Boards

PARISHRAM 2026

Mathematics

Relations and Functions

DPP: 3

Q1 Let A = {a, b, c} and let R = {(a, a), (b, b), (a, b), (b,a)}. Then, R is

(A) reflexive and symmetric but not transitive

(B) reflexive and transitive but not symmetric

(C) symmetric and transitive but not reflexive

(D) an equivalence relation

Q2 Let B = {a, b, c, d} & R = {(a,c), (c,a), (a, a), (b, d), (d, b)} be a relation on B, then R is

(A) Symmetric (B) Transitive

(C) Reflexive (D) Equivalence

Q3 For the set A = {1, 2, 3}, define a relation R in the set A as follows

R = {(1, 1), (2, 2), (3, 3), (1, 3)}

Then, the ordered pair to be added to R to make it the smallest equivalence relation is:

(A) (1, 3) (B) (3, 1)

(C) (2, 1) (D) (1, 2)

Q4 Let R be the relation in the set {1, 2, 3, 4} given by R = {(1, 2), (2, 2), (1, 1), (4, 4), (1, 3), (3, 3), (3, 2)). Choose the correct answer.

(A) R is reflexive and symmetric but not transitive

(B) R is reflexive and transitive but not symmetric

(C) R is symmetric and transitive but not reflexive

(D) R is an equivalence relation

Q5 Let S be the set of all real numbers and let R be a relation on S defined by $\mathrm{aRb} \Leftrightarrow \mathrm{a}^2 + \mathrm{b}^2 = 1$. Then, R is

(A) symmetric but neither reflexive nor transitive

(B) reflexive but neither symmetric nor transitive

(C) transitive but neither reflexive nor symmetric

(D) None of these

Q6 Let S be the set of all real numbers and let R be a relation on S, defined by $\mathrm{aRb} \Leftrightarrow (1 + \mathrm{ab}) > 0$. Then, R is

(A) reflexive and symmetric but not transitive

(B) reflexive and transitive but not symmetric

(C) symmetric and transitive but not reflexive

(D) None of these

Q7 Let R be a relation on the set N of all natural numbers, defined by $\mathrm{aRb} \Leftrightarrow \mathrm{a}$ is a factor of b. Then, R is

(A) reflexive and symmetric but not transitive

(B) reflexive and transitive but not symmetric

(C) symmetric and transitive but not reflexive

(D) an equivalence relation

Q8 Let S be the set of all straight lines in a plane. Let R be a relation on S defined by $\mathrm{aRb} \Leftrightarrow \mathrm{a} \parallel \mathrm{b}$. Then, R is

(A) reflexive and symmetric but not transitive

(B) reflexive and transitive but not symmetric

(C) symmetric and transitive but not reflexive

(D) an equivalence relation

Q9 Let S be the set of all straight lines in a plane. Let R be a relation on S defined by aRb $\Leftrightarrow \mathrm{a} \perp \mathrm{b}$. Then, R is

(A) reflexive but neither symmetric nor transitive

(B) symmetric but neither reflexive nor transitive

(C) transitive but neither reflexive nor symmetry

(D) an equivalence relation

Q10 Let A be the set of all students in a school. A relation R is defined on A as follows: aRb iff a and b have the same teacher

(A) Reflexive

(B) Symmetric

(C) Transitive

(D) Equivalence

Answer Key

Q1	C
Q2	A
Q3	B
Q4	B
Q5	A
Q6	A
Q7	B
Q8	D
Q9	B
Q10	D

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Reflexive

As $(c, c) \notin R$

$\therefore$ R is not reflexive.

Symmetric

As $(x, y) \in R \Rightarrow (y, x) \in R\ \forall\ x, y \in A$

$\therefore$R is a symmetric relation.

Transitive

As (x, y) and $(y, z) \in R$

$\Rightarrow (x, z) \in R\ \forall\ x, y, z \in A$

$\therefore$R is a transitive relation.

Video Solution:

Q2 Text Solution:

Reflexivity

As (b, b) $\notin$R

$\therefore$R is not reflexive

Symmetric

As $(x, y) \in R \Rightarrow (y, x) \in R,\ x, y \in B$

$\therefore$R is a symmetric relation

Transitive

As $(b, d) \in R$ and $(d, b) \in R$

But $(b, b) \notin R$

$\therefore$ R is not transitive.

Video Solution:

Q3 Text Solution:

(1, 1,), (2, 2) and (3, 3) $\in$ R

$\Rightarrow$ R is Reflexive.

Now, (1, 3) $\in$ R but (3, 1) $\notin$ R

$\Rightarrow$ R is not symmetric.

Clearly, R is transitive as $(a, b) \in R$, $(b, c) \in R \Rightarrow (a, c) \in R$ where $a, b, c \in A$.

For R to be symmetric we should add (3, 1) in R.

Hence, to make R an equivalence we should add (3, 1).

Video Solution:

Q4 Text Solution:

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

It is seen that (a, a) $\in$ R, for every a $\in$ {1, 2, 3, 4}.

$\therefore$R is reflexive.

It is seen that (1, 2) $\in$ R, but (2, 1) $\notin$ R.

$\therefore$R is not symmetric.

Also, it is observed that (a, b), (b, c) $\in$ R $\Rightarrow$ (a, c) $\in$ R for all a, b, c $\in$ {1, 2, 3, 4}.

$\therefore$ R is transitive.

Hence, R is reflexive and transitive but not symmetric.

Video Solution:

Q5 Text Solution:

Reflexive

R is not reflexive

$\because\ (1, 1) \notin R$ as $1^2 + 1^2 \neq 1$

Symmetric

Let $(a, b) \in R$ where $a, b \in S$

$\Rightarrow a^2 + b^2 = 1$

$\Rightarrow b^2 + a^2 = 1$

$\Rightarrow (b, a) \in R$

$\therefore$ R is a symmetric relation.

Transitive

R is not transitive

as $(1, 0) \in R, (0, 1) \in R$

but $(1, 1) \notin R$

Video Solution:

Q6 Text Solution:

Reflexive

To check: $(a, a) \in R \ \forall\ a \in S$

To check: 1 + a × a > 0

To check: 1 + a^2 > 0, which is true

$\therefore (a, a) \in R \ \forall\ a \in S$

$\therefore$ R is a reflexive relation.

Symmetric

Let $(a, b) \in R$ where $a, b \in S$

$\Rightarrow 1 + ab > 0$

$\Rightarrow 1 + ba > 0$

$\Rightarrow (b, a) \in R$

$\therefore$ R is a Symmetric relation.

Transitive

As $\left(1, \frac{-1}{2}\right) \in R$

and $\left(-\frac{1}{2}, -2\right) \in R$

but $(1, -2) \notin R$

$\therefore$ R is not transitive

Video Solution:

Q7 Text Solution:

Reflexive

As $(a, a) \in R \ \forall\ a \in A$

$(\because$ a is a factor of itself$)$

$\therefore$ R is a reflexive relation.

Symmetric

R is not symmetric

as $(1, 2) \in R$ but $(2, 1) \notin R$

Transitive

Let $(a, b) \in R$ and $(b, c) \in R$ where $a, b, c \in A$

$\Rightarrow$ a is a factor of b

and b is a factor of c

$\Rightarrow$ a is a factor of c

$\Rightarrow (a, c) \in R$

$\therefore$ R is a transitive relation.

Video Solution:

Q8 Text Solution:

Reflexive

To check: $(a, a) \in R \ \forall\ a \in S$

As $a \parallel a$, a line is parallel to itself

$\therefore (a, a) \in R \ \forall\ a \in S$

$\therefore$ R is a reflexive relation.

Symmetric

Let $(a, b) \in S$ where $a, b \in S$

$\Rightarrow a \parallel b$

$\Rightarrow b \parallel a$

$\Rightarrow (b, a) \in S$

$\therefore$ R is a symmetric relation.

Transitive

Let $(a, b) \in R$ and $(b, c) \in R$ $a, b, c \in S$

$\Rightarrow a \parallel b$ and $b \parallel c$

$\Rightarrow a \parallel c$

$\Rightarrow (a, c) \in R$

$\therefore$ R is a transitive relation.

Video Solution:

Q9 Text Solution:

Reflexive

A line cann't be $\perp$ to itself

$\therefore$R is not reflexive.

Symmetric

Let $(a, b) \in R$ where $a, b \in S$

$\Rightarrow a \perp b$

$\Rightarrow b \perp a$

$\Rightarrow (b, a) \in R$

$\therefore$R is a symmetric relation.

Transitive

Let $(a, b) \in R,\ (b, c) \in R$

where $a, b, c \in S$

$\Rightarrow a \perp b,\ b \perp c$

$\not\Rightarrow a \perp c$ (Infact $a \parallel c$)

$\therefore$R is not transitive.

Video Solution:

Q10 Text Solution:

Reflexive

Let $a \in A$

As a and a have same teacher

$\therefore\ (a,\ a) \in R \equiv aRa$ for every $a \in A$

$\therefore$ R is a reflexive relation

Symmetric

Let $a,\ b \in A$

such that $(a,\ b) \in R$

$\Rightarrow$a and b have same teacher

$\Rightarrow$b and a have same teacher

$\Rightarrow bRa \equiv (b,\ a) \in R$

$\therefore$ R is symmetric.

Transitive

Let $a, b, c \in A$ such that $(a,\ b) \in R,\ (b, c) \in R$

$\Rightarrow$a and b have same teacher, b and c have same teacher

$\therefore$a and c have same teacher

$\therefore\ (a, c) \in R$

Video Solution: