



MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

RELATIONS AND FUNCTIONS

One Marks Questions With Answers

1. Give an example of a relation which is symmetric and transtric and transitive but not reflexive.

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2. Give an example of a relation which is symmetric but neither reflexive

nor transitive.



3. Give an example of a relation which is transitive but neither reflexive nor transitive.

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4. Give an example of a relation which is reflexive and symmetric but not

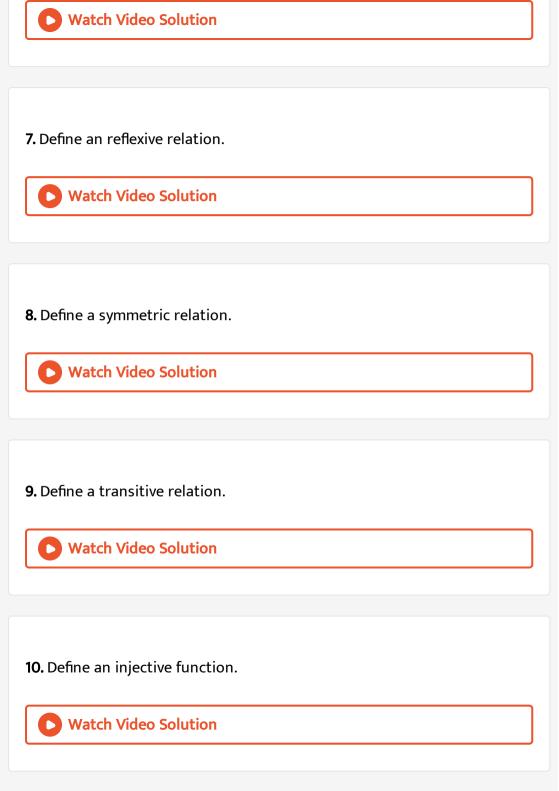
transitive.

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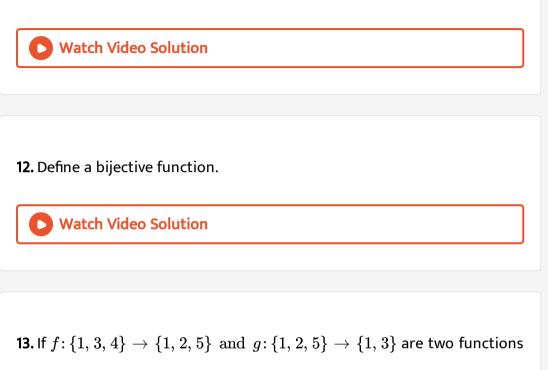
5. Give an example of a relation which is reflexive and transitive but not symmetric.

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6. Define an equivalence relation.



11. Define a surjective function.



given by $f = \{(1,2), (3,5), (4,1)\}$ and $g\{(1,3), (2,3), (5,1)\}$. Write

down gof.

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14. Let * be a binary operation defined on the set of non-zero rational number, by $a * b = \frac{ab}{4}$. Find the identity element.

15. $a * b = a^b \forall a, b \in Z$. Show that * is not a binary operation on Z by giving a counter example. Watch Video Solution **16.** The operation * defined a * b = a. Is * a binary operation on z. Watch Video Solution 17. Give an example of a relation which is symmetric but neither reflexive nor transitive. Watch Video Solution

18. Let * be a binary operation on N defined by a * b = LCM of a and b.

Find 20 * 16.



19. Let * be a binary operation on N defined by a * b = LCM of a and b.

Find 20 * 16.

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20. Let * be defined on the set on $A = \{1, 2, 3, 4, 5\}$ by a * b = HCF of

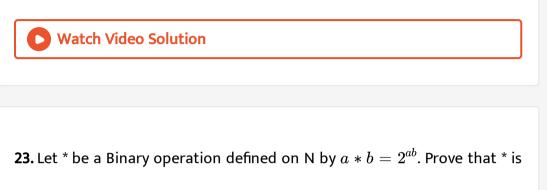
a and b. Is *a binary operation on A.

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21. Let * be a Binary operation on the set Q of rational number's by $a \cdot b = (a - b)^2$. Prove that * is commutative.

22. Let * be a Binary operation defined on N by $a * b = 2^{ab}$. Prove that * is

commutative.



commutative.

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24. Let * be a Binary operation defined on N by $a * b = 2^{ab}$. Prove that * is

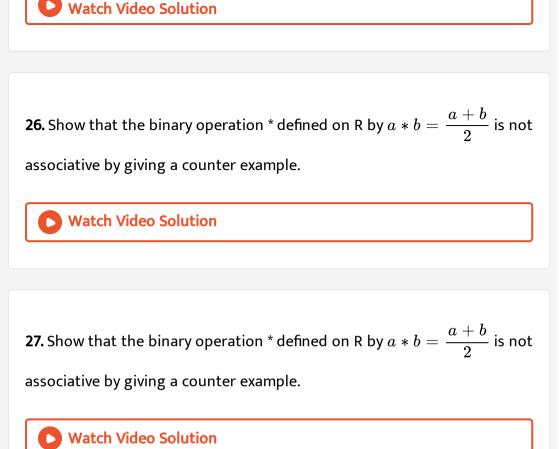
commutative.



25. Show that the binary operation * defined on R by $a * b = rac{a+b}{2}$ is not

associative by giving a counter example.





28. If f: $\{(5,2), (6,3)\}, g = \{(2,5), (3,6)\}$ Write fog.



29. Let R be the equivalence relation on z defined by $R = \{(a, b) : 2 \text{divides}a - b\}$. Write the equivalence class [0].



30. Let $f \colon R o R$ be a function defined by $f(x) = 4x - 3 \, orall x \in R$. Then

Write f^{-1} .

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Two Marks Questions With Answers

1. Define binary operation on a set. Verify whether the operation * defined

on Z, by a * b = ab + 1 is binary or not.



2. Show that the signum function $f\colon R o R$ given by

$$f(x) = egin{cases} 1 & ext{if} & x > 0 \ 0 & ext{if} & x = 0 \ ext{is neither one-one nor onto.} \ -1 & ext{if} & x < 0 \end{cases}$$

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3. A relation R is defined on the set $A = \{1, 2, 3, 4, 5, 6\}$ by $R = \{(x, y) : y$ is divisible by $x\}$. Verify whether R is symmetric and reflexive or not. Give reason.

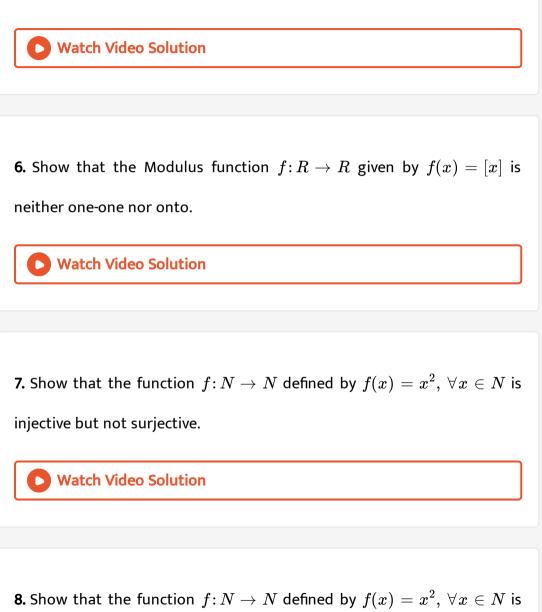
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4. Prove that the greatest integer function $f: R \to R$ defined by f(x) = [x], where [x] indicates the greatest integer not greater than x, is neither one-one nor onto.



5. Show that the function $f\!:\!R o R$, defined by $f(x)=rac{1}{x}$ is one-one

and onto, where R, is the set of all non-zero real numbers.



injective but not surjective.



9. Show that the function $f\!:\!R o R$ defined by $f(x)=x^2\,orall\,x\in R$ is neither injective nor subjective.

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10. Show that the function $f\colon N o N$ defined by $f(x)=x^3,\ orall x\in N$ is

injective but not surjective.

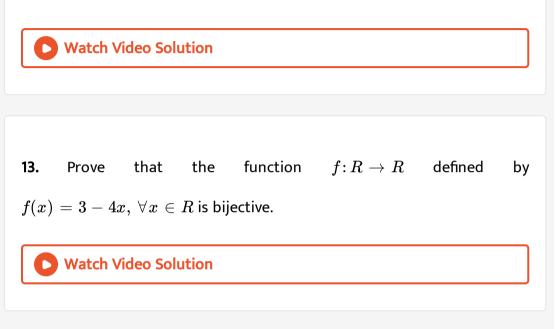
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11. Show that the function $f\colon Z o Z$ defined by $f(x)=x^3,\,orall x\in Z$ is

injective but not surjective.

12. Prove that the function $f\!:\!R o R$ defined by $f(x)=2x,\,orall x\in R$ is

bijective.



14. A binary operation * on N defined as $a * b = a^3 + b^3$, show that * is

commutative but not associative.



15. A binary operation * on N defined as $a * b = \sqrt{a^2 + b^2}$, show that * is

both cummutative and associative.

Three Marks Questions With Answers

1. Verify whether the function $f\colon A o B$, where A = R - {3} and B = R -{1}, defined by $f(x)=rac{x-2}{x-3}$ is one-one and onto or not. Give reason.

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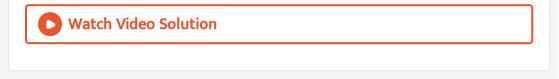
2. If * is a binary operation defined on $A = N \times N$ by (a, b) * (c, d) = (a + c, b + d), prove that * is both commutative and associative. Find the identify if it exists.

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

4. Show that the relation R in the set of all natural number, N defined by

is an $R = \{(a, b) : |a - b| \text{ is even}\}$ in an equivalence relation.



5. Show that the relation R in the set $A=\{x\in Z\colon 0\leq x\leq 12\}$ given by

 $R = \{a, b\} : |a - b|$ is a multiple of 4} is an equivalence relation.

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6. Let R be relation on the set $A = \{1, 2, 3, \dots, 14\}$ by

 $R = \{(x, y) : 3x - y = 0\}$. Verify R is reflexive symmetric and transitive.

7. Relation R on Z defined as $R = \{(x, y) : x - y \text{ is an integer}\}$. Show that

R is an equivalence relation.



8. Show that the relation R in R defined $R = \{(a, b) : a \leq b\}$ is reflexive and transitive but not symmetric.

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9. Show that if
$$f: R - \left\{\frac{7}{5}\right\} \to R - \left\{\frac{3}{5}\right\}$$
 is defined by
 $f(x) = \frac{3x+4}{5x-7}$ and $g: R - \left\{\frac{3}{5}\right\} \to R - \left\{\frac{7}{5}\right\}$ is defined by
 $g(x) = \frac{7x+4}{5x-3}$, then fog = I_A and $gof = I_n$, where
 $A = R - \left\{\frac{3}{5}\right\}, B = R - \left\{\frac{7}{5}\right\}, I_A(x) = x, \forall x \in A, I_B(x) = x, \forall x \in B$

are called identify function on sets A and B, respectively.

10. Show that if $f \colon A o B$ and $g \colon B o C$ are one-one, then gof: A o C

is also one-one.



11. Show that if $f \colon A \to B$ and $g \colon B \to C$ are onto, then $\mathsf{gof} \colon A \to C$ is also onto.

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12. Consider $f: N \to N, g: N \to N$ and $h: N \to R$ defined as f(x) = 2x, g(y) = 3y + 4 and $h(z) = \sin z, \forall x, y$ and z in N. Show that ho(gof) = (hog)of.

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13. If $f: X \to Y, g: Y \to Z$ and $h: Z \to S$ are functions, then ho(gof) = (hog)of.

14. Let $f\colon X o Y\,\, {
m and}\,\, g\colon Y o Z$ be two invertible functions. Then gof is

also invertible with $(gof)^{-1} = f^{-1}og^{-1}$.

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15. If R_1 and R_2 are equivalence relations in a set A, show that $R_1 \cap R_2$ is

also an equivalence relation.

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16. Prove that the relation R defined on the set of real numbers R as $R=ig\{(a,b)\colon a\leq b^2\,orall\,a,\,b\in Rig\}$ is neither reflexive nor symmetric nor transitive.

1. Prove that the function $f\!:\!N o Y$ defined by $f(x)=x^2$, where

 $y = ig\{y : y = x^2, x \in Nig\}$ is invertible. Also write the inverse of f(x).

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2. Let $f\colon N o R$ be defined by $f(x)=4x^2+12x+15$, show that

 $f\colon N o S$, where S is the function, is invertible. Also find the inverse.

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3. Verify whether the function $f: N \to Y$ defined by f(x) = 4x + 3, where $Y = \{y: y = 4x + 3, x \in N\}$ is invertible or not. Write the inverse of f(x) if exists.



4. Let R+ be the set of all non-negative real number. Show that the faction $f:R, \to [4,\infty)$ defined $f(x)=x^2+4$ is invertible. Also write the inverse of f.

5. If R, is the set of all non-negative real numbers prove that the $f:R, \to [-5,\infty)$ defined by $f(x)=9x^2+6x-5$ is invertible. Write also $f^{-1}(x)$.

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6. If
$$A \to A$$
 where $A - R - \left\{\frac{2}{3}\right\}$ defined by $f(x) = \frac{4x + 3}{6x - 4}$ is invertible. Prove that $f^{-1} = f$.

7. $f\!:\!R o R$ be defined as $f(x)=4x+5\,orall\,x\in R$ show that f is invertible and find $f^{-1}.$

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Try Yourself Exercise One Mark Questions

1. On Z defined * by a * b = a - b show that * is a binary operation of Z.

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2. On Q defined * by a * b = ab + 1 show that * commutative.



3. Let * be a Binary operation defined on N by $a * b = 2^{ab}$. Prove that * is

commutative.

4. On Q define * by
$$a * b = \frac{ab}{3}$$
. Show that * is associative.

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5. On Q - {0} define * by
$$a * b = \frac{ab}{5}$$
. Find the identity element.

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Try Yourself Exercise Two Marks Questions

1. Define an equivalence relation.



2. On Q, define * by $a * b = \frac{ab}{4}$. Show that * is both commutative and

associative.

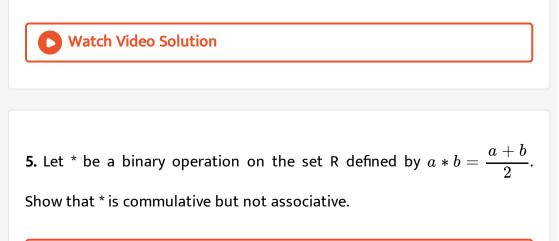
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3. On Q, define * by $a * b = \frac{2ab}{3}$. Show that * is both cummutative and associative.

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4. Let * be a binary operation on N defined by a * b = HCF of a and b.

Show that * is both commutative and associative.



Try Yourself Exercise Three Marks Questions

1. Find gof and fog given f(x) = |x| and g(x) = |5x - 2|.

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2. Find gof and fog given $f(x) = 8x^3$ and $g(x) = x^{1/3}$.

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3. If
$$f\!:\!R o R$$
 given by $f(x)=\left(3-x^3
ight)^{1/3}$. Find fof(x).

4. Consider $f:N \to N, g:N \to N$ and $h:N \to R$ defined as f(x) = 2x, g(y) = 3y + 4 and $h(z) = \sin z, \forall x, y \text{ and } z$ in N. Show that ho(gof) = (hog)of.

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Try Yourself Exercise Five Marks Questions

1. Show that $f\colon [-1,1] o R$ given by $f(x) = rac{x}{x+2}$ is one-one. Find

the inverse of the function $f\colon [-1,1] o S$,where S is the range of f.