Logical Reasoning

Directions for question 1 – 4: Read the following passage and answer the questions that follow.

Shoaib, Tauqir, Usman, Vusi and Wasim are members of a detective agency. To maintain impersonification, they operate under the code names S, T, U, V and W not necessarily in that order.
Following are the details pertaining to their impersonification:

I. If Tauqir is U, then Vusi is V.
II. If Shoaib is T, then Usman is V.
III. If Vusi is not W, then Wasim is V.
IV. Shoaib is T if and only if Tauqir is V or S.
V. If Usman is not W, then Tauqir is not S.
VI. Vusi is U and Wasim is not V if and only if Tauqir is T.
VII. If Shoaib is U, then Usman is W.

Q1. Who operates under the name 'U'?

A. Shoaib
B. Usman
C. Tauqir
D. Vusi

Q2. Who operates under the name 'T'?

A. Shoaib
B. Tauqir
C. Usman

D. Vusi

Q3. Under what name does Tauqir operate?

A. S
B. T
C. U
D. W

Q4. Under what name does Wasim operate?

A. S
B. T
C. U
D. V

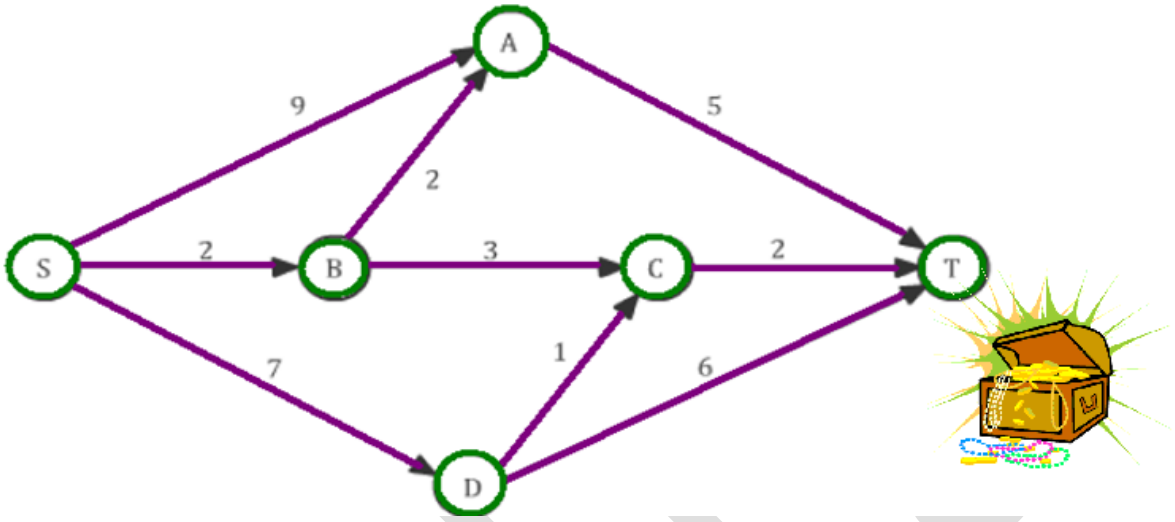
Solution -

From (I), if Tauqir is U, then Vusi is V. However we cannot conclude that if Vusi is V, then Tauqir is U.
Let us assume that Tauqir is U. Then, Vusi is V.
From (III), as Vusi is not W, Wasim is V. But both Vusi and Wasim cannot be V.
So, our assumption that Tauqir is U is itself not valid.
∴ Tauqir is not U.
If Tauqir is V, then Shoaib is T [from IV]. In such a case, Usman is V [from II]. Once again it is not acceptable, as Tauqir and Usman both cannot be V.
∴ The assumption made that Tauqir is V is invalid.
∴ Tauqir is not V.
If Tauqir is S, then Shoaib is T [from IV]. In this case, Usman is V [from II]. As Usman is not W, Tauqir is not S [from V]. This contradicts the assumption that Tauqir is S. So, this is also invalid.
∴ Tauqir is not S.
As Tauqir is neither V nor S, it is clear from (IV) that Shoaib is not T.

If Vusi is V, then Vusi is not W and thus Wasim is V [From (III)]. This is not possible, as both Vusi and Wasim cannot be V.
∴ Vusi is not V.
Tauqir can either be only T or W. Now if Tauqir is T, Vusi is U and Wasim is not V [from VI].
But if Vusi is U, then Vusi is not W and thus Wasim must be V, according to (III).
∴ Tauqir is not T.
Let us summarize the findings till now.
Shoaib: Not T
Tauqir: Not U, Not S, Not V and Not T
Vusi: Not V
So, the only possibility is that Tauqir is W.
From (VI), Vusi is U and Wasim is not V, if and only if Tauqir is T. Now, as Tauqir is not T, it follows that Vusi is not U. It also follows that Wasim is V.
If Shoaib is U, then Usman is W [from VII]. But we know that Tauqir is W, so Usman is not W.
∴ It follows that Shoaib is not U.
Now, Shoaib is not U, Shoaib is not T, Shoaib is not W (as Tauqir is W) and Shoaib is not V (as Wasim is V).
∴ Shoaib is S.
Also, Vusi is neither S nor V or W. Also, Vusi is not U.
∴ Vusi is T. Thus, Usman has to be U.
So Shoaib, Tauqir, Usman, Vusi and Wasim operate under the names of S, W, U, T and V respectively.

Directions for questions 5 – 9 : Answer the questions based on the information given below.
The All Mumbai Treasure Hunt is going on. It starts from point S and ends at point T. Points A, B, C, D are junctions in between the two points and the routes to point T from point S are as indicated below. Time (in hours) to reach the destination by traveling along a path is indicated by the number adjacent to the

path. Apart from that at every point A, B, C, D, exactly one task is to be performed that takes a certain integral number of hours (E.g. 0,1,2,3….Hours).



Participants travelling from point S to point T would obviously take the route for which the total hours of travelling is minimum, so as to arrive at treasure point T the fastest. If two or more routes have the same number of travel hours, then participants will choose either of them. As a result of this, all participants travel evenly across all the least hour routes.

The organizers can control the number of participants travelling along a path only by changing the number of hours taken to perform a task at each junction. For example, if a participant takes the route S-A-T (using junction A alone), then the total hours of travel would be 14 hours (i.e. 9+5) plus the time taken at junction A to perform a task.

5) If the organizers want to ensure that all participants travelling from S to T take the same time (travelling time and task time combined) regardless of the route they choose and the street from B to C is under repairs (and hence unusable), then a feasible set of task time (in hours) at junctions A, B, C, and D respectively to achieve this goal is:
a) 2,5,3,2

b) 0,5,3,1

c) 1,5,3,2

d) Both (b) and (c)

6) If the organizers want to ensure that no participant should travel on the street from D to T, while equal number of participants should travel through junctions A and C, then a feasible set of task time (in hours) at junctions A, B, C, and D respectively to achieve this goal is:

a) 0,5,2,2

b) 1,4,4,3

c) 1,5,4,2

d) 0,5,2,3

7) If the organizers want to ensure that all routes from S to T get the same number of participants, then a feasible set of task time (in hours) at junctions A, B, C, and D respectively to achieve this goal is:

a) 0,5,2,2

b) 0,5,4,1

c) 1,5,3,3

d) 1,5,3,2

8) If the organizers want to ensure that the number of participants at S gets evenly distributed along streets from S to A, from S to B, and from S to D, then a feasible set of task time (in hours) at junctions A, B, C, and D respectively to achieve this goal is:

a) 0,5,4,1

b) 0,5,2,2

c) 1,5,3,3

d) 1,5,3,2

9) The organizers want to devise a task time policy such that the total time for the participants to reach the treasure is minimized. The policy should also ensure that not more than 70 per cent of the total traffic passes through junction B. The time taken by the participants in travelling from point S to point T under this policy will be:

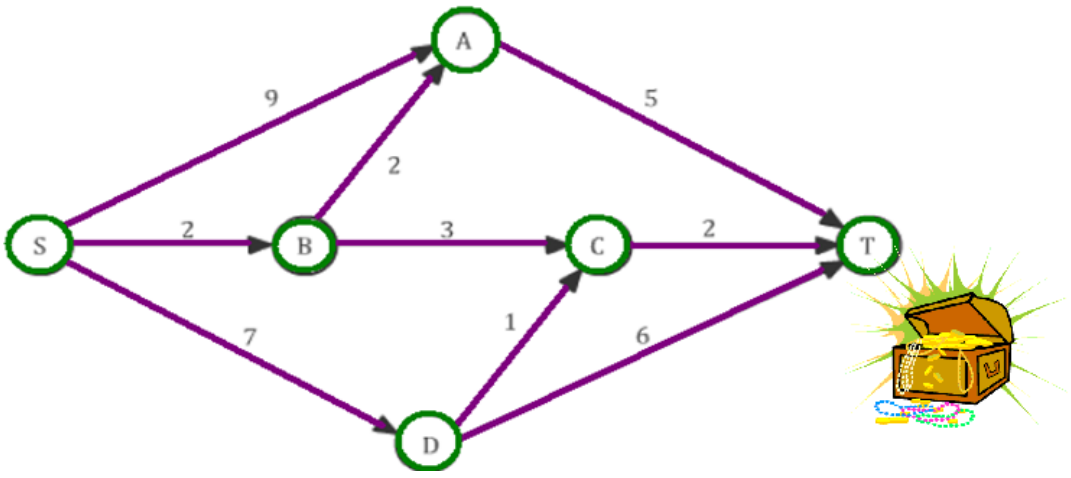
a) 7 hours

b) 9 hours

c) 10 hours

d) 13 hours

Solutions for questions 5-9 -



The possible routes are -

Route	Total Time	Junction
S – A – T	14	A
S – B – A – T	9	A,B
S – B – C – T	7	B , C
S – D – C – T	10	C, D
S – D – T	13	D

It is given that, for each of the routes, the only way to increase the total time is to impose task time at the junctions. Let the task time at A, B, C, D be a, b, c, d hours respectively.

Now, the total time for each of the five routes will be as follows.

Route	Total Time
S – A – T	14 + a
S – B – A – T	9 + (a + b)
S – B – C – T	7 + (b + c)
S – D – C – T	10 + (c + d)
S – D – T	13 + d

5) As B – C is unusable; S – B – C – T is not possible. From the remaining options, if we apply all of them:

Route	**Option a**	**Option b**	**Option c**	**Option d**
S-A-T	**16**	**14**	**15**	**-**
S-B-A-T	**16**	**14**	**15**	**-**
S-D-C-T	**15**	**14**	**15**	**-**
S-D-T	**15**	**14**	**15**	**-**

Both option (b) and (c) are true, as in both the cases total time is same for each of the four routes.

6) No traffic flows from D – T. Now apply each of the options. New time will be as follows.

Route	Option a	Option b	Option c	Option d
S-A-T	**14**	**15**	**15**	**14**
S-B-A-T	**14**	**14**	**15**	**14**
S-B-C-T	**14**	**15**	**16**	**14**
S-D-C-T	**14**	**17**	**16**	**15**
S-D-T	**15**	**16**	**15**	**16**

As it is given that traffic flow at junction A is same as that at junction C.
∴ Number of routes involving A that can be used must be same as that involving C. Further, only the routes with minimum time will be used.
Among the routes that can be used, this happens only in (a). The number of routes involving A is two (S-A-T and S-B-A-T) and that involving C is also two (S-B-C-T and S-D-C-T) in (a).

7) From the given options, new times will be as follows -

Route	Option a	Option b	Option c	Option d
S-A-T	**14**	**14**	**15**	**15**
S-B-A-T	**14**	**14**	**15**	**15**
S-B-C-T	**14**	**16**	**15**	**15**
S-D-C-T	**14**	**15**	**16**	**15**
S-D-T	**15**	**14**	**16**	**15**

Since the organizers want to ensure that all routes from S to T get the same number of participants, the time must be same for all the routes. So it must be option (d).

8) From the given options -

Route	Option a	Option b	Option c	Option d
S-A-T	**14**	**14**	**15**	**15**
S-B-A-T	**14**	**14**	**15**	**15**
S-B-C-T	**16**	**14**	**15**	**15**
S-D-C-T	**15**	**14**	**16**	**15**
S-D-T	**14**	**15**	**16**	**15**

It is very likely that option (d) is selected. But if all the five routes have the same time taken, then there will be an equal number of participants in all the five routes i.e. 20% in each route.
But then the percentage of participants in -
S-A = 20%
S-B = 40% (As there are two routes involving S-B)
S-D = 40% (For the same reason as above)

But here the given condition is that number of participants in S-A is equal to that in S-B, which in turn is equal to S-D, which is not satisfied.
As S-A = S-B = S-D, of the routes that can be used, the number of routes involving S-A must be the same as S-B, which in turn must be same as that of S-D. It happens only in option (a) where, in the minimum time of 14 hours, all of S-A, S-B, S-D is preferred equally.

9) There must be another route other than those involving B with the least time as at most only 70% participants can use this route.
Also, the other route should take time equal to the route through B. The minimum time for the other route will be through route S-D-C-T which is 10 hours (if task time at C and D is 0).

In that case, for route S-B-C-T, the total time = 10 hours (if task time at B = 3 hours).
∴ 10 hours is the least time.

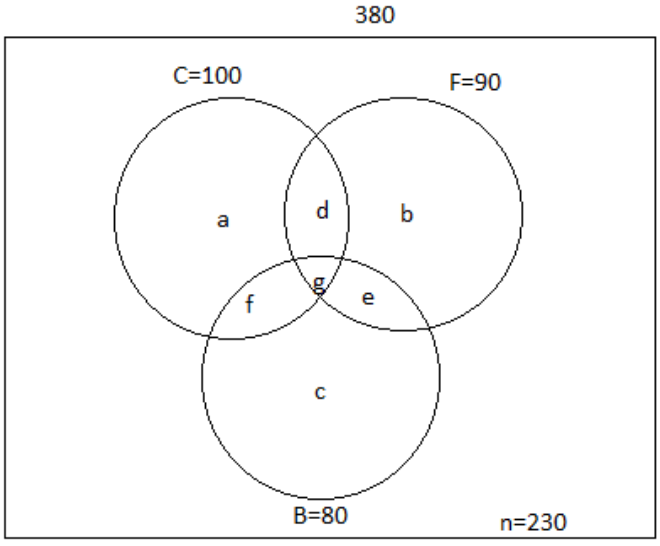
(Created) Directions for question 10 to 13: Read the following information and answer the questions given below:

In a survey conducted, it is found that of the 380 people surveyed, 100 people like cricket, 90 people like football, 80 people like basketball, 230 people like none of these.

10. If 15 people like only football, then what is the maximum number of people who like all the three games?

Answer: 45

Solution:



a + b + c + d + e+ f + g + 230 = 380

$\Rightarrow$ a + b + c + d + e + f + g = 150

Given, b = 15

a + 15 + c + d + e + f + g = 150

$\Rightarrow$ a + c + d + e + f + g = 135

But a + f + d + g = 100

$\Rightarrow$ c + e = 35

And c+ e + f + g = 80

$\Rightarrow$ a + d = 55

$\therefore$ f + g = 45

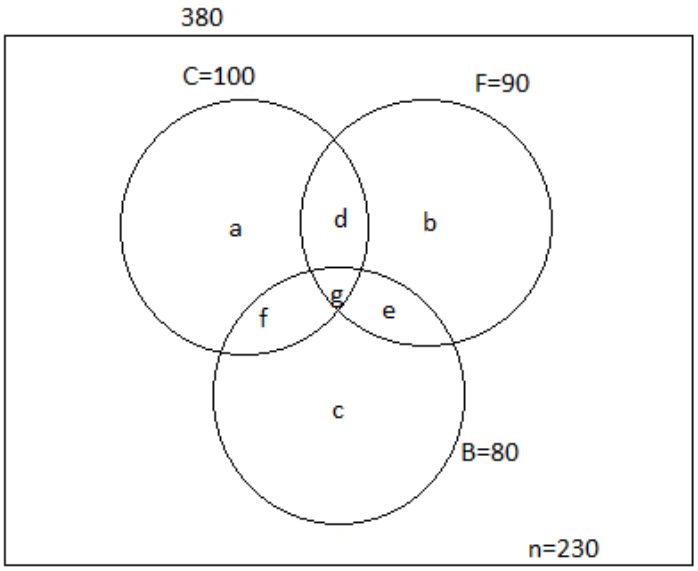
G will be the maximum when f = 0

$\therefore$ g = 45

11. What is the maximum possible number of people who like exactly two out of 3 games?

Answer: 120

Solution:



a + b + c + d + e + f + g = 150 … (1)

a + d + g + f = 100 … (2)

b + d + e + g = 90 … (3)

c + f + e + g = 80 … (4)

Adding (2) + (3) + (4) and subtracting from (1)

$\Rightarrow$ 100+90+80-(e+d+f)-2g = 150

$\Rightarrow$ e + d + f + 2g = 120

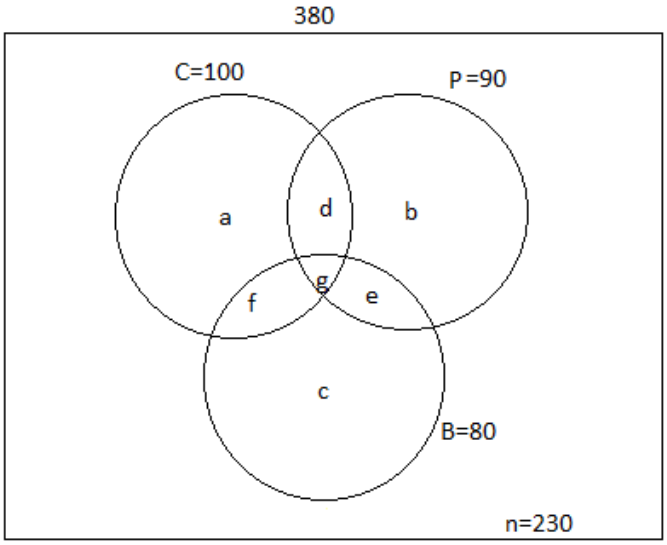
$\Rightarrow$ e + d + f will be maximum when g = 0

$\therefore$ e + d + f = 120

12. If 10 people like all the three games, then what is the number of people who like exactly one game?

Answer: 40

Solution:



a + b + c + d + e + f + g = 150

Given, g = 10

e + d + f + 2g = 120

$\Rightarrow$ e + d + f = 100

But a + b + c + d + e + f + g = 150

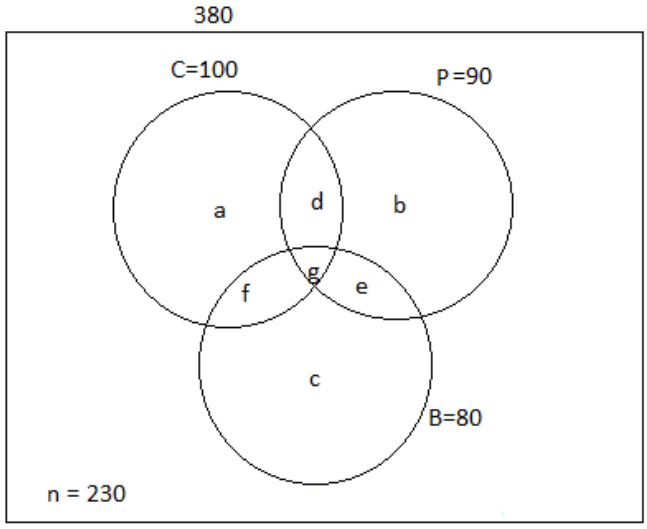
$\Rightarrow$ a + b + c + 100 + 10 = 150

$\Rightarrow$ a + b + c = 40

13. What is the maximum possible number of people who like exactly one game?

Answer: 90

Solution:



a + b + c + d + e + f + g = 150…(1)

e + d + f + 2g = 120

$\Rightarrow$ e + d + f = 120 – 2g…(2)

Putting (2) in (1), we get –

a + b + c + 120 - g = 150

$\Rightarrow$ a + b + c = 30 + g

Thus, a + b + c is maximum when g is maximum.

$\therefore$ 0 + 2g = 120 $\Rightarrow$ g = 60

$\therefore$ a + b + c = 30 + 60 = 90

Directions for question 14 – 17: Answer the questions based on the information given below:

A state court is staffed by exactly eight judges -- R, S, T, U, V, W, X and Y. At the beginning of each session of the court, the clerk of the court announces two panels of three judges each, one to hear criminal cases and the other to hear civil cases.

(a) No judge can serve on more than one panel at one session of the court.

(b) At least two members of the panel hearing criminal cases must have had prior experience with criminal cases. The judges with experience in criminal cases listed in order of descending seniority are R, S, T, U.

(c) At least two members of the panel hearing civil cases must have had prior experience with civil cases. The judges with experience in civil cases, listed in order of descending seniority are V, W, X, Y.

(d) The president judge of each panel is the judge among the three on the panel with the greatest seniority in the area of the cases.

(e) Each of the three major geographical regions of the state must be represented on every panel by exactly one judge. Judges S & W are from the western part of the state, Judges R, U and Y are from the central part of the state and judges T, V and X are from the eastern part of the state.

(e) If a judge cannot serve on a panel because of illness or conflict of interests, his or her place can be taken only by a judge who satisfies the necessary conditions for the panel.

14) Which of the following could be the panel of judges selected to hear civil cases?

(a) R, S, V

(b) S, U, X

(c) T, W, Y

(d) V, X, Y

Solution:

Both R, S, V and S, U, X violate condition (c). V, X, Y violates condition (e). Only T, W, Y satisfies all the given conditions.

15) If X is the presiding judge of the panel selected for the civil cases, which of the following must be the other two members of that panel?

(a) R & W

(b) S & U

(c) S & Y

(d) U & V

Solution:

Since X is the presiding judge, the next experienced civil judge lower in seniority is Y. Now, the remaining judge will be from the third geographical region which is S.

16) Which of the following could be the panel of judges selected to hear criminal cases?

(a) R, S, X

(b) R, V, W

(c) S, T, W

(d) T, U, X

Solution:

Option (b) is eliminated as there has to be two judges experienced in criminal cases. Option (c) is eliminated as S & W belong to the same region. Option (d) is eliminated as T & X belong to the same region.

17) The judges selected to serve on any panel announced by the clerk of the court must include either:

(a) R or U

(b) R or Y

(c) T or V

(d) S or W

Solution:

Both S and W are from the western part of the state and whatever panel is selected; should include 1 judge from the western part of the state. So, the panel of three judges must include either S or W.