1. An organization awarded 48 medals in event $'A'$, 25 in event $'B'$ and 18 in event $'C'$. If these medals went to total 60 men and only five men got medals in all the three events, then, how many received medals in exactly two of three events?

(1) 15
(2) 21
(3) 10
(4) 9

2. Out of all the patients in a hospital 89% are found to be suffering from heart ailment and 98% are suffering from lungs infection. If $K\%$ of them are suffering from both ailments, then K can not belong to the set:

(1) $\{79, 81, 83, 85\}$
(2) $\{84, 87, 90, 93\}$
(3) $\{80, 83, 86, 89\}$
(4) $\{84, 86, 88, 90\}$

3. In a group of 100 persons 75 speak English and 40 speak Hindi. Each person speaks at least one of the two languages. If the number of persons who speak only English is α and the number of persons who speaks only Hindi is β, then the eccentricity of the ellipse $25\left(\beta^2 x^2+\alpha^2 y^2\right)=\alpha^2 \beta^2$ is

(1) $\frac{\sqrt{119}}{12}$
(2) $\frac{\sqrt{117}}{12}$
(3) $\frac{3\sqrt{15}}{12}$
(4) $\frac{\sqrt{129}}{12}$

4. The sum of all the elements of the set $\{\alpha \in\{1,2, \ldots \ldots 100\}: HCF(\alpha, 24)=1\}$ is

5. Let $A=\{1,2,3,4,5,6,7\}$. Then the relation $R=\{(x, y) \in A \times A: x+y=7\}$ is

(1) an equivalence relation
(2) symmetric but neither reflexive nor transitive
(3) transitive but neither symmetric nor reflexive
(4) reflexive but neither symmetric nor transitive

6. The relation $R=\{(a, b): gcd(a, b)=1,\ 2a \neq b,\ a,\ b \in \mathbb{Z}\}$ is:

(1) transitive but not reflexive
(2) symmetric but not transitive
(3) reflexive but not symmetric
(4) neither symmetric nor transitive

7. Let $R_1=\{(a, b) \in N \times N: |a-b| \leq 13\}$ and $R_2=\{(a, b) \in N \times N: |a-b| \neq 13\}$ Then on N:

(1) Both R_1 and R_2 are equivalence relations
(2) Neither R_1 nor R_2 is an equivalence relation
(3) R_1 is an equivalence relation but R_2 is not
(4) R_2 is an equivalence relation but R_1 is not

8. Among the relations

$S=\left\{(a, b): a, b \in R-\{0\}, 2+\frac{a}{b}>0\right\}$ and $T=\left\{(a, b): a, b \in R, a^2-b^2 \in Z\right\}$,

(1) S is transitive but T is not
(2) both S and T are symmetric
(3) neither S not T is transitive
(4) T is symmetric but S is not

9. Let R be a relation on $\mathbb{R}$, given by $R=\left\{(a, b): 3a-3b+\sqrt{7}\right.$ is an irrational number $\}$. Then R is

(1) Reflexive but neither symmetric nor transitive
(2) Reflexive and transitive but not symmetric
(3) Reflexive and symmetric but not transitive
(4) An equivalence relation

10. Let $A=\{1,2,3,4,5,6,7\}$ and $B=\{3,6,7,9\}$. Then the number of elements in the set $\{C \subseteq A: C \cap B \neq \phi\}$ is ______

11. Let $A=\{2,3,4\}$ and $B=\{8,9,12\}$. Then the number of elements in the relation $R=\{((a_1, b_1),(a_2, b_2)) \in(A \times B, A \times B): a_1$ divides b_2 and a_2 divides $b_1\}$ is

(1) 36
(2) 24
(3) 18
(4) 12

12. Let R be a relation on $N \times N$ defined by $(a, b) R(c, d)$ if and only if $ad(b-c)=bc(a-d)$. Then R is

(1) symmetric but neither reflexive nor transitive
(2) transitive but neither reflexive nor symmetric
(3) reflexive and symmetric but not transitive
(4) symmetric and transitive but not reflexive

13. For $\alpha \in N$, consider a relation R on N given by $R=\{(x, y): 3x+\alpha y$ is a multiple of $7\}$. The relation R is an equivalence relation if and only if

(1) $\alpha=14$
(2) α is a multiple of 4
(3) 4 is the remainder when α is divided by 10
(4) 4 is the remainder when α is divided by 7

14. Define a relation R over a class of $n \times n$ real matrices A and B as "ARB iff there exists a non-singular matrix P such that $PAP^{-1}=B$ ". Then which of the following is true ?

(1) R is symmetric, transitive but not reflexive
(2) R is reflexive, symmetric but not transitive
(3) R is an equivalence relation
(4) R is reflexive, transitive but not symmetric

15. The minimum number of elements that must be added to relation $R=\{(a, b),(b, c),(b, d)\}$ on the set $\{a, b, c, d\}$, so that it is an equivalence relation is

16. The number of relations, on the set $\{1,\ 2,\ 3\}$ containing $(1,\ 2)$ and $(2,\ 3)$ which are reflexive and transitive but not symmetric, is _________.

17. Let $A=\{-4,-3,-2,0,1,3,4\}$ and $R=\left\{(a, b) \in A \times A: b=|a|\right.$ or $\left.b^2=a+1\right\}$ be a relation on A. Then the minimum number of elements, that must be added to the relation R so that it becomes reflexive and symmetric, is

18. The number of elements in the set $\{n \in \mathbb{N}: 10 \leq n \leq 100$ and 3^n-3 is a multiple of $7\}$ is _______.

19. Let $A=\{1, a_1, a_2 \ldots \ldots a_{18}, 77\}$ be a set of integers with $1<a_1<a_2<\ldots \ldots<a_{18}<77$. Let the set $A+A=\{x+y: x, y \in A\}$ contain exactly 39 elements. Then, the value of $a_1+a_2+\ldots \ldots+a_{18}$ is equal to ______.

20. Let R_1 and R_2 be relations on the set $\{1,2, \ldots, 50\}$ such that $R_1=\{(p, p^n): p$ is a prime and $n \geq 0$ is an integer$\}$ and $R_2=\{(p, p^n): p$ is a prime and $n=0$ or $1\}$. Then, the number of elements in R_1-R_2 is ____.