MATHS

BOOKS - OSWAAL PUBLICATION MATHS (KANNADA ENGLISH)

RELATIONS & FUNCTIONS

Relation Very Short Answer Type Questions

1. A relation R on A $= \{1, 2, 3\}$ defined by $R = \{(1, 1), (1, 2), (3, 3)\}$ is not symmetric.

Why?

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2. Give an example of a relation which is symmetric only.

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3. For the set $A = \{1,\ 2,\ 3\}$, define a relation R on the set A as follows: $R = \{(1,\ 1),\ (2,\ 2),\ (3,\ 3),\ (1,\ 3)\}$ Write

the ordered pairs to be added to R to make the smallest equivalence relation.

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4. Let R be the equivalence relation in the set $A = \{0, 1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : 2 \text{ divides } (a - b)\}$. Write the equivalence class [0].

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5. If $R = \{(x,\ y) : x + 2y = 8\}$ is a relation on N, then write the range of R.

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6. Let $R = \{(a,\ a^3) : a$ is a prime number less than 5$\}$ be a relation. Find the range of R.

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7. State the reason for the relation R in the set {1, 2, 3} given by R={(1, 2), (2, 1)} not to be transitive.

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Relation Short Answer Type Questions I

1. Stating the reason if y is divisible by x then it is not necessary that x is divisible by y.

Stating the reason x is divisible by x, $\forall x \in A$.

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Relation Long Answer Type Questions I

1. Show that the relations R on the set R of all real numbers, defined as $R = \{(a, b) : a \leq b^2\}$ is neither reflexive nor symmetric nor transitive.

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2. Determine whether Relation R on the set $A = \{1,\ 2,\ 3,\ ,\ 13,\ 14\}$ defined as $R = \{(x,\ y) : 3x - y = 0\}$

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3. Show that the relation R on the set Z of integers, given by $R = \{(a,\ b) : 2$ divides $a - b\}$, is an equivalence relation.

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4. Show that the relation R on the set Z of integers, given by $R = \{(a, b) : 2$ divides $a - b\}$, is an equivalence relation.

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5. Let R be a relation defined on the set of natural numbers N as follow :

$R = \{(x, y) : x \in N, y \in N \text{ and } 2x + y = 24\}$

Find the domain and range of the relation R.

Also, find R is an equivalence relation or not.

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6. Let $A = \{1, 2, 3, , 9\}$ and R be the relation on $A \times A$ defined by $(a, b)R(c, d)$ if $a + d = b + c$ for all $(a, b), (c, d) \in A \times A$. Prove that R is an equivalence relation and also obtain the equivalence class [(2, 5)].

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7. Let $f: X \to Y$ be a function. Define a relation R in X given by $R = \{(a, b) : f(a) = f(b)\}$. Examine whether R is an equivalence relation or not.

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8. Let Z be the set of all integers and R be the relation on Z defined as $R = \{(a, b); a, b \in Z,$ and $(a - b)$ is

divisible by $5\}$. Prove that R is an equivalence relation.

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9. Show that the relation S in the set R of real numbers defined as $S = \{(a, b) : a, b \in R \text{ and } a \leq b^3\}$ is neither reflexive, nor symmetric, nor transitive.

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Function Short Answer Type Questions I

1. Show that if $f: A \to B$ and $g: B \to C$ are one-one, then $gof: A \to C$ is also one-one.

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2. Prove that the greatest function, $f: R \to R$, defined by $f(x) = [x]$, where $[x]$ indicates the greatest integer not greater than x, neither one-one nor onto.

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3. Show that the function $f: N \to N$ given by $f(1) = f(2) = 1$ and $f(x) = x - 1$ for every $x \geq 2$, is onto but not one-one.

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4. Let $f: R \to R$ be defined by $f(x) = x^2 + 1$, find the pre image of 17 and -3, respectively, are

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5. If $f: R \to R$ defined as $f(x) = \dfrac{2x - 7}{4}$ is an invertible function, write $f^{-1}(x)$.

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6. If $f: R \to R$ defined by $f(x) = 3x - 4$ is invertible then write $f^{-1}(x)$.

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7. What is the range of the function $f(x) = \frac{|x-1|}{(x-1)}$?

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8. Show that the function $f: R \to R$ defined by $f(x) = \frac{x}{x^2+1} \forall x \in R$ is neither one-one nor onto. Also if $g: R \to R$ is defined by $g(x) = 2x - 1$ find fog(x)

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9. Let $A = R - (3), B = R - \{1\}$. Let $f: A \to B$ be defined by $f(x) = \left(\frac{x-2}{x-3}\right) \forall x \in A$. Then show that f is bijective. Hence find $f^{-1}(x)$.

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10. Let $f: W \to W$ be defined as $f(n) = n - 1$, if is odd and $f(n) = n + 1$, if n is even. Show that f is invertible. Find the inverse of f. Here, W is the set of all whole numbers.

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11. Let $f: N \overrightarrow{R}$ be a function defined as $f(x) = 4x^2 + 12x + 15$. Show that $f: N \overrightarrow{S}$, where S is the range of f, is invertible. Also find the inverse of f

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12. Show that the function f in $A = \ | \ R - \left\{ \frac{2}{3} \right\}$ defined as $f(x) = \frac{4x + 3}{6x - 4}$ is one-one and onto. Hence find f^{-1}.

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13. Consider $f: R_+ \overrightarrow{4, \infty}$ given by $f(x) = x^2 + 4$. Show that f is invertible with the inverse $\left(f^{-1}\right)$ of f given by $f^{-1}(y) = \sqrt{y-4}$, where R_+ is the set of all non-negative real numbers.

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14. Let $f: N \to N$ be defined as $f(n) = \frac{n+1}{2}$ if n is odd and $f(n) = \frac{n}{2}$ if n is even for all n $\in$ N State whether the function f is bijective. Justify your answer

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15. If $f: R \to R$ be the function defined by $f(x) = 4x^3 + 7$, show that f is a bijection.

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16. Show that the function $f: R \xrightarrow{} $ given by $f(x) = xa + b,$ where $a, b \in R, a \neq 0$ is a bijection.

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17. Consider $f: R \xrightarrow{-5, \infty}$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(y) = \left(\frac{\sqrt{y+6} - 1}{3} \right)$.

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Function Long Answer Type Questions Ii

1. Let R+ be the set of all non-negative real numbers. Show that the function $f: R+ \to [4, \infty]$ given by $f(x) = x^2 + 4$ is invertible and write the inverse of f.

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2. Let $f: N\overrightarrow{Y}$ be a function defined as $f(x) = 4x + 3$, where $Y = \{y \in N: y = 4x + 3 \text{ for some } x \in N\}$.

Show that f is invertible and its inverse is (1) $g(y) = \frac{3y+4}{3}$ (2) $g(y) = 4 + \frac{y+3}{4}$ (3) $g(y) = \frac{y+3}{4}$ (4) $g(y) = \frac{y-3}{4}$

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3. Prove that the function $f: N \to Y$ defined by $f(x) = x^2$, where $y = \{y: y = x^2, x \in N\}$ is invertible. Also write the inverse of f(x).

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4. Let $S = \{1, 2, 3\}$. Determine whether the functions $f: S \to S$defined as below have inverses. Find f^{-1}, if it exists.(a) $f = \{(1, 1), (2, 2), (3, 3)\}$(b) $f = \{(1, 2), (2, 1), (3, 1)\}$(c) `f =

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Composite Functions Very Short Answer Type Questions

1. Let $f: \{1, 3, 4\} \to \{1, 2, 5\}$ and $g: \{1, 2, 5\} \to \{1, 3\}$ be given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(1, 3), (2, 3), (5, 1)\}$. Write down gof.

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2. If $f: R \overrightarrow{R}$ is defined by $f(x) = 3x + 2$, define $f[f(x)]$.

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3. If $f : R \div R$ be defined by $f(x) = \left(3 - x^3\right)^{1/3}$, then find $fof(x)$

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Composite Functions Short Answer Type Question I

1. Find gof if $f(x) = 8x^3$ and $g(x) = x^{\frac{1}{3}}$

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Composite Functions Short Answer Type Question Ii

1. Find gof and fog, if $f: R \to R$and $g: R \to R$ are given by $f(x) = \cos x$and $g(x) = 3x^2$. Show that $gof \neq fog$.

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2. Let $f, g: R\overrightarrow{R}$ be two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x$, for all xR. Then find fog and gof.

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3. If the function $f: R \overrightarrow{R}$ be given by $f(x) = x^2 + 2 and g: R \overrightarrow{R}$ be given by $g(x) = \frac{x}{x-1}$. Find $fogandgof$.

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4. If $f(x) = \frac{4x+3}{6x-4}, x \neq \frac{2}{3}$, show that $fof(x) = x$ for all $x \neq \frac{2}{3}$. What is the inverse of f?

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5. Let $f: R \overrightarrow{\ }$ be defined as $f(x) = 10x + 7$. Find the function $g: R \overrightarrow{R}$ such that $gof = fog = I_R$.

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Binary Operations

1. Consider the binary operation* on the set {1, 2, 3, 4, 5} defined by a * b=min. {a, b}. Write the

operation table of the operation *.

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2. Let * be a binary operation on Q_0 (set of non-zero rational numbers) defined by $a \cdot b = \frac{3ab}{5}$ for all $a,\ b \in Q_0$. Show that * is commutative as well as associative. Also, find the identity element, if it exists.

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Binary Operations Long Answer Type Questions

1. Let $f: N \overrightarrow{R}$ be a function defined as $f(x) = 4x^2 + 12x + 15$. Show that $f: N \overrightarrow{S}$, where S is the range of f, is invertible. Also find the inverse of f

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