CHAPTER 11

Coded Inequalities

INTRODUCTION

Questions related to coded inequalities are essential part of competitive examinations. Such problems are not very difficult and very easy for them who are even slightly comfortable with basic mathematics. But for those, who are not at case with maths may find it a bit difficult. This chapter would give you the basic idea of inequalities and methods to solve it in time saving way.

WHAT IS THE PROBLEM LIKE? (PROBLEM FORMAT)

Sample Problem

Directions (Qs. 1-5) : In the following questions, the symbols α, β, γ, δ and η are used with following meaning:

A α B means A is greater than B.

A β B means A is either greater than or equal to B.

A γ B means A is equal to B.

A δ B means A is smaller than B.

A η B means A is either smaller than or equal to B.

Now, in each of the following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true. Give answer.

(a) If only conclusion I is true.
(b) If only conclusion II is true.
(c) If either I or II is true.
(d) If neither I nor II is true; and
(e) If both I and II are true.

1. **Statements:** P α N, L γ P, O δ N, L η K
Conclusions: I. P δ K **II.** L α N

2. **Statements:** E γ F, C δ D, F β G, D α E
Conclusions: I. E α G **II.** C γ E

3. **Statements:** T β M, O γ N, T δ H, M γ O
Conclusions: I. T γ N **II.** T α N

4. **Statements:** R η Y, K γ L, Y δ X, R α K
Conclusions: I. Y α L **II.** Y γ L

5. **Statements:** P δ I, S γ C, S β I, C α O
Conclusions: I. C δ I **II.** S α P

It is clear from the given problem format that such problems involves essentially a combination of two elementary problems:-

i. Inequalities ii. Coding

It is obvious, that the coding part is not a big challenge here as the coding scheme is told entirely in advance. Hence, to decode the inequalities in a given problem is not an uphill task. In fact, you require only few seconds to decode the inequalities. As such problems based on inequalities, it is high time to get the concept of the basics of inequalities.

WHAT IS INEQUALITY?

As we know,

$3 \times 3 = 9$

Now, we can say that the result of multiplication between 3 and 3 is equal to 9. Therefore, $3 \times 3 = 9$ is a case of equality. But when we multiply 3×4, we get 12 as a result of this multiplication. It does mean that

$3 \times 4 \neq 9$

As 3×4, is not equal to 9, it is a case of inequality.

When, we come to know that one thing is not equal to another; there can be only two possibilities:-

(i) One thing is greater than another thing.
or
(ii) One thing is less than the another thing.

When, we denote (i) and (ii) mathematically, then we will write.

(i) One thing > another thing.
or
(ii) One thing < another thing.

where '>' denotes 'greater than'.
and '<' denotes 'less than'
Hence, you can write,

$3 \times 4 > 9$
$4 \times 1 < 9$

$(3 \times 4 > 9)$ does mean 'Product of 3 and 4 is greater than 9'.
$(4 \times 1 < 9)$ does mean 'Product of 4 and 1 is less than 9'.

Sometimes we come across two numbers where, we do not know the exact state of inequality between them. For example, we may have two numbers *m* and *n* and all that we know that '*n*' is not less than *m*'. In such case m can be either greater than or equal to *n*. This situation is represented as $\geq$ sign. When we have to represent '*m* is less than or equal to *n*' then we will use '$\leq$' sign. Let us see:-

$m \geq n$ does mean m is either greater than or equal to *n*.
$m \leq n$ does mean n is either less than or equal to *m*.

Hence, we can summarise the signs to be used in inequalities as below:

'=' is called equal to
'>' is called greater than
'$\geq$' is called greater than or equal to
'<' is called less than
'$\leq$' is called less than or equal to

WHAT IS CHAIN OF INEQUALITIES?

Sometimes two or more inequalities are combined together to create a single inequality having three or more terms. Such combination is called chain of inequalities. For example $24 > 20$ and $20 > 16$ can be combined as $24 > 20 > 16$. In the same way, $13 < 17$; $17 < 31$ and $31 < 38$ may be combined as $13 < 17 < 31 < 38$.

Note : *If you see the given problem format (sample problem). You will find that your primarily task is to combine two or more inequalities to create a single inequality.*

CONDITIONS FOR COMBINING TWO INEQUALITIES

Condition I: Two inequalities will be combined if and only if they have a common term.

Condition II: Two inequalities will be combined if and only if the common term is greater than (or 'greater' than or equal to') one and less than (or 'less than or equal to') the other.

For example : 14 > 13, 13 > 12 can be easily combined as '14 > 13 > 12'.

Coded Inequalities

Here,

$$14 > \underset{\text{Common term}}{13} > 12$$

Clearly, 14 > 13 and 13 > 12 have common term 13 and this common term is greater than 12 and less than 14. Hence, 14 > 13 and 13 > 12 have been combined into 14 > 13 > 12 as per the conditions I and II.

For example : 17 < 19, and 19 < 20 can be easily combined as 17 < 19 < 20.

Here,

$$17 < \underset{\text{Common term}}{19} < 20$$

Clearly, 17 < 19 and 19 < 20 have common term 19 and this common term is greater than 17 and less than 20. Hence, 17 < 19 and 19 < 20 have been combined into 17 < 19 < 20 as per the conditions I and II.

Now, let us see some examples of inequalities which can not be combined. Some such examples are given below:

i. 14 > 12, 19 > 18

ii. 18 < 20, 22 < 25

iii. 100 > 99, 80 > 77

iv. 100 < 115, 118 < 119

Clearly, (i), (ii), (iii) and (iv) can not be combined as they do not have any common term and therefore, they do not follow condition I and condition II.

How to Derive Conclusions from a Combined Inequalities?

To derive conclusion from a combined inequality, you have to eliminate the common term.

For example,

(a) If we have

$m > \ell > n$

then, our conclusion is $\boxed{m > n}$

(b) When, we have

$m < \ell < n$

then, our conclusion is $\boxed{m < n}$

(c) When, we have '≥' signs in the combined inequalities then you have to think a little bit more. Let us consider the combined inequality given below:

$m \geq \ell > n$

Here, m is either greater than ℓ or equal to ℓ.

Hence, the minimum value for m is equal to ℓ. But ℓ is always greater than n. Therefore, m is always greater than n.

$\therefore$ Our conclusion is $\boxed{m > n}$

(d) When, we have the following inequalities:-

$m > \ell \geq n$

In this case, m is always greater than ℓ and ℓ is either greater than n or equal to it. When ℓ is greater than n; m will obviously be greater than n. Even when ℓ is equal to n; m will be greater than n as m is always greater than ℓ.

$\therefore$ Our conclusion is $\boxed{m > n}$

(e) When, we have combined inequality

$m \geq \ell \geq n$

Here, m is either greater than ℓ or equal to ℓ.

When m is greater than ℓ; we have $m > \ell \geq n$, which gives the conclusion.

$\boxed{m > n}$ — (A)

When m is equal to ℓ; we have

$m = \ell \geq n$, which gives the conclusion

$\boxed{m \geq n}$ —(B)

Combining (A) and (B), we have the final conclusion as

$\boxed{m \geq n}$

From (a), (b), (c), (d) and (e), we get a rule for deriving conclusions from a combined inequality, we may say it 'Golden Rule'.

GOLDEN RULE

The conclusion inequality will have an '≥' sign or a '≤' sign if and only if both the signs in the combined inequality are '≥' or '≤' sign

Clearly, in (a), (b), (c), (d) and (e) only one inequality (e) ($m \geq l \geq n$) has '≥' as its both the sign.

REMEMBER

★ If m > n, then n < m must be true.

If m < n, then n > m must be true.

If m ≥ n, then n ≤ m must be true.

If m ≤ n, then n ≥ m must be true.

EITHER CHOICE RULES

I. When your derived conclusion is of the type $m \geq n$ (or $m \leq n$) then check if the two conclusions are $m > n$ and $m = n$ (or, $m < n$ and $m = n$). If yes, choice "either follows" is true.

II. If neither of the given conclusions seems correct. Then try to check if the given conclusions form a complementary pair. Given conclusions form a complementary pair in the 4 cases given below:-

(i) $m \geq n$ and $m < n$ (ii) $m > n$ and $m \leq n$

(iii) $m \leq n$ and $m > n$ (iv) $m < n$ and $m \geq n$

In such case, the choice "either follows" is correct.

Steps for Solving Problems

Step I: Decode the given symbols like $\alpha, \beta, \gamma, \theta, \delta, \eta$, etc.

Step II: Take one conclusion at a time and make an idea that which statements are relevant for evaluating it.

Step III: Use conditions I and II and the 'Golden Rule' to combine the relevant statements and derive a conclusion from it. They are:

Condition I: There must be a common term.

Condition II: The common term must be less than or equal to one term and greater than or equal to another.

Golden Rule: The conclusion — inequality is obtained by letting the common term be eliminated and it has a '≥' or a '≤' sign if and only if both the inequalities in 2nd step had a '≥' or a '≤' sign. In all other cases, there will be a '>' or a '<' sign in the conclusion.

After performing the above mentioned three steps, if a conclusion is established and verified, it is well and good. But if does not happen so, then you have to perform 4 more new steps given below:

New Step I: Check if the given conclusion directly follows from anyone single statement.

New Step II: Check if the conclusion — inequality you get is essentially as same as the given conclusion but written differently (As discussed in important points to remember)

New Step III: Check if the derived conclusion follows 'Either choice Rule I'.

New Step IV: If neither of the conclusions has been proved correct till now, then check 'Either choice Rule II'.

SOLUTION TO SAMPLE PROBLEM (PROBLEM FORMAT)

Through this, we will demonstrate how to use the stepwise method mentioned above to solve the real problem.

Step I: We decode the symbols at this very 1st step.

(1) Statements: P > N, L = P, O < N, L ≤ K
Conclusions: **I.** P < K **II.** L > N

(2) Statements: E = F, C < D, F ≥ G, D > E
Conclusions: **I.** E > G **II.** C = E

(3) Statements: T ≥ M, O = N, T < H, M = O
Conclusions: **I.** T = N **II.** T > N

(4) Statements: R ≤ Y, K = L, Y < X, R > K
Conclusions: **I.** Y > L **II.** Y = L

(5) Statements: P < I, S = C, S ≥ I, C > O
Conclusions: **I.** C < I **II.** S > P

Next, we will take each of the questions separately and perform step II and step III for each of the conclusion.

1. Conclusion I: Relevant statements = (L = P, L ≤ K). Combining both the relevant statements, we get P ≤ K. This does not match to the given conclusion P < K.

Conclusion II: Relevant statements are P > N and L = P combining both the relevant statement, we get L > N. Hence, only conclusion II follows.

∴ Our correct answer choice is (b)

2. Conclusion I: Relevant statements = (E = F, F ≥ G). Combining both the relevant statements, we get E ≥ G. This does not match with the given conclusion E > G.

Conclusion II: Relevant statements are C < D and D > E. Combining both the relevant statements, we get C < E. This does not match with C = E. Hence, both conclusions are rejected. Now, new steps I, II, III, IV as mentioned in the segment 'Steps for solving problems' also does not work for this conclusion. Hence, our correct answer choice is (d).

3. Conclusion I: Relevant statements = (O = N, M = O, T ≥ M). Combining the 1st two statements, we have M = N. Now, combining M = N with T ≥ M, we get T ≥ N. Clearly, conclusion I does not follow.

Conclusion II: We have already seen then T ≥ N follows. This is different from T > N. So, the conclusion II does not follow. But, by virtue of New step III. Choice (c) is our correct answer.

4. Conclusion I: Conclusion I is Y > L. Now from the given statements Y and L do not appear separately with a single common term. Y appears with R, R with K and K with L. Hence, we will take these three statements as our relevant statements. They are
R ≤ Y, R > K, K = L
Combining R ≤ Y and R > K
(Just see 'Golden Rule'), we get Y > K, now combining it with K = L; we get Y > L. Hence, conclusion I follows.

Conclusion II: Conclusion II is Y = L, which is not true as > L has been proved.

∴ Our correct answer choice is (a).

5. Conclusion I: Conclusion I is C < I. C and I appear separately with S in S = C and S ≥ I. So, these two are our relevant statements. Combining these two relevant statements, we get: C > I. This does mean conclusion I is not true.

Conclusion II: Conclusion II is S > P. Now, S and P appear separately with a common term I; in P > I and S ≥ I. So these two are our relevant statements and combining them, we get: P < S. By New step II, it is the same as S > P. Therefore, conclusion II follows.

∴ Our correct answer choice is (b)

In this type of questions, usual mathematical symbols (+, –, ÷, ×, <, > etc.) are represented by symbols, different from the usual ones. To solve this type of questions, substitute the real signs in the given expression and then solve the expression according to the rule BODMAS.

EXAMPLE 1 to 3: In the following questions, the symbols ©, @, =, * and $ are used with the following meanings :
P © Q means 'P is greater than Q';
P @ Q means 'P is greater than or equal to Q';
P = Q means 'P is equal to Q';
P * Q means 'P is smaller than Q';
P $ Q means 'P is either smaller than or equal to Q'.

Now in each of following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true.
Give answer :
(a) if only conclusion I is true;
(b) if only conclusion II is true;
(c) if either I or II is true;
(d) if neither I nor II is true.
(e) if both I and II are true.

1. **Statements :** P © T, M $ K, T = K
Conclusions : I. T © M II. T = M
Sol. (c) Given statements : P > T, M ≤ K, T = K.
T = K, K ≥ M ⇒ T ≥ M ⇒ T > M or T = M
⇒ T © M or T = M
So, either I or II is true.

2. **Statements:** D © F, F = S, S $ M
Conclusions : I. D © M II. F @M
Sol. (d) Given statements : D > F, F = S, S ≤ M
F = S, S ≤ M ⇒ F ≤ M
Therefore, II is not true.
Now D > F, F ≤ M
⇒ nothing can be said about F and M.
So, I is not true.

3. **Statements :** J = V, V * N, R $ J
Conclusions : I. R * N II. J @ N
Sol. (a) Given statements: J = V, V < N, R ≤ J
R ≤ J, J = V, V < N ⇒ R < N i.e R * N.
So, I is true.
Now, J = V, V < N ⇒ J < N
So, J @ N i.e., J ≥ N is not true.
Thus, II is false.

DIRECT INEQUALITY

In this type of questions direct relation between two or more than two elements are given in a meaningful inequality. Candidates are required to establish the relation between elements with the help of used signs between the elements.

EXAMPLE 4 : Which of the following symbols should replace the question mark in the given expression in order to make the expressions. 'I > L' as well as 'M ≥ K' definitely true?
I > J ≥ K ? L ≤ N = M
(a) > (b) <
(c) ≤ (d) =
(e) Either < or ≤

Sol. (d) On putting sign (=) in place of question mark (?)
I > J ≥ K = L ≤ N = M ⇒ means I > L and M ≥ K

EXAMPLE 5. Which of the following symbols should be placed in the blank spaces respectively (in the same order from left to right) in order to complete the given expression in such a manner that 'S > P' definitely holds true but 'S = P' does not hold true?
P ___ Q ___ R ___ S
(a) ≥, >, ≥ (b) ≤, =, ≤
(c) >, <, < (d) <, ≤, ≤
(e) None of these

Sol. (d) On putting sign (<, ≤, ≤) in place of blank spaces P ≤ Q ≤ R ≤ S ⇒ means S > P and S = P

Directions (Illustrations 3 and 4) : In these questions, relationship between different elements is shown in the statements. These statements are followed by two conclusions.
Give answer
(a) If only Conclusion I follows
(b) If only Conclusion II follows
(c) If either Conclusion I or II follows
(d) If neither Conclusion I nor II follows
(e) If both Conclusions I and II follow

3. **Statement** E < F ≤ G = H > S
Conclusions I. G > S II. F ≤ H
Sol. (e) **Statement** E < F ≤ G = H > S
Conclusions I. G > S → It follows because G = H is greater than S.
II. F ≤ H → It follows because H is equal to G and G ≥ F.
So, both Conclusions I and II follow.

4. **Statement** P ≤ Q < W = L
Conclusions I. L > P
II. Q ≤ L
Sol. (a) **Statement** P ≤ Q < W = L
Conclusions I. L > P → If follows
II. Q ≤ L → It does not follow because L is equal to W and W is only greater than Q.

REMEMBER

Inequality depends upon combining more than two element with a common term. Now observe the below diagram thoroughly
Accordance to this diagram
Definite Conclusion
• > = → > • < = → < • ≥ = → ≥ • ≤ = → ≤
• ≥ > → > • ≤ < → < • < = ≤ → < • > = ≥ → >
Indefinite Conclusion
• > < → No relation • ≥ ≤ → No relation
• > ≤ → No relation • ≥ < → No relation

Shortcut Approach

Case 1. < OR >

Two signs opposite to each other will make the conclusion wrong But again if the signs are in same manner that will not make it wrong.
For example:
If A > B < C > D then A < C = False, C > A = False .
But

If E > F > G > H then E > G = True , F > H = True , E > H = True.
Statement: A < D > C < E > B
Conclusions:
- C > B → False
- A < E → False
- D > B → False

In simple way, whenever these two sign comes in opposite direction the answer will be false.

Case 2. ≤ OR ≥

Two signs opposite to each other will make the conclusion wrong But again if the signs are same then it will be true.
For example:
If A ≥ B ≤ C then A ≤ C = False, C ≥ A = False.
But
If A ≥ B ≥ C then A ≥ C = True, C ≤ A = True.
Statement: B ≥ D ≤ A ≥ F ≥ C
Conclusions :
I. A ≥ C → True
II. B ≤ F → False
III. D ≥ C → False

Case 3. Sets Priority

1st Priority : < or >
2nd Priority: ≤ or ≥
3rd Priority: =
Statement: P ≥ R > Q = T ≥ S
Conclusions :
I. P ≥ Q → False
II. P > Q → True
III. Q ≥ S → True

Case 4.

When it occurs to you that the statement of order is opposite just change the sign into similar opposite direction. Then change the sign into similar opposite /corresponding / alternative direction.
If A > B > F > C < D < E
than F < A → True
Example : [∵ A > B > F = F < B < A]
Statements : A > B > F > C; D > E > C
Conclusions:
I. C < A → True
II. C > A → False
Statements : R ≥ S ≥ T > U > X; T < V < W
Conclusions:
I. R > X → True [Note: Apply Case 3 here]
II. X < R → True [Note: Apply Case 3 & 4 here]
Statements : K ≤ L ≤ M = N ; P ≥ O ≥ N
Conclusions:
K ≤ L ≤ M = N ≤ O ≤ P
I. K < O → False
II. K = N → False — Neither Nor
III. K ≤ M → True
IV. K < P → False
V. K = P → False
Statement IV & V Apply Either Or

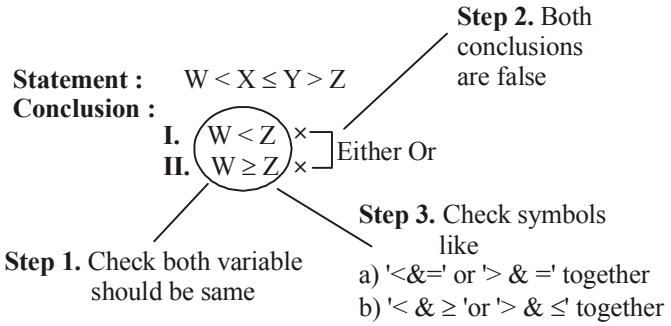
Case 5. > or < and ≥ or ≤

Whenever there is two conclusions which are false then check for these two symbols **(> or < and ≥ or ≤)**. In most of case where two conclusions are false and these two similar signs are not there respectively then that statement can call it as either or but should check there variable it should same.

#Case Either Or :

Note : First thing need to check whether in conclusion any 2 or more conclusions are wrong then if it is there then check whether the two variables are same. If It happens then write it as 'Either or' but after checking their symbols.
Rules:
1. Both conclusion should False
2. Should have same Predicate or Variable
3. Check the symbols

If above conditionsare satisfied then write it as 'Either Or' Other wise leave it.
Note : If 3 condition is satisfied than the conclusions are called Either Or



Solved Examples :

Statement : H = W ≤ R > F
Conclusion : I. R = H ×
II. R > H × — Either Or

Statement : H > L = E < T
Conclusion : I. H ≤ T ×
II. H > T × — Either Or

Statement : S < T ≥ R ≥ M
Conclusion : I. M < T ×
II. M = T × — Either Or

Statement : I ≥ H = T > S ≤ R
Conclusion: I. I > T ×
II. I = T × — Either Or

#Case Neither Nor :

First thing you need to check whether in your conclusion any 2 or more conclusions are wrong
then write it as 'Neither Nor' but before checking their symbols.
Rules:
1. Both conclusion should False
2. Check the symbols

If both conditions are satisfied then write it as " Neither Nor' other wise leave it.

Statement : P > Q ≥ S = R
Conclusion : I. P ≥ R ×
II. R > Q × — Neither nor

Statement : L = T ≤ J ≥ K
Conclusion : I. L > K
II. T ≤ K — Neither nor

Statement : V < L ≥ J ≤ T
Conclusion : I. V < J
II. L = T — Neither nor

Statement : G ≤ K ≤ F < M
Conclusion: I. G > F
II. K ≤ M — Neither nor

EXERCISE

Directions (Qs.1-5): In the following questions, the symbols @, #, $, * and % are used as illustrated below:

'P @ Q' means 'P is not smaller than Q'.

'P # Q' means 'P is neither greater than nor equal to Q'.

'P $ Q' means 'P is neither smaller than nor greater than Q'.

'P * Q' means 'P is not greater than Q'.

'P % Q' means 'P is neither smaller than nor equal to Q'.

Now, in each of the following questions assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true? Give answer

(a) if only Conclusion I is true.
(b) if only Conclusion II is true.
(c) if either Conclusion I or II is true.
(d) if neither Conclusion I nor II is true.
(e) if both Conclusions I and II are true.

1. **Statements:**
M $ K, D * K, R # K
Conclusions:
I. D $ M
II. M % D

2. **Statements:**
F * M, M % R, E @ F
Conclusions:
I. M % E
II. R @ E

3. **Statements:**
H $ K, T # H, W * T
Conclusions:
I. K % W
II. T # K

4. **Statements:**
N % A, A # L, F $ N
Conclusions:
I. L % F
II. F % A

5. **Statements:**
B * D, D $ M, F % M
Conclusions:
I. B # M
II. F % B

Directions (Qs. 6-11): In the following questions the symbols +, ×, ?, @ and $ are used with the following meanings:

$P + Q$ means P is neither smaller nor greater than Q.

$P \times Q$'means P is neither equal to nor smaller than Q.

P ? Q means P is neither greater than nor equal to Q.

P @ Q means P is either greater than or equal to Q.

P $ Q means P is not equal to Q.

Now, in each of the following questions assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true. Give answer

(a) if only conclusion I is true;
(b) if only conclusion II is true;
(c) if either I or II is true:
(d) if neither I nor II is true; and
(e) if both I and II are true.

6. **Statement:**
P $ Q, $Q \times R$, $P + R$
Conclusions:
I. $Q \times P$
II. P ? Q

7. **Statement:**
$A + B$, B $ C, C ? A
Conclusions:
I. C $ A
II. $B + C$

8. **Statement:**
Y @ Z, $Z \times Q$, Q $ P
Conclusions:
I. Y ? Q
II. Y ? P

9. **Statement:**
$E \times F$, F @ L, $L + N$
Conclusions:
I. $N + F$
II. $E \times L$

10. **Statement:**
H @ J. J ? K, $K \times M$
Conclusions:
I. H @ M
II. $M \times J$

11. **Statement:**
M @ T, $T + V$, V ? E
Conclusions:
I. $V + M$
II. V ? M

Directions (Qs. 12 - 16): In the following questions, the symbols @, ©, ★, $ and # are used with the following meaning:

'P @ Q' means 'P is neither smaller than nor equal to Q'.

'P © Q' means 'P is not smaller than Q'.

'P★Q' means 'P is not greater than Q'.

'P $ Q' means 'P is neither smaller than nor greater than Q'.

'P # Q' means 'P is neither greater than nor equal to Q'.

Now, in each of the following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true? Give answer

(a) if only conclusion I is true.
(b) if only conclusion II is true.
(c) if either conclusion I or II is true.
(d) if neither conclusion I nor II is true.
(e) if both conclusions I and II are true.

12. **Statements:**
Z # N, F © N, F ★ K
Conclusion :
I. K $ N
II. K @ Z

13. **Statements:**
D $ T, T © M, M # K
Conclusion:
I. M $ D
II. D @ M

14. **Statements:**
W © A, B ★ A, B @ M
Conclusions:
I. B # W
II. W $ B

15. **Statements:**
J ★ M, M $ N, N # T
Conclusions:
I. T @ J
II. T $ J

16. **Statements:**
V ★ F, F @ R, R © G
Conclusions:
I. G # V
II. G @ V

Directions (Qs. 17-21): In the following questions, the symbols #, $, @, * and © are used with the following meaning as illustrated below:
'*P* # *Q*' means '*P* is not smaller than *Q*'
'*P* $ *Q*' means '*P* is neither smaller than nor greater than *Q*'
'*P* @ *Q*' means '*P* is neither greater than nor equal to *Q*'
'*P* * *Q*' means '*P* is not greater than *Q*'
'*P* © *Q*' means '*P* is neither smaller than nor equal to *Q*'
Now in each of the following questions assuming the given statements to be true, find which of the two conclusions I and II given below them is/are **definitely true. Give answer**
(a) if only Conclusion I is true.
(b) if only Conclusion II is true.
(c) if either Conclusion I or II is true.
(d) if neither Conclusion I nor II is true.
(e) if both Conclusions I and II are true.

17. **Statements:**
B $ K, K @ D, D # M
Conclusions:
I. *B $ M*
II. *B @ M*

18. **Statements:**
H @ N, N © W, W # V
Conclusions:
I. *H @ V*
II. *V @ N*

19. **Statements:**
*J * D, Q # D, Q @ M*
Conclusions:
I. *Q © J*
II. *Q $ J*

20. **Statements:**
F # G, N $ G, N © T
Conclusions:
I. *T © F*
II. *N * F*

21. **Statements:**
M © R, R @ K , K $ T
Conclusions:
I. *T © R*
II. *T © M*

Directions (Qs. 22-26): In the following questions the symbols @, +, ©, $, △ and ? a re used with the following meaning:
P △ Q means P is not equal to Q.
P @ Q means P is greater than Q.
P + Q means P is smaller than Q.
P © Q means P is either greater than or equal to Q.
P $ Q means P is either smaller than or equal to Q.
P ? Q means P is equal to Q.
Now in each of the following questions assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true. Give answer
(a) if only conclusion I is true.
(b) if only conclusion II is true.
(c) if either conclusion I or II is true.
(d) if neither conclusion I nor II is true.
(e) if both conclusions I and II are true.

22. **Statements :**
K © M, M △ R, R ? T
Conclusions:
I. K © T
II. M ? T

23. **Statements:**
B + D, D @ N, N $ H
Conclusions:
I. H © D
II. H © N

24. **Statements:**
M © K, K@ P, P $ N
Conclusions:
I. M @ N
II. M ? N

25. **Statements:**
T $ M, M ? Q, Q + R
Conclusions:
I. Q @ T
II. Q ? T

26. **Statements:**
D @ B, B $ T, T + M
Conclusions:
I. M @ B
II. T © B

Directions (Qs.27-31): In the following questions, the symbols $, ©, ×, @ and # are used with the following meanings:
P $ Q means P is not smaller than Q.
P © Q means P is neither greater than nor smaller than Q.
P @ Q means P is not greater than Q.
P × Q means P is neither smaller than nor equal to Q.
P # Q means P is neither greater than nor equal to Q.
Now in each of the following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true. Give answer
(a) if only conclusion I is true;
(b) if only conclusion II is true;
(c) if either I or II is true;
(d) if neither I nor II is true; and
(e) if both I and II are true.

27. **Statements:**
Z $ K, K × T, T © F
Conclusions:
I. F # Z
II. Z × T

28. **Statements:**
K × B, B @ D, D # K
Conclusions:
I. B @ K
II. B # K

29. **Statements:**
N © R, R @ M, M $ J
Conclusions:
I. N © M
II. N # M

30. **Statements:**
S $ T, T @ R, R # M
Conclusions:
I. M × T
II. M© T

31. **Statements:**
H @ V, V © M, M × R
Conclusions:
I. R × H
II. H × R

Directions (Qs. 32-36): In these questions, certain symbols have been used to indicate relationships between elements as follows:
A B means A is either equal to or greater than B.
A $ B means A is equal to B.
A £ B means A is either equal to or smaller than B.
A & B means A is smaller than B.
A @ B means A is greater than B.
In each question, three statements showing relationships have been given, which are followed by **two** conclusions I & II. Assuming that the given statements are true, find out which conclusion(s) is/are **definitely true.**
Mark answer (a) if only conclusion I is true.
Mark answer (b) if only conclusion II is true.
Mark answer (c) if either conclusion I or II is true.
Mark answer (d) if neither I nor II is true.
Mark answer (e) if both conclusions I and II are true.

32. **Statements:**
S K, T & K, K B
Conclusions:
I. S $ B
II. S @ B

33. **Statements:**
Y $ Z, H $ D, Z D
Conclusions:
I. D £ Y
II. H £ Z

34. **Statements:**
M @ N, P @ R, P & N
Conclusions:
I. P £ M
II. R & N

35. **Statements:**
T & K, K B, S K
Conclusions:
I. B T
II. S £ T

36. **Statements:**
P @ R, M @ N, P & N
Conclusions:
I. N @ R
II. P & M

Directions (Qs. 37-41): In the following questions, the symbols ×, %, , @ and © are used with the following meanings as illustrated below:
'P @ Q' means 'P is neither greater than nor equal to Q'.
'P × Q' means 'P is not smaller than Q'.
'P Q' means 'P is not greater than Q'.
'P © Q' means 'P is neither smaller than nor equal to Q'.
'P % Q' means 'P is neither greater than nor smaller than Q'.
Now in each of the following questions assuming the given statements to be true, find which of the conclusions given below are **definitely true.**

37. **Statements :** J©T, T B, B@R
Conclusions :
I. J@R
II. R%T
III. J@B
(a) None follows
(b) Only I follows
(c) Only II follows
(d) Only II and III follow
(e) Only I and II follow

38. **Statements :** T M, K@M, K×Z,
Conclusions :
I. T@Z
II. Z@M
III. M%Z
(a) None follows
(b) Only II follows
(c) Only either II or III follows
(d) Only I follows
(e) All follow

39. **Statements :** K N, N%T, R@T
Conclusions :
I. K@R
II. T©K
III. R%K
(a) All follow
(b) Only II follows
(c) Only either I or III and II follow
(d) Only either I or II and III follow
(e) None follows

40. **Statements :** H©M, M×D, T@D
Conclusions :
I. T@M
II. H©D
III. H%D
(a) All follow
(b) Only I and III follow
(c) Only II and III follow
(d) Only I and II follow
(e) None of these

41. **Statements :** W×M, M©F, D F
Conclusions :
I. D@W
II. M©D
III. F@W
(a) None follows
(b) Only I and II follow
(c) Only II and III follow
(d) Only I and III follow
(e) All follow

Directions (Qs. 42-45) : In the questions given below, certain symbols are used with the following meanings:
P $ Q means P is neither equal to nor smaller than Q.
P © Q means P is not smaller than Q.
P * Q means P is neither greater nor smaller than Q.
P # Q means P is neither greater than nor equal to Q.
P @ Q means P is not greater than Q.
Now in each of the following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true. Give answer
(a) if only conclusion I is true.
(b) if only conclusion II is true.
(c) if either conclusion I or II is true.
(d) if neither conclusion I nor II is true.
(e) if both conclusions I and II are true.

42. **Statements :**
M # K, K * D, D @ P
Conclusions :
I. M @ P
II. M *P

43. **Statements :**
W © T, T $ M, B # M
Conclusions :
I. W $ B
II. M # W

44. **Statements :**
H * D, D # R, R © N
Conclusions :
I. N * H
II. N $ H

45. **Statements:**
Z @ R, R © D, D # T
Conclusions:
I. D # Z
II. Z # T

Directions (Qs. 47-50) In these questions, relations between different elements is shown in the statements. These statements are followed by to conclusions.

Give answer
(a) Only Conclusion I follows
(b) Only Conclusion II follows
(c) Either Conclusion I or II follows
(d) Neither Conclusion I nor II follows
(e) Both Conclusions I or II follow

46. **Statements**
$N = P, P \leq F, F \geq L, L = K$
Conclusions
I. $F = K$ II. $F > K$

47. **Statements**
$Z > T, T < M, M \leq J$
Conclusions
I. $T = J$ II. $J > Z$

48. **Statements**
$Q = Z, C \geq G, G \geq Q, Q \geq R, J \geq C$
Conclusions
I. $G \geq Z$ II. $C \geq R$

49. **Statements**
$A > B > C, D > E > F, D > C$
Conclusions
I. $E > C$ II. $F > B$

50. **Statements**
$K > L, K > M, M \geq N, N > O$
Conclusions
I. $O > M$ II. $O > K$

Directions (Qs. 51-55) In these questions, relationship between different element is shown in the statements. These statements are followed by two conclusions.

Give answer
(a) If only Conclusion I follows
(b) If only Conclusion II follows
(c) If either Conclusion I or II follows
(d) If neither Conclusion I nor II follows
(e) If both Conclusions I and II follow

51. **Statements**
$P \geq Q = R > S > T$
Conclusions
I. $P \geq T$ II. $T < Q$

52. **Statements**
$L \leq M < N > O \geq P$
Conclusions
I. $O < M$ II. $P \leq N$

53. **Statements**
$A > B, B \geq C = D < E$
Conclusions
I. $C < A$ II. $D \leq B$

54. **Statements**
$H > J = K, K \geq L, L > T, T < V$
Conclusions
I. $K < T$ II. $L \leq H$

55. **Statements**
$A \leq B = C, D > C = E$
Conclusions
I. $E \geq A$ II. $A < D$

56. Which of the following expression will be true if the expression $P > Q = R \geq S < T \leq U$ is definitely true?
(a) $P \geq T$ (b) $Q > T$
(c) $S < P$ (d) $U = R$
(e) $Q < U$

57. Which of the following expression will be false if the expression $A < B \leq C = D \geq E$ is definitely true?
(a) $C > A$ (b) $E \leq C$
(c) $D > B$ (d) $C \geq E$
(e) $B \leq D$

58. Which of the following expression will be true if the expression $M \geq P < N = O \geq R$ is definitely true?
(a) $M > R$ (b) $P > O$
(c) $R < P$ (d) $P \geq R$
(e) $O < M$

59. Which of the symbols should be placed in the blank spaces respectively (in the same order from left to right) in order to complete the given expression in such a manner that makes the expression P < K as well as O $\underline{\leq}$ K definitely true?
"K_L_O_P_Q"
(a) ≥ , =, >, ≥ (b) = , =, >, ≥
(c) $\underline{\geq}$, >, ≥ , > (d) > , =, ≥ , ≥
(e) > , ≥ , ≥ , ≥

60. Which of the following should be placed in the blank spaces respectively (in the same order from left to right) in order to complete the given expression in such a manner that makes the expression D < A definitely false.
_ > _ = _ $\underline{\leq}$ _ <_
(a) E, B, C, D, A (b) A, C, D, B, E
(c) C, E, A, B, D (d) B, D, E, C, A
(e) C, B, D, E, A

Directions (Qs. 61-65): In the given questions, assuming the given statement to be true, find which of the given four conclusions numbered I, II, III and IV is/are definitely true and give your answer accordingly.

61. **Statements:**
D ≤ A < C, N ≥ B = E, N = F > D
Conclusions:
I. F ≥ E
II. C < D
III. N ≥ A
IV. B ≤ F
(a) Only I is true
(b) Only III is true
(c) Only II and IV are true
(d) Only I and IV are true
(e) None of these

62. **Statements:** B > E ≥ L, N = G ≥ B, M ≤ P < L
Conclusions:
I. G ≥ L
II. E > P
III. B > M
IV. M < N
(a) Only I, II and III are true
(b) Only II, III and IV are true
(c) Only III and IV are true
(d) Only I is true
(e) None of these

63. **Statements:** H < A ≤ V < L, M = H, J > K ≥ M
Conclusions:
I. L > M
II. A ≤ K
III. J > V
IV. K < L
(a) Only II and III are true
(b) Only I and II are true
(c) Only III and IV are true
(d) Only I, II and IV are true
(e) None of these

64. **Statements:** E ≤ N ≥ T ≤ R, P ≥ Q = R
Conclusions:
I. P ≥ T
II. Q ≤ N
III. R ≥ E
IV. N ≤ P
(a) Only I is true
(b) Only II and II are true
(c) Only II and IV are true
(d) Only I and IV are true
(e) None of these

65. **Statements:** R > S = T ≤ U, P = K > M ≥ U
Conclusions:
I. R > K
II. M ≥ T
III. P > U
IV. S ≤ M
(a) Only II and IV are true
(b) Only II, III and IV are true
(c) Only I and III are true
(d) All I, II, III and IV are true
(e) None of these

Directions (Qs. 66-70) : Read each statement carefully and answer the following questions.

66. Which of the following expressions will be true, if the expression R > O = A > S < T is definitely true ?
(a) O > T (b) S < R
(c) T > A (d) S = O
(e) T < R

67. Which of the following symbols should replace the question mark (?) in the given expression in order to make the expressions 'P > A' as well as 'T < L' definitely true?
P > L ? A ≥ N = T
(a) ≤ (b) >
(c) < (d) ≥
(e) Either (a) and (b)

68. Which of the following symbols should be placed in the blank spaces respectively (in the same order from left to right) in order to complete the given expression in such a manner that makes the expressions 'B > N' as well as, 'D ≤ L' definitely true ?
B – L – O – N – D
(a) =, =, ≥, ≥ (b) >, ≥, =, >
(c) >, <, =, ≤ (d) >, =, =, ≥
(e) >, =, ≥, >

69. Which of the following should be placed in the blank spaces respectively (in the same order from left to right) in order to complete the given expression in such a manner that makes the expression 'A < P' definitely false ?
– ≤ – ≤ – ≥
(a) L, N, P, A (b) L, A, P, N
(c) A, L, P, N (d) N, A, P, L
(e) P, N A, L

70. Which of the following symbols should be placed in the blank spaces respectively (in the same order from left to right) in order to complete the given expression in such a manner that makes the expression 'F > N' and 'U > D' definitely false ?
F – O – U – N – D
(a) <, <, >, = (b) <, =, =, >
(c) <, =, =, < (d) ≥, =, =, ≥
(e) >, >, =, <

ANSWER KEY

1	(c)	8	(d)	15	(a)	22	(d)	29	(c)	36	(e)	43	(e)	50	(d)	57	(c)	64	(a)
2	(d)	9	(b)	16	(d)	23	(b)	30	(a)	37	(a)	44	(d)	51	(b)	58	(d)	65	(b)
3	(e)	10	(d)	17	(d)	24	(d)	31	(d)	38	(b)	45	(d)	52	(d)	59	(a)	66	(b)
4	(b)	11	(c)	18	(b)	25	(c)	32	(c)	39	(e)	46	(c)	53	(e)	60	(c)	67	(b)
5	(b)	12	(b)	19	(c)	26	(e)	33	(e)	40	(d)	47	(d)	54	(a)	61	(d)	68	(d)
6	(e)	13	(c)	20	(b)	27	(e)	34	(b)	41	(e)	48	(e)	55	(e)	62	(b)	69	(e)
7	(a)	14	(c)	21	(a)	28	(b)	35	(d)	42	(d)	49	(d)	56	(c)	63	(e)	70	(c)

Hints & Explanations

1. (c) M = K ..... (i);
D ≤ K ..... (ii);
R < K ..... (iii)
From (i) and (ii), we get
M = K ≥ D ⇒ M ≥ D
Hence, either M > D (conclusion II) or M = D (conclusion I) is true

2. (d) F ≤ M... (i); M > R... (ii); E ≥ F... (iii)
From (i) and (iii), no specific relation can be obtained between M and E. Similarly, no specific relation can be obtained between R and E.

3. (e) H = K... (i); T < H...(ii),
W ≤ T ...(iii)
From (i), (ii) and (iii), we get
K = H > T ≥ W ⇒ K > W (conclusion I) and
T < K (conclusion II).

4. (b) N > A... (i), A < L... (ii), F = N...(iii)
From (i) and (iii), we get
F = N > A ⇒ F > A (conclusion II). But no specific relation can be obtained between L and F. Hence, conclusion I is not necessarily true.

5. (b) B ≤ D...(i); D = M...(ii);
F > M ...(iii)
From (i), (ii) and (iii), we get
F > M = D ≥ B ⇒ B < M and F > B (conclusion II).
Since, B < M, therefore, conclusion I is not necessarily true.

6. (e) $P \neq Q$ ...(i), $Q > R$ ... (ii), $P = R$ ...(iii)
From (ii) and (iii), we get $Q > R = P \Rightarrow Q > P$. Hence, both I and II are true.

7. (a) $A = B$ ... (i), $B \neq C$ ... (ii), $C < A$ ... (iii) From (iii), conclusion I is true. II contradicts statement (ii), hence, it is not true.

8. (d) $Y \geq Z$ ...(i), $Z > Q$ ... (ii), $Q \neq P$ ...(iii)
From (i) and (ii), we get $Y > Z > Q \Rightarrow Y > Q$ ... (A)
Hence, I is not true. From (iii), two possible relationships between P and Q are;
Case I: When $P > Q$
Now, using (A), we get $Y > Q < P \Rightarrow$ no conclusion.
Case II: When $Q > P$
using (A), we get $Y > Q > P \Rightarrow Y > P$. Hence, II is not true.

9. (b) $E > F$ .... (i), $F \geq L$ ... (ii), $L = N$ ...(iii)
From (ii) and (iii), we get $F \geq L = N \Rightarrow F \geq N$ or $N \leq F$.
Hence, I may be true but not necessarily so.
From (i) and (ii), we get $E > F \geq L \Rightarrow E > L$
Hence, II is true.

10. (d) $H \geq J$ ... (i), $J < K$ ... (ii), $K > M$ ... (iii)
From (ii) and (iii), we get $J < K > M \Rightarrow$ no relationship between J and M can be established. Hence, II can't be established. Again, combining all we can't conclude the relationship between H and M. Hence, I is not true.

11. (c) $M \geq T$ ... (i), $T = V$ .... (ii), $V < E$ ...(iii)
From (i) and (ii), we get
$M \geq T = V \Rightarrow M \geq V \Rightarrow$ either $V = M$ or $V < M$ is true.

12. (b) Z < N ....(i); F ≥ N .... (ii); F ≤ K ....(iii) Combining all, we get
K ≥ F ≥ N > Z ⇒ K = N and K > Z
Hence, conclusion I (K = N) is not necessarily true but conclusion II (K > Z) is true.

13. (c) D = T ....(i); T ≥ M ....(ii); M < K ... (iii) Combining (i) and (ii), we get
D = T ≥ M ⇒ D ≥ M ⇒ D = M or D > M
Hence, either conclusion I (M = D) or conclusion II (D > M) is true.

14. (c) W ≥ A ...(i); B ≤ A .... (ii); B > M ... (iii) Combining all, we get
W ≥ A ≥ B > M ⇒ B ≤ W
⇒ B < W or B = W
Hence, either conclusion I or II is true.

15. (a) J ≤ M ....(i); M = N ...(ii); N < T .... (iii)
Combining all, we get
J ≤ M = N < T ⇒ T > J
Hence, only conclusion I is true

16. (d) V ≤ F .... (i); F > R .... (ii); R ≥ G ....(iii)
Combining (ii) and (iii), we get F > R ≥ G ....(iv)
Comparing (i) and (iv), we can't get any specific relationship between G and V. Hence, both conclusions are not true.

17. (d) $B = K$ ...(i);
$K < D$ ...(ii);
$D \geq M$ ...(iii)
From (i) and (ii), we get
$D > K = B$ ...(iv)

From (iii) and (iv), no specific relation can be obtained between B and M. Therefore, $B = M$ (Conclusion I) and $B < M$ (Conclusion II) are not necessarily true.

18. (b) $H < N$ ...(i)
$N > W$ ...(ii);
$W \geq V$ ...(iii)
From (ii) and (iii), we get
$N > W \geq V$ ...(iv)
From (i) and (iv), no specific relation can be obtained between H and V. Hence, $H < V$ (Conclusion I) is not necessarily true. But $V < N$ (Conclusion II) follows from equation (iv).

19. (c) $J \leq D$ ...(i);
$Q \geq D$ ...(ii);
$Q < M$ ...(iii)
Combining (i) and (ii), we get
$Q \geq D \geq J \Rightarrow Q > J$ (Conclusion I) or $Q = J$ (Conclusion II)
Hence, either conclusion I or conclusion II is true.

20. (b) $F \geq G$ ...(i);
$N = G$ ... (ii);
$N > T$ ... (iii)
Combining all, we get
$F \geq G = N > T \Rightarrow N \leq F$ (Conclusion II) and $T < F$.
Hence, conclusion I ($T > F$) is not true but conclusion II is true.

21. (a) $M > R$ ...(i);
$R < K$ ...(ii);
$K = T$ ... (iii)
Combining (ii) and (iii), we get
$K = T > R$
$\Rightarrow T > R$ (Conclusion I).
On the basis of the given information no specific relation can be obtained between T and M. Hence, $T > M$ (Conclusion II) is not necessarily true.

22. (d) $K \geq M$ ... (i); $M \neq R$ ...(ii); $R = T$ ...(iii)
Combining all equations, we get
$K \geq M \neq R = T \Rightarrow M \neq T$
From this we can't get any specific relation between K and T. Hence, conclusion I is not true. Conclusion II is false since $M \neq T$.

23. (b) $B < D$ ....(i); $D > N$ ...(ii); $N \leq H$ ...(iii)
From equations (ii) and (iii), we can't obtain any specific relation between H and D. Hence, conclusion I ($H \geq D$) is not true. But conclusion II ($H \geq N$) follows from equation (iii)

24. (d) $M \geq K$ ... (i); $K > P$ ...(ii); $P \leq N$ ...(iii)
Combining (i) and (ii), we get
$M \geq K > P$ ...(iv)
From (iii) and (iv), no specific relation can be obtained between M and N. Hence, conclusion I ($M > N$) and conclusion II ($M = N$) are not true.

25. (c) $T \leq M$ ...(i); $M = Q$ ...(ii); $Q < R$ ...(iii)
Combining (i) and (ii) we get
$M = Q \geq T \Rightarrow Q > T$ (Conclusion I)
or $Q = T$ (Conclusion II)

26. (e) $D > B$ ... (i); $B \leq T$ ...(ii); $T < M$ ...(iii)
Combining (ii) and (iii), we get
$M > T \geq B \Rightarrow M > B$ (Conclusion I) and
$T \geq B$ (Conclusion II).

27. (e)

28. (b) $K > B$ ...(i), $B \leq D$...(ii), $D < K$...(iii)
From (i), $B < K$. Hence II is true but I is not true.

29. (c) $N = R$...(i), $R \leq M$...(ii), $M \geq J$...(iii)
From (i) and (ii), we get $N = R \leq M \Rightarrow N \leq M$. Hence either I or II is true.

30. (a) $S \geq T$...(i), $T \leq R$... (ii), $R < M$ ... (iii)
From (ii) and (iii), we get $T \leq R < M \Rightarrow T < M$ or $M > T$.
Hence I is true and II is not true.

31. (d) $H \leq V$ ... (i), $V = M$ ... (ii), $M > R$... (iii)
Combining all, we get $H \leq V = M > R \Rightarrow$ no relationship between H and R can be established. Since conclusions I and II are not exhaustive, neither of them is true.

32. (c) $S \geq K$... (i); $T < K$ ... (ii);
$K \geq B$ ... (iii)
Combining (i) and (iii), we get
$S \geq K \geq B$. Hence, $S > B$ or $S = B$. Therefore either conclusion I or II is true.

33. (e) Combining all the three statements, we get
$Y = Z \geq D = H$. Therefore $D \leq Y$ and $H \leq Z$ are true.

34. (b) Combining all the three statements together we get
$M > N > P > R$. Therefore $P \leq M$ is not true, but $R < N$ is true.

35. (d) Combining I and III, we get
$S \geq K > T$. Therefore $S \leq T$ is not true. We have no information about the relationship between B and T.

36. (e) Combining all the three statements, we get
$M > N > P > R$. Therefore $N > R$ and $P < M$ are true.

37. (a) $J > T$ ....(i)
$T \leq B$....(ii)
$B < R$ ... (iii)
From (ii) and (iii), we get
$R > B \geq T$ ... (iv)
Hence, no specific relation can be obtained between (i) J and R or (ii) J and B. Hence, neither I nor III follows. From equation (iv) we get $R > T$. Therefore, conclusion II does not follow.

38. (b) $T \leq M$ ... (i)
$K < M$ ...(ii)
$K \geq Z$ ... (iii)
From (ii) and (iii), we get
$M > K \geq Z$ ...(iv).
$\Rightarrow M > Z$
Hence, conclusion II ($Z < M$) follows. But conclusion III ($M = Z$) does not follow. Again, no specific relation can be obtained between T and Z. Hence, conclusion I does not follow.

39. (e) $K \leq N$ ...(i);
$N = T$ ...(ii);
$R < T$ ...(iii)
From (i) and (ii), we get
$T = N \geq K$ ...(iv)
From (ii) and (iii), we get
$T = N > R$ ...(v)

From equation (iv), we get $T \geq K$. Hence, conclusion II ($T > K$) is not necessarily true.
From equations (iv) and (v) we can't obtain any specific relation between K and R. There fore, conclusion I and conclusion III do not follow. Thus, no conclusion follows.

40. (d) $H > M$ ... (i); $M \geq D$ ... (ii); $T < D$ ... (iii)
From (i), (ii) and (iii), we get
$H > M \geq D > T$ ...(iv)
From equation (iv), we get $H > T$. This implies $T < M$. Hence, conclusion I follows.
Again, $H > D$. Hence II follows but III does not.

41. (e) $W \geq M$... (i); $M > F$... (ii); $D \leq F$...(iii)
From (i), (ii) and (iii), we get
$W \geq M > F \geq D$...(iv)
From (iv); we get $W > D$. Hence, conclusion I ($D < W$) follows. Again, from the equation (iv), we get $M > D$. Hence, conclusion II ($M > D$) follows. Again, from the equation (iv), we get $W > F$. Hence, conclusion III ($F < W$) follows.

42. (d) $M < K$ ... (i); $K = D$... (ii); $D < P$...(iii)
Combining all the equations, we get
$P \geq D = K > M \Rightarrow P > M$. Hence, conclusion I ($M \leq P$) and conclusion II ($M = P$) are not true.

43. (e) $W \geq T$... (i); $T > M$... (ii); $B < M$ ...(iii)
Combining all, we get $W \geq T > M > B$
$\Rightarrow W > B$ and $W > M$. Hence, both conclusions ($W > B$, $M < W$) are true.

44. (d) $H = D$ ...(i); $D < R$ ...(ii) $R \geq N$ ...(iii)
Combining (i) and (ii), we get
$R > H = D$ ...(iv)
From (iii) and (iv), we cann't get any specific relation between N and H. Therefore, conclusion I ($N = H$) and conclusion II ($N > H$) are not true.

45. (d) $Z \leq R$ ...(i); $R \geq D$ ...(ii); $D < T$ ...(iii)
With these equations no relation can be established between D and Z, and Z and T.

46. (c) $N = P$, $P \leq F$, $F \geq L$ and $L = K$
$\therefore N = P \leq F \geq L = K$
I. $F = K \Rightarrow$ false (because F is greater than and equal to L so, F is also greater than and equal to K. So, true will be $F \geq K$)
II. $F > K \Rightarrow$ false
(But either F is greater than or equal to so, Either I or II will be true)

$F \geq K$ — and — ($F > K$, $F = K$)] Either

47. (d) $Z > T$, $T < M$, $M \leq J$
$\therefore Z > T < M \leq J$
(I) $T = J$
(II) $J > Z$ = False

48. (e) $Q = Z$, $C \geq G$, $G \geq Q$, $Q \geq R$, $J \geq C$
$\therefore J \geq C \geq G \geq Q \geq R$, $Q = Z$
I. $G \geq Z \Rightarrow$ True
II. $C \geq R \Rightarrow$ True

49. (d) $A > B > C$, $D > E > F$, $D > C$
$\therefore A > B > C < D > E < F$
I. $E > C \Rightarrow$ False
II. $F > B \Rightarrow$ False

50. (d) $K > L$, $K > M$, $M \geq N$, $N > O$
$\therefore L < K > M \geq N > O$
I. $O > M \Rightarrow$ False
II. $O > K \Rightarrow$ False

51. (b) **Statement** $P \geq Q = R > S > T$
Conclusions
I. $P \geq T$ (It cannot follows, because $R > S > T$. If the conclusions were $P \geq R$, then it would be correct.)
II. $T < Q$ (It follows.)
So, only Conclusion II follows.

52. (d) **Statement** $L \leq M < N > O \geq P$
Conclusions
I. $M > O$ (It cannot follow because $M < N \geq O$.)
II. $N \geq P$ (It cannot follow)
So, neither Conclusion I nor II follows.

53. (e) **Statement** $A > B$, $B \geq C = D < E$
$\therefore A > B \geq C = D < E$
Conclusions
I. $A > C$ (It follows because $A > B \geq C$)
II. $B \geq D$ (It also follows because $B \geq C = D$)
So, both Conclusions I and II follow.

54. (a) **Statements** $H > J = K$, $K \geq L$, $L > T$, $T < V$
$\therefore H > J = K \geq L > T < V$
Conclusions
I. $K > T$ (It follows because $K \geq L < T$)
II. $H \geq L$ (It does not follows because $H > J = K \geq L$)
So, only Conclusion I follows.

55. (e) **Statements** $A \leq B = C$, $D > C = E$
$\therefore A \leq B = C = E < D$
Conclusions
I. $E \geq A$ (It follows because $E = C = B \geq A$)
II. $A < D$ (It follows because $D > B \geq A$)
So, both Conclusions I and II follow.

56. (c) Conclusion $S < P$ is definately true from the expression $P > Q = R \geq S < T \leq U$.

57. (c) Conclusion $D > B$ is definately false from the expression $A < B \leq C = D \geq E$.

58. (d) Conclusion $P \gtrless R$ is definately true from the expression $M \geq P < N = O \geq R$.

59. (a) Symbols $\geq$, $=$, $>$, $\geq$ will make the expression meaningful to make the conclusion $P < K$ and $O \leq K$ definately true
$K \geq L = O > P \geq Q$.

60. (c) Letters C, E, A, B and D will make the expression meaningful to make the conclusion $D < A$ definitely false.
$C > E = A \leq B < D$.

61. (d) **Statements :** $D \leq A \leq C$, $N \geq B = E$, $N = F > D$
$\therefore E = B \leq N = F > D \leq A < C$
Conclusions :
I. $F \geq E$ (True)
II. $C < D$ (False)
III. $N \geq A$ (False)
IV. $B \leq F$ (True)

So, only I and IV are true.

62. (b) **Statement :** $B > E \geq L, N = G \geq B, M \leq P < L$
$\therefore N = G \geq B > E \geq L > P \geq M$
Conclusions
I. $G \geq L$ (False)
II. $E > P$ (True)
III. $B > M$ (True)
IV. $M < N$ (True)
So, only II, III and IV are true.

63. (e) **Statements :** $H < A \leq V < L, M = H, J > K \geq M$
$\therefore J > K \geq M = H < A \leq V < L$
Conclusions :
I. $L > M$ (True)
II. $A \leq K$ (False)
III. $J > V$ (False)
IV. $K < L$ (False)
So, only I is true.

64. (a) **Statements :** $E \leq N \geq T \leq R, P \geq Q = R$
$\therefore E \leq N \geq T \leq R = Q \leq P$
Conclusions :
I. $P \geq T$ (True)
II. $Q \leq N$ (False)
III. $R \geq E$ (False)
IV. $N \leq P$ (False)
So, only I is true.

65. (b) **Statements :** $R > S = T \leq U, P = K > M \geq U$
$\therefore R > S = T \leq U \leq M < K = P$
Conclusions:
I. $R > K$ (False)
II. $M \geq T$ (True)
III. $P > U$ (True)
IV. $S \leq M$ (True)
So, only II, III and IV are true.

66. (b) Conclusion $S < R$ is definately true from the expression $R > O = A > S < T$.

67. (b) Sign, '>' will make the expression proper to conclude $P > A$ and $T < L$ definately true.

68. (d) Sign, >, =, =, will complete the expression to conclude '$B > N$' as well as '$D \leq L$' definately true.

69. (e) Expression $P \leq N < A > L$ will make the conclusion $A < P$ definately.

70. (c) Expression $F < O = U = N < D$, will make the conclusion '$F > N$' and '$U > D$' definately false.

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