Relations and Functions

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1. Let R be a relation on the set L of lines defined by l_1 R l_2 if l_1 is perpendicular to l_2, then relation R is

(a) reflexive and symmetric
(b) symmetric and transitive
(c) equivalence relation
(d) symmetric

Answer: d
Explaination: (d), not reflexive, as l_1 R l_2
$\Rightarrow l_1 \perp l_1$ Not true
Symmetric, true as l_1 R l_2 $\Rightarrow$ l2R h
Transitive, false as l_1 R l_2, l_2 R l_3
$\Rightarrow l_1 \parallel l_3$. l_1 R l_2.

2. Given triangles with sides T_1 : 3, 4, 5; T_2 : 5, 12, 13; T_3 : 6, 8, 10; T_4 : 4, 7, 9 and a relation R in set of triangles defined as R = {(Δ_1, Δ_2) : Δ_1 is similar to Δ_2}. Which triangles belong to the same equivalence class?

(a) T_1 and T_2
(b) T_2 and T_3
(c) T_1 and T_3
(d) T_1 and T_4

Answer: c
Explaination: (c), T_1 and T_3 are similar as their sides are proportional.

3. Given set A ={1, 2, 3} and a relation R = {(1, 2), (2, 1)}, the relation R will be

(a) reflexive if (1, 1) is added
(b) symmetric if (2, 3) is added
(c) transitive if (1, 1) is added
(d) symmetric if (3, 2) is added

Answer: c
Explaination: (c), here (1,2) e R, (2,1) € R, if transitive (1,1) should belong to R.

4. Given set A = {a, b, c). An identity relation in set A is

(a) R = {(a, b), (a, c)}
(b) R = {(a, a), (b, b), (c, c)}

(c) R = {(a, a), (b, b), (c, c), (a, c)}
(d) R= {(c, a), (b, a), (a, a)}

Answer: b
Explaination: (b), A relation R is an identity relation in set A if for all a ∈ A, (a, a) ∈ R.

5. A relation S in the set of real numbers is defined as xSy ⇒ x − y+ √3 is an irrational number, then relation S is

(a) reflexive
(b) reflexive and symmetric
(c) transitive
(d) symmetric and transitive

Answer: a
Explaination:
(a), reflexive, true as $x\,S\,x \Rightarrow x - x + \sqrt{3}$
$= \sqrt{3}$ is an irrational number.
Symmetric, false e.g. $x = \sqrt{3}, y = 2$
$xSy \Rightarrow \sqrt{3} - 2 + \sqrt{3} = 2\sqrt{3} - 2$ is an irrational number.
but $ySx \Rightarrow 2 - \sqrt{3} + \sqrt{3} = 2$ is not an irrational number.
transitive, false e.g. $x = 1 + \sqrt{3}, y = 5,$
$z = 2\sqrt{3}$
$xSy \Rightarrow 1 + \sqrt{3} - 5 + \sqrt{3} = 2\sqrt{3} - 4$
is an irrational number.
$ySz \Rightarrow 5 - 2\sqrt{3} + \sqrt{3} = 5 - \sqrt{3}$ is an irrational number.
But $xSz \Rightarrow 1 + \sqrt{3} - 2\sqrt{3} + \sqrt{3} = 1$
not an irrational number.

6. Set A has 3 elements and the set B has 4 elements. Then the number of injective functions that can be defined from set A to set B is

(a) 144
(b) 12
(c) 24
(d) 64

Answer: c
Explaination: (c), total injective mappings/functions
$= {}^4P_3 = 4! = 24$.

7. Given a function If as f(x) = 5x + 4, x ∈ R. If g : R → R is inverse of function 'f then

(a) g(x) = 4x + 5
(b) g(x) = $\frac{5}{4x-5}$
(c) g(x) = $\frac{x-4}{5}$
(d) g(x) = 5x – 4

Answer: c
Explaination:

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\begin{aligned}
&(c), \text{ as} && y = f(x) \\
&\Rightarrow && y = 5x + 4 \\
&\Rightarrow && x = \frac{y-4}{5} \\
&\therefore && f^{-1}(y) = \frac{y-4}{5} \\
&\text{or} && f^{-1}(x) = \frac{x-4}{5}.
\end{aligned}
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8. Let A = {a, b }. Then number of one-one functions from A to A possible are

(a) 2
(b) 4
(c) 1
(d) 3

Answer: (a)
Explaination: (a), as if n(A) = m, then possible one-one functions from A to A are m!