



MATHS

BOOKS - A N EXCEL PUBLICATION

RELATIONS AND FUNCTIONS

Question Bank

1. 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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2. 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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3. If $G = \{7,8\}$ and $H = \{5,4,2\}$, find $G \times H$ and $H \times G$



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4. State whether each of the following statements 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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5. State whether each of the following statements is true or false. If the statement is false, rewrite the given statement correctly. If

A and B are non -empty sets, then $A \times B$ is a non - empty set of ordered pairs (x,y) such that $x \in A$ and $y \in B$



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6. State whether each of the following statements is true or false. If the statement is false, rewrite the given statement correctly. If

$$A = \{1,2\}, B = \{3,4\} \text{ then } A \times (B \cap \phi) = \phi$$



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



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



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

and

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

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



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

and

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

$A \times C$ is a subset of $B \times D$



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11. 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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12. 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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13. 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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14. $A = \{1, 2, 3, \dots, 14\}$. 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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15. A relation R on set natural numbers is defined by $R = \{(x, y) : y = x + 5, x \text{ is a natural number less than } 4, x, y \in \mathbb{N}\}$

Write the domain and range of the relation.



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16. $A = \{1, 2, 3, 5\}$ and $B = \{4, 6, 9\}$. Define a relation R from A to B by $R = \{(x, y) : \text{the difference}$

between x and y is odd: $x \in A, y \in B$. Write

R in roster form.



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17. Shows a relationship between the sets P and Q . write this relation in set-builder form

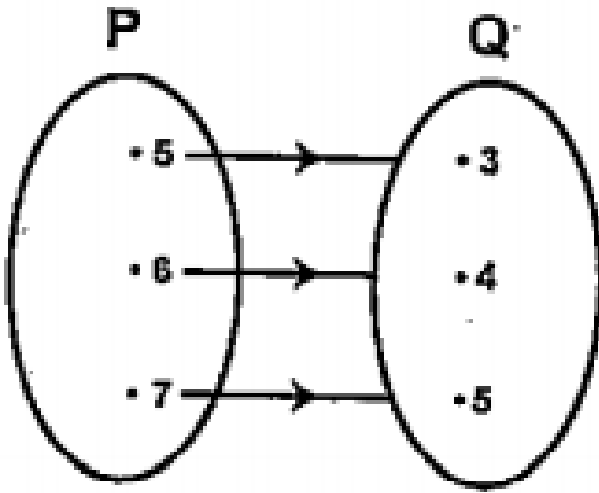


Fig 2.7



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18. Shows a relationship between the sets P and Q. write this relation roster form. What is

its domain and range ?

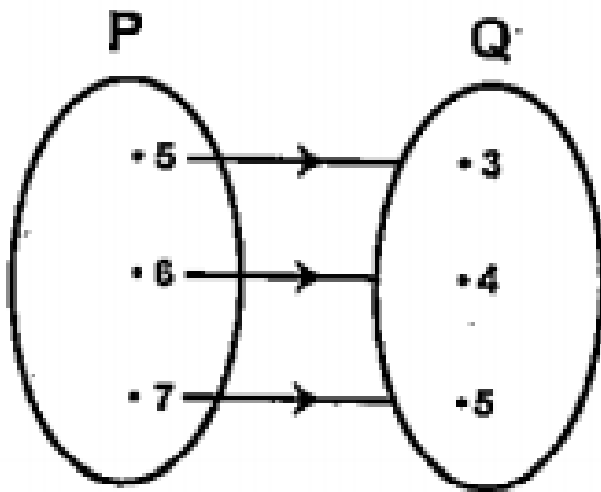


Fig 2.7



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

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

Write R in roster form.



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

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

Find the domain of R.



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

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

Find the range of R .



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22. 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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23. Write the relation $R = \{(x, x^3), x \text{ is a prime number less than } 10\}$, in roster form.



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



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



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26. 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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27. Which of the following relations are functions ? Give reasons. If it is a functions determine its domain and range. $\{(2,1),(4,2), (6,3),(8,4),(10,5),(12,6),(14,7)\}$



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28. Which of the following relations are functions ? Give reasons. If it is a functions determine its domain and range. $\{(1,3),(1,5), (2,5)\}$





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

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



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

$$f(x) = \sqrt{9 - x^2}$$



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31. 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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32. 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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33. 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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34. 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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35. 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 (28)



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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(-10)



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

Find The value of C, when $t(C) = 212$



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38. Find the range of the following functions.

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



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39. Find the range of the following functions.

$$f(x) = x^2 + 2, x \text{ is a real number.}$$



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40. Find the range of the following functions.

$$f(x) = x, x \text{ is a real number.}$$



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41. Let R be the set of all real numbers and let

$f: R \rightarrow R$ be a function defined by

$f(x) = x + 1$ Complete the following table

(i) Complete the following table

| | | | | |
|--------|-----|-----|-----|-----|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | ... | ... | ... | ... |

The graph of a linear function is a straight line



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42. Let R be the set of all real numbers and let

$f: R \rightarrow R$ be a function defined by

$f(x) = x + 1$ Draw the graph of f



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43. Let $f = \{(1,1),(2,8),(3,27),(4,64),\}$ be a function
fill in the blanks $f(1) = \dots$, $f(2)=\dots$, $f(3)=\dots$,
 $f(4)=\dots$



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44. Let $f = \{(1,1),(2,8),(3,27),(4,64),\}$ be a function
write a formula for $f(x)$



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45. Given the function

$$f(x) = \begin{cases} -x^2 & \text{if } x \leq 0, \\ \end{cases}$$

$$5x - 4 \quad \text{if } 0 < x \leq 1,$$

$$4x^2 - 3x \quad \text{if } 1 < x < 2, \quad 3x + 4 \quad \text{if } x \geq 2$$

Complete the following table

| | | | | |
|--------|-------|-------|---------------|-------|
| x | 0 | 1 | $\frac{3}{2}$ | 2 |
| $f(x)$ | ----- | ----- | ----- | ----- |



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46. If $(3x, x + y) = (6, 3)$, find x and y





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



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48. If $A = \{1,2,3\}$, $B = \{3,4\}$ and $C = \{4,5,6\}$ Prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$



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49. If $A = \{1,2,3\}$, $B = \{3,4\}$ and Prove that $A \times B$
not= $B \times A$



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50. Given the relations

$$R_1 = \{(x, y) : x, y \in N \text{ and } x + y = 6\}$$



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51. Given the relations $R_2 = \{(x, y) : x, y \in N$
and $x^2 + y^2 \leq 10\}$.



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52. If $A = \{a, b\}$, write all relation on A



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53. Find the domain and range of the relation

$R = \{(x, y) : y = x^3, x \text{ is a positive prime number} < 8\}$



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54. Find the number of relations which can be defined from $P = \{1,2,3\}$ to $Q = \{x,y\}$



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55. If $A = \{1,2,3\}$ and f is a relation on A defined as follows, then find the given relation is a function or not from A to A ? Explain $f = \{(1,2), (3,2)\}$



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56. If $A = \{1,2,3\}$ and g is relation on A defined as follows, then which of these relations is a function from A to A ? Explain. $g = \{(1,2),(1,3), (2,3)\}$



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57. If $A = \{1,2,3\}$ and h is a relation on A defined as follows, then which of these relations is a function from A to A ? Explain. $h = \{(1,3),(2,1), (3,2)\}$



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58. Let $f : X \rightarrow Y$ be a function defined by $f(x) = x^2 + 1$ for all $x \in X$ where $X = \{-1, 0, 1, 2, 3\}$ and $Y = \{1, 2, 5, 10, 11\}$. If $A = \{-1, 0, 2\}$ and $B = \{1, 2, 3\}$. Verify that $f(A \cap B) = f(A) \cap f(B)$



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59. Let $f : X \rightarrow Y$ be a function defined by $f(x) = x^2 + 1$ for all $x \in X$ where $X = \{-1, 0, 1, 2, 3\}$ and $Y = \{1, 2, 5, 10, 11\}$. If $A = \{-1, 0, 2\}$ and $B = \{1, 2, 3\}$. Verify that $f(A \cap B) \neq f(A) \cap f(B)$



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60. Let $f : X \rightarrow Y$ be a function defined by $f(x) = x^2 + 1$ for all $x \in X$ where $X = \{-1, 0, 1, 2, 3\}$ and $Y = \{1, 2, 5, 10, 11\}$. If $A = \{-1, 0, 2\}$ and $B = \{1, 2, 3\}$. verify that $f(A \cap B) = f(A) \cap f(B)$



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61. Find the domain and range of the function

$$f(x) = \sqrt{x^2 - 3x + 2}$$



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62. Draw the graph of the function

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



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63. Find the domain and the range of the

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



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64. Find the domain and the range of the functions $f(x) = x^3$



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65. Let $f(x) = x^2 - 2x + 3$. Then find $f(f(x))$



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66. If $f(x) = \frac{1}{1-x}$, show that

$$f(f(f(x))) = x$$



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67. 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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68. If $f(x) = x^3 + 1$ and $g(x) = x + 1$, find

$$f + g, f - g, af(a \in R), fg, \frac{1}{f} \text{ and } \frac{f}{g}$$



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



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71. Find the domain of the following.

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



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

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



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73. Find the domain and the range of the real function f defined by $f(x) = |x| - 1$



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74. 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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75. Let $f, g: \mathbb{R} \rightarrow \mathbb{R}$ be defined, respectively by

$$f(x) = x + 1, g(x) = 2x - 3. \quad \text{find}$$

$$f + g, f - g \text{ and } \frac{f}{g}$$



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76. Let $f = \{(1,1), (2,3), (0, -1), (-1, -3)\}$ be a

function from \mathbb{Z} to \mathbb{Z} defined by

$$f(x) = ax + b, \quad \text{for some integers } a, b.$$

determine a, b .



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77. 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? $\{(a, a) \in R, \text{ for all } a \in N\}$



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78. 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? $(a, b) \in R, \text{ implies } (b, a) \in R$



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79. 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? $(a, b) \in R, (b, c) \in R$ implies $(a, c) \in R$. Justify your answer .



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80. Let $A = \{1, 2, 3, 4\}$
 $B = \{1, 5, 9, 11, 15, 16\}$ and
 $f = \{(1, 5), (2, 9), (3, 1), (4, 5), (2, 1)\}$. State

with the reason whether f is a relation or a function.



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



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



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