which of the following relations are functions ? Give reasons. If it is a

functions determine its domain and range.{(2,1),(5,1),(8,1),(1,1),(14,1),(17,1)}

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34. Find the domain and range of the following functions.

$f(x) = -|x|$

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35. A function f is defined as $f(x) = 2x - 5$.

Write down the values of $f(0), f(7), f(-3)$.

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36. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \frac{9C}{5} + 32$. Find t (0)

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37. Find the range of the following functions.

$f(x) = 2 - 3x, x \in R, x > 0$

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38. Let R be the set of real numbers. Define the real function. f: $R \to R$ by $f(x) = x + 10$ and sketch the graph of this function.

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39. Let R be a.relation from Q to Q defined by $R = \{(a, b) : a, b \in Q$ and $a - b \in Z\}$. Show that

i) $(a, a) \in R$ for all $a \in Q$

ii) $(a, b) \in R$ implies that $(b, a) \in R$

iii) $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$.

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40. Let f={(1,1),(2,3),(0,-1),(-1,-3)} be a linear function from Z into Z. Find $f(x)$.

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41. Find the domain of the function

$$f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$$

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42. The function f is defined by

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

Draw the graph of Find $f(x)$

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43. The relation f is defined by $f(x) = \begin{cases} x^2, 0 \leq x \leq 3 \\ 3x, 3 \leq x \leq 10 \end{cases}$

The relation g is defined by $g(x) = \begin{cases} x^2, 0 \leq x \leq 2 \\ 3x, 2 \leq x \leq 10 \end{cases}$

show that f is a function and g is not a function

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44. If $f(x) = x^2$, find $\frac{f(1.1) - f(1)}{(1.1 - 1)}$

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45. Find the domain of the following.

$f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}$

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46. Find the domain and range of the following

functions.

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

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47. Find the domain and range of the following functions.

$f(x) = |x-1|$

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48. Let $f = \left\{\left(x, \frac{x^2}{1+x^2}\right), x \in R\right\}$ be a real function from R to R. Determine the domain and range of f.

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49. Let f,g: R $\rightarrow$ R be defined, respectively by $f(x) = x+1, g(x) = 2x-3$. find $f+g$, $f-g$ and $\frac{f}{g}$

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50. Let f = {(1,1), (2,3),(0, -1), (- 1, - 3)} be a function from Z to Z defined by $f(x) = ax + b$, for some integers a,b. determine a,b.

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51. Let R be a relation from N to N defined by R = $\{(a, b) \in N \text{ and } a = b^2\}$. Are the following true? $\{(a, a) \in R$, for all $a \in N\}$

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52. Let A = {1,2,3,4}, B = {1,5,9,11,15,16} and f = {(1,5),(2,9),(3,1),(4,5),(2,11),}. Are the following true? F is a function from A to B. Justify your answer.

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53. Let f be the subset of $Z \times Z$ defined by $f = \{(ab, a + b) : a, b \in Z\}$ is f a function from Z to Z? justify your answer.

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54. Let A = {9,10,11,12,13} and let f : A $\rightarrow$ N be defined by f (n) = the highest prime factor of n. find the range of f.

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55. A relation R is defined on the set Z of integers as follows. $R = \{(x, y) \in R : x^2 + y^2 = 25\}$ Express R and R^{-1} as the sets of ordèred pairs and hence find their respective domains.

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56. Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{1, 2, 3, \ldots., 6, 7\}$. If R be a relation from A to the set B defined by

i) is square root of

ii) is cube root of, find R and also its domain and range.

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57. Find the domain and range of the function $f = \left\{\left(x, \frac{x^2 - 1}{x - 1}\right) : x \in R, x \neq 1\right\}$

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58. Let R be the relation on the set Z of all integers defined by $R = \{(x, y) : x, y \in Z, x - y$ is divisible by n}.Prove that

i) $(x, x) \in R$ for all $x \in , Z$

ii) $(x, y) \in R$ implies that $(y, x) \in R$ for all $x, y \in Z$

iii) $(x, y) \in R$ and $(y, z) \in R$ implies that $(x, z) \in R$ for all $x, y, z \in Z$

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59. Let f be defined by $f(x) = x - 4$ and g be defined by $g(x) = \frac{x^2 - 16}{x + 4}, x \neq -4.$

find λ such that $f(x) = g(x)$ for all x

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60. If f is a real function defined by $f(x) = \frac{x - 1}{x + 1}$, then prove that $f(2x) = \frac{3f(x) + 1}{f(x) + 3}.$

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61. Find the domain and range of the following functions:

i) $f(x) = \frac{1}{\sqrt{x - 5}}$

ii) $f(x) = \frac{x}{1 + x^2}.$

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62. Let f and g be two real functions defined by $f(x) = \frac{1}{x+4}$ and $g(x) = (x+4)^3$, find the following:

i) $f - g$

ii) $\frac{f}{g}$ iii) 2f

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63. Which of the following relations are functions? Give reasons. If it is a function, determine its domain and range.

i) $\{(2,1),(5,1),(8,1),(11,1),(14,1),(17,1)\}$

ii) $\{(2,1,(4,2),(6,3),(8,4),(10,5),(12,6),(14,7)\}$

iii)

$\{(0,0),(1,1),(1,-1),(4,2),(4,-2),(9,3)(9,-3),(16,-4),(16,-$

iv) $\{(1,2),(1,3),(2,5)\}$

v) $\{(2,1),(3,1),(5,2)\}$

vi) $\{(1,2),(2,2),(3,2)\}$

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64. If $f(x) = x^2 + x - 1$ and $g(x) = 4x - 7$. be real functions then find:

i) $(f + g)(2)$

ii) $(f - g)(7)$

(iii) $(fg)(-5)$

iv) $\left(\frac{f}{g}\right)(4)$

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65. Let f and g be real functions defined by $f(x) = \sqrt{x+4}, x \geq -4$ and $g(x) = \sqrt{x-4}, x \geq 4$. Find the functions $f + g, f - g, fg, \frac{f}{g}$

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66. If $af(x) + bf\left(\frac{1}{x}\right) = \frac{1}{x} - 5$ for $x \neq 0$, where $a \neq b$. Find $f(x)$

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67. If $A = \{3, 4, 6\}$, $B = \{1, 3\}$ and $C = \{1, 2, 6\}$, then find

(i) $A \times (B \cap C)$

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

(iii) $(A - B) \times (A - C)$

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68. Let A and B are two sets such that n (A) = 3 and n (B) = 2. If (x,1), (y,2), (z,1) are in $A \times B$, find A and B, where x,y and z are distinct elements.

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69. Let A be a non - empty set such that $A \times B = A \times C$ show that $B = C$

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70. Let $A \subset B, C \subset D$, then prove that $A \times C \subset B \times D$

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71. Let R be the relation on Z defined by $R = \{(a, b), a, b \in Z, a^2 = b^2\}$

Find (i) R (ii) domain of R (iii) range of R

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72. Let R be the relation on Z defined by R = { (a,b): a,b $\in$ Z, a - b is an integer}. Find the domain and range of R

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73. If $f: R \to R$ is defined by $f(x) = x^2 - 3x + 2$, find $f(f(x))$. Also evaluate $f(f(5))$

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74. If $f(x) = x + \frac{1}{x}$ show that $(f(x))^3 = f(x^3) + 3f(x)$

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75. Find the domain of the following.

$$f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}$$

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76. Draw the graph of the real function $y = x^2 + 2x + 3$

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77. Draw the graph of the real function $y = \begin{cases} x & \text{if } x \leq 0 \\ x^2 & \text{if } 0 < x \leq 2 \end{cases}$

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78. Let $f: R \to R$ be a function defined by $f(x) = x^2 + [x] + |x| - 7, x \in R$. Find the valueof 'f' at the points $-3.4, -2, -1.7, 0, 0.8, 1, 4.3$

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79. Let $f, g: R \to R$ be functions defined respectively by $f(x) = x + 1, g(x) = 2x - 3$ Find fg.

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