1. Consider the following two binary relations on the set $A=\{a,\ b,\ c\}$: $R_1=\{(c,\ a),\ (b,\ b),\ (a,\ c),\ (c,\ c),\ (b,\ c),\ (a,\ a)\}$ and $R_2=\{(a,\ b),\ (b,\ a),\ (c,\ c),\ (c,\ a),\ (a,\ a),\ (b,\ b),\ (a,\ c)\}$, then :

(1) R_2 is symmetric but it is not transitive
(2) both R_1 and R_2 are not symmetric
(3) both R_1 and R_2 are transitive
(4) R_1 is not symmetric but it is transitive

2. If there are three athletic teams in a school; out of all team members 21 are in the basketball team, 26 are in the hockey team and 29 are in the football team; 14 members play hockey and basketball, 15 play hockey and football, 12 members play football and basketball and 8 members play all the games. Then the total number of members is

(1) 42
(2) 43
(3) 45
(4) 40

3. Suppose $A_1,\ A_2,\ \ldots,\ A_{30}$ are thirty sets each having 5 elements and $B_1,\ B_2,\ \ldots,\ B_n$ are n sets each with 3 elements. Let $\bigcup_{i=1}^{30} A_i=\bigcup_{j=1}^{n} B_j=S$ and each element of S belongs to exactly 10 of the A_i's and exactly 9 of the Bj's. Then n is equal to

(1) 35
(2) 45
(3) 55
(4) 65

4. Set A contains n elements and is defined as $A=\{1,2,3,\ldots..n\}$. Then the number of subsets of A having at least one odd integer must be ([.] denotes greatest integer $\leq x$)

(1) $2^{\left[\frac{n}{2}\right]}$
(2) $2^{\left[\frac{n+1}{2}\right]}$
(3) $2^n-2^{\left[\frac{n}{2}\right]}$
(4) $2^n-2^{n-\left[\frac{n}{2}\right]}$

5. If S is a set with 10 elements and $A=\{(x,\ y):\ x,\ y\in S,\ x\neq y\}$, then the number of elements in A is

(1) 100
(2) 90
(3) 80
(4) 150

6. Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of m and n are

(1) $7,6$
(2) $6,3$
(3) $5,1$
(4) $8,7$

7. Let R_1 and R_2 be two relations defined as follows :
$R_1=\left\{(a,\ b)\in R^2: a^2+b^2\in Q\right\}$ and $R_2=\left\{(a,\ b)\in R^2: a^2+b^2\notin Q\right\}$, where Q is the set of all rational numbers, then

(1) R_1 is transitive but R_2 is not transitive.
(2) R_2 is transitive but R_1 is not transitive.
(3) Neither R_1 nor R_2 is transitive.
(4) R_1 and R_2 are both transitive.

8. The set of all straight lines in a plane is denoted by L.The relation R is defined as $\alpha R\beta\Leftrightarrow\alpha\perp\beta,\ \alpha,\ \beta\in L$. Then the relation R is_____.

(1) Reflexive
(2) Symmetric
(3) Transitive
(4) None of these

9. Consider the following relations: $R=\{(x,y)|x,y$ are real numbers and $x=wy$ for some rational number $w\}$;
$\mathrm{s}=\left\{\left(\frac{\mathrm{m}}{\mathrm{n}},\frac{\mathrm{p}}{\mathrm{q}}\right)\middle|\mathrm{m,\ n,\ p\&q\ are\ integers\ such\ that\ n,\ q}\neq 0\ \mathrm{and\ qm}=\mathrm{pn}\right\}$.
Then

(1) R is an equivalence relation but S is not an equivalence relation
(2) Neither R nor S is an equivalence relation
(3) S is an equivalence relation but R is not an equivalence relation
(4) R and S both are equivalence relations

10. Let r be a relation from R (set of real numbers) to R defined by $r=\{(a,\ b)|a,\ b\in R$ and $a-b+\sqrt{3}$ is an irrational number$\}$. The relation r is

(1) An equivalent relation
(2) Reflexive only
(3) Symmetric only
(4) Transitive only