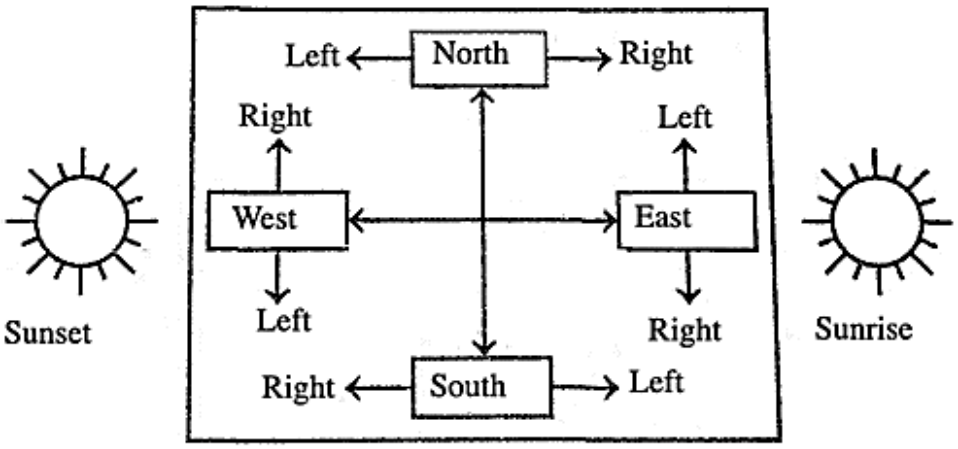
Distance and Direction Sense Test

Direction is the measurement of position of one object with respect to another object and displacement is the minimum distance between the starting point and final point of an object.

Main Directions

There are four main directions *viz*. East, West, North and South as shown in the figure given below

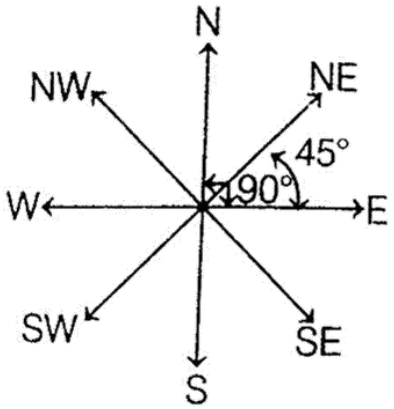


Main directions

Abbreviations for these directions are E (East), W (West), N (North) and S (South).

Cardinal Directions

A direction between two main directions is called cardinal direction or sub-direction, i.e., NE (North-East), NW (North-West), SE (South-East) and SW (South-West).



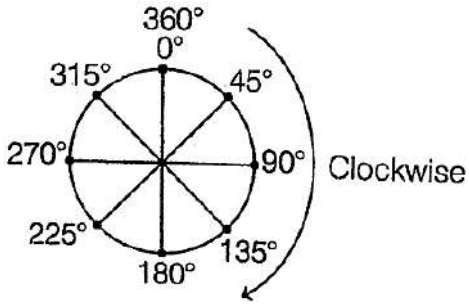
Students are advised to use diagram as given here, for the purpose of sensing directions.

Angle formed between two main directions (i.e., North-East; North-West; South-East or South-West) is 90° and angle formed between a cardinal direction and main direction is 45°.

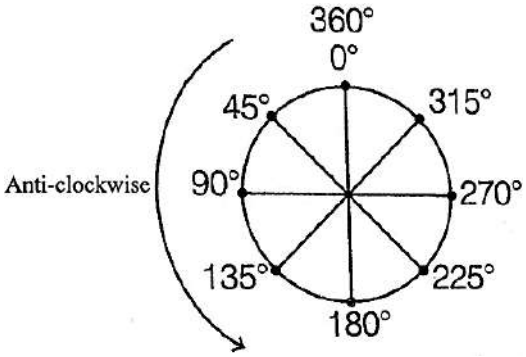
Angle of Movement

For solving questions based on angle of movement, it is necessary to know the rotations which are given below

(i) Movement towards the right is called clockwise (CW) movement.

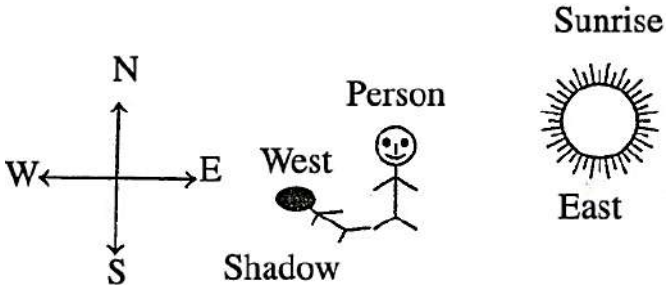


(ii) Movement towards the left is called anti-clockwise (ACW) movement.



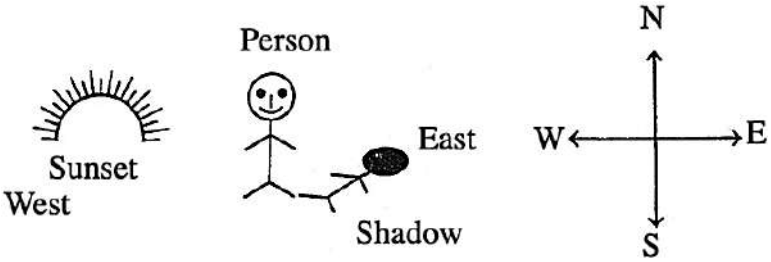
Shadow at the Time of Sunrise

In the morning, sunrise in the East, the shadow of any person or object falls in the West.



Shadow at the Time of Sunset

In the evening, when the sunset in the West, the shadow of a person or an object falls in the East.



Shortest Distance

If we draw a straight line from the initial point of the object to the final point, then length of this line is called shortest distance.

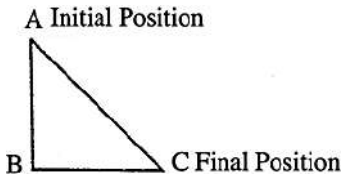
e.g., An object starts from point A and reaches to point C after going through point B.

Then, **distance between initial and final position = AB + BC**

But shortest distance between initial and final position = AC

To find the shortest distance between two points, it is necessary to know Pythagoras theorem.

Here, in Δ ABC



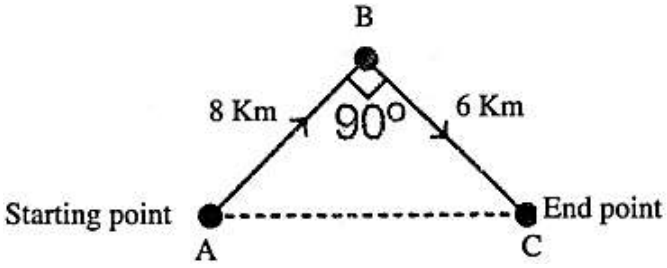
AB = Perpendicular, BC = Base and AC = Hypotenuse. Hence, the shortest distance between A and C

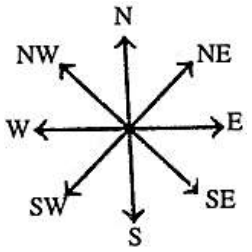
i.e., $AC = \sqrt{AB^2 + BC^2}$.

Example 1: Ravi walks 8 km North-East and then 6 km South-East. Find the total distance as well as shortest distance between starting and end points.

A. 14 km, 12 km ***B.*** 14 km, 10 km ***C.*** 10 km, 8 km ***D.*** 8 km, 6 km

Solution: (B) According to the question,





Here, total distance = AB + BC = 8 + 6 = 14 km

and shortest distance $AC = \sqrt{AB^2 + BC^2} = \sqrt{8^2 + 6^2} = \sqrt{64 + 36} = \sqrt{100}$ = 10 km.

Types of Reasoning Questions on Direction Sense

There are four types of questions which are generally asked in various competitive examinations.

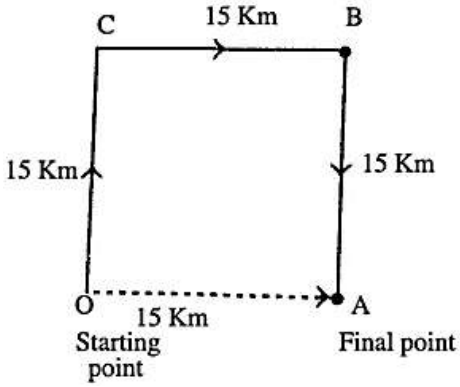
Type #1: Based on Final Direction

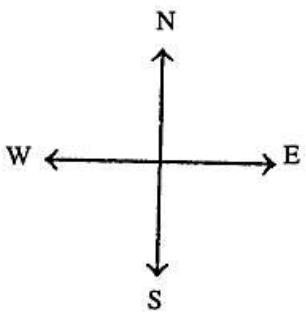
These question are based on finding the final direction of an object with respect to its starting point.

Example 1: Suman walks 15 km towards North. She turns right and walks another 15 km. She turns right and walks another 15 km. In which direction is she from the starting point?

A. North ***B.*** South ***C.*** East ***D.*** West

Solution: (C) According to the question, the direction diagram of Suman is a given below.



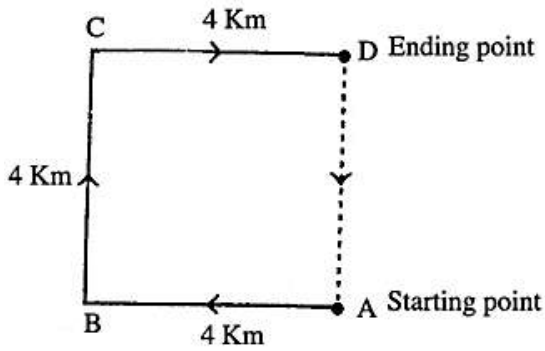


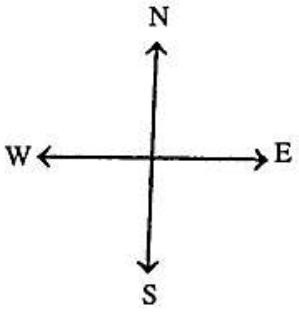
Let O be the starting point and A be ending point of Suman. It is clear from the diagram that, she is in East direction from her starting point.

Example 2: After starting from a point, a man walks 4 km towards West, then turning to his right he moves 4 km. After this, he again turns right and moves 4 km. Which choice given below indicates the correct direction in which he is from his starting point?

A. North ***B.*** East ***C.*** South ***D.*** West

Solution: (A) According to the question, the direction diagram of a man is as given below



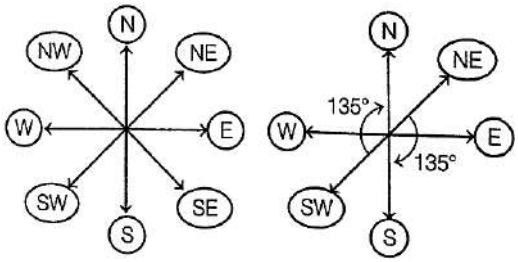


Let A be the starting and D be the ending point of man. It is clear from diagram that, he is in North direction from his starting point.

Example 3: If South-West becomes North, then what will North-East be?

A. North ***B.*** South-East ***C.*** South ***D.*** East

Solution: (C) The diagrammatic representation of direction is as shown below

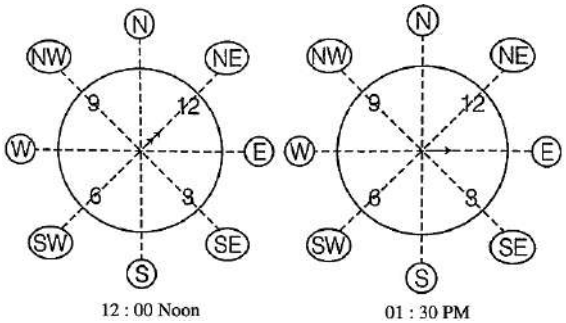


Clearly, directions are moving 135° clockwise. Hence, North-East will become South moving 135° clockwise.

Example 4: A clock is so placed that at 12 noon its minute hand points towards North-East. In which direction does its hour hand point at 1:30 pm?

A. North ***B.*** South ***C.*** East ***D.*** West

Solution: (C) In this question, the clock is placed, so that at 12 noon its minute hand point towards North-East. We know that, minute and hour hand point in the same direction at 12 noon. Therefore, the clock will look somewhat like this

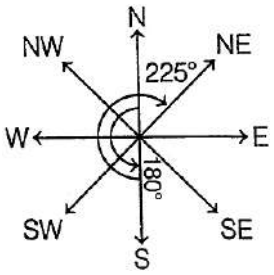


At 1 : 30 pm, the hour hand will point in the East direction.

Example 5: A girl is facing North. She turns 180° in the anti-clockwise direction and then 225° in the clockwise direction. Which direction is she facing now?

A. West ***B.*** North-East ***C.*** South-West ***D.*** East ***E.*** North-West

Solution: (B) The girl turns 180° in anti-clockwise direction and then 225° in the clockwise direction, which means she finally turns 45° in clockwise direction.

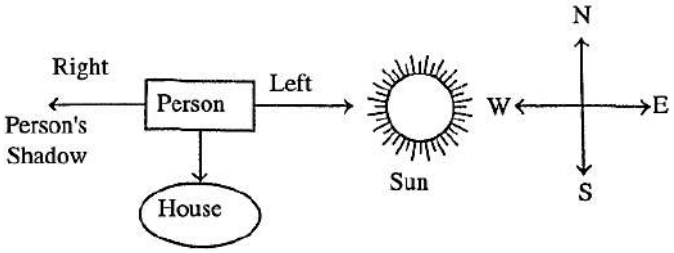


Initially she was facing North. So, now she is facing North-East direction.

Example 6: A person walks towards his house at 8:00 am and observes his shadow to his right. In which direction he is walking?

A. North ***B.*** South ***C.*** East ***D.*** west

Solution: (B) At 8:00 am the Sun is in the East direction.



Clearly, the person is walking towards the South direction.

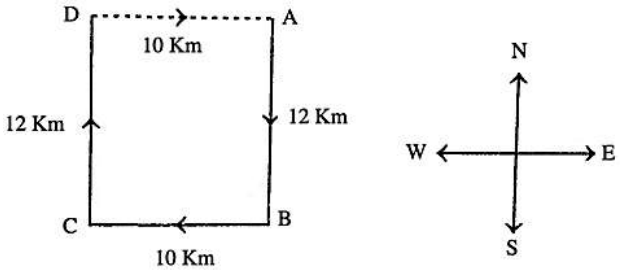
Type #2: Based on Displacement

In this type of questions, we have to find out the final distance between the starting and the final points or distance between two points/persons/things.

Example 1: Vijay travelled 12 km Southward, then turned right and travelled 10 km, then turned right and travelled 12 km. How far was Vijay from the starting point?

A. 22 km ***B.*** 44 km ***C.*** 12 km ***D.*** 10 km

Solution: (D) According to the question, direction diagram of Vijay is a given below.



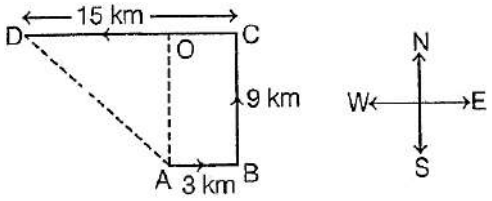
Let point A be the starting point and D be the final point of travelling of Vijay.

Now, Vijay's distance from starting point = AD = BC = 10 km

Example 2: A person starts from a point A and travels 3 km Eastwards to B and then turns left and travels thrice that distance to reach C. He again turns left and travels five times the distance he covered between A and B and reaches his destination D. The shortest distance between the starting point and the destination is

A. 12 km ***B.*** 15 km ***C.*** 16 km ***D.*** 18 km

Solution: (B) According to the question, the movements of the person are as given below



According to the question, BC = (3×3) = 9 km, CD = (3×5) = 15 km

$\therefore$ OD = $(15 - 3)$ = 12 km

Now, required distance,

$$AD = \sqrt{OD^2 + OA^2} = \sqrt{12^2 + 9^2} = \sqrt{144 + 81} = \sqrt{225} = 15 \text{ km}$$

Type #3: Based on Direction and Displacement

In this type of questions, we have to determine both the distance and direction.

Example 1: Shyam, goes 5 km in the North from his school. Now, turning to the left, he goes to 10 km and again turns to left and goes to 5 km. How far he is from his school and in which direction?

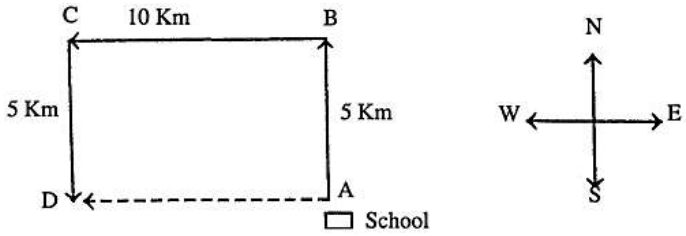
A. 10 km, South from school

B. 10 km, North from school

C. 10km, West from school

D. 10 km, East from school

Solution: (C) According to the question, the movements of Shyam are given below



Let point A be the starting point, i.e., school of Shyam and point D be the final point.

From figure, AB = CD = 5 km and AD = BC = 10 km.

So, Shyam is 10 km far away from his school and in West direction from school.

Example 2: x and Y start from the same point X walks 40 m North, then turns West and walks 80 m, then turns to his right and walks 50 m. At the same time, Y walks 90 m North. Where is Y now with respect to the position of X?

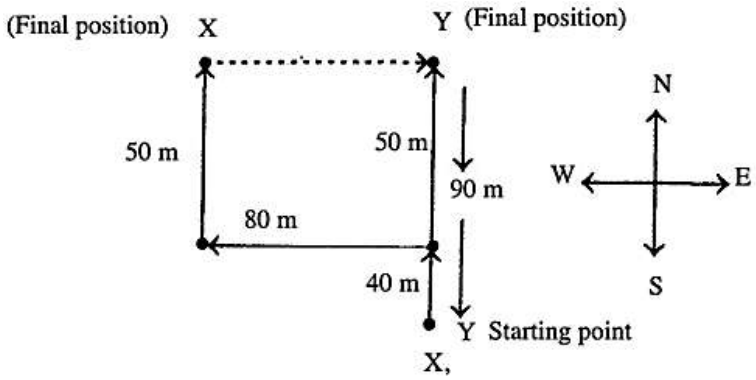
A. Y is 30 m to the East of X

B. Y is 80 m to the West of X

C. Y is 30 m to the west of X

D. Y is 80 m to the East of X

Solution: (D) According to the question, diagram is as given below



It is clear from diagram that, Y is 80 m to the East of X.

Exercise

Q. 1. Rahul put his timepiece on the table in such a way that at 6 P.M. hour hand points to North. In which direction the minute hand will point at 9.15 P.M. ?

A. South-East **B.** South **C.** North **D.** West

Q. 2. One evening before sunset Rekha and Hema were talking to each other face to face. If Hema's shadow was exactly to the right of Hema, which direction was Rekha facing?

A. North **B.** South **C.** East **D.** Data is inadequate

Q. 3. Y is in the East of X which is in the North of Z. If P is in the South of Z, then in which direction of Y, is P?

A. North **B.** South **C.** South-East **D.** None of these

Q. 4. One morning Udai and Vishal were talking to each other face to face at a crossing. If Vishal's shadow was exactly to the left of Udai, which direction was Udai facing?

A. East **B.** West **C.** North **D.** South

Q. 5. A man walks 5 km toward south and then turns to the right. After walking 3 km he turns to the left and walks 5 km. Now in which direction is he from the starting place?

A. West **B.** South **C.** North-East **D.** South-West

Q. 6. If South-East becomes North, North-East becomes West and so on. What will West become?

A. North-East **B.** North-West **C.** South-East **D.** South-West

Q. 7. K is 40 m South-West of L. If M is 40 m South-East of L, then M is in which direction of K?

A. East **B.** West **C.** North-East **D.** South

Q. 8. Some boys are sitting in three rows all facing North such that A is in the middle row. P is just to the right of A but in the same row. Q is just behind of P while R is in the North of A. In which direction of R is Q?

A. South **B.** South-West **C.** North-East **D.** South-East

Q. 9. A boy rode his bicycle Northward, then turned left and rode 1 km and again turned left and rode 2 km. He found himself 1 km west of his starting point. How far did he ride northward initially?

A. 1 km **B. 2 km** **C. 3 km** **D. 5 km**

Q. 10. Rasik walked 20 m towards north. Then he turned right and walks 30 m. Then he turns right and walks 35 m. Then he turns left and walks 15 m. Finally, he turns left and walks 15 m. In which direction and how many metres is he from the starting position?

A. 15 m West **B.** 30 m East **C.** 30 m West **D.** 45 m East

Q. 11. Starting from the point X, Jayant walked 15 m towards west. He turned left and walked 20 m. He then turned left and walked 15 m. After this he turned to his right and walked 12 m. How far and in which directions is now Jayant from X?

A. 32 m, South **B.** 47 m, East **C.** 42 m, North **D.** 27 m, South

Q. 12. The length and breadth of a room are 8 m and 6 m respectively. A cat runs along all the four walls and finally along a diagonal order to catch a rat. How much total distance is covered by the cat?

A. 10 m **B. 14 m** **C. 38 m** **D. 48 m**

Q. 13. If A x B means A is to the south of B; A + B means A is to the north of B; A % B means A is to the east of B; A - B means A is to the west of B; then in P % Q + R - S, S is in which direction with respect to Q?

A. South-West **B.** South-East **C.** North-East **D.** North-West

Q. 14. P started from his house towards west. After walking a distance of 25 m. He turned to the right and walked 10 m. He then again turned to the right and walked 15 m. After this he is to turn right at 135^0 and to cover 30 m. In which direction should he go?

A. West **B.** South **C.** South-West **D.** South-East

Q. 15. A man is facing north. He turns 45 degree in the clockwise direction and then another 180 degree in the same direction and then 45 degree in the anticlockwise direction. Find which direction he is facing now ?

A. North **B.** East **C.** West **D.** South

Q. 16. A child is looking for his father. He went 90 meters in the east before turning to his right. He went 20 meters before turning to is right again to look for his father at his uncle's place 30 meters from this point. His father was not there. From there, he went 100 meters to his north before meeting his father in a street. How far did the son meet his father from starting point ?

A. 80 m **B. 90 m** **C. 100 m** **D. 110 m**

Directions to Solve (Q. 17 to Q. 19)

Each of the following questions is based on the following information:

1. Eight trees – mango, guava, papaya, pomegranate, lemon, banana, raspberry and apple are in two rows 4 in each facing North and South.

2. Lemon is between mango and apple but just opposite to guava.

3. Banana is at one end of a line and is just next in the right of guava or either banana tree is just after guava tree.

4. Raspberry tree which at one end of a line, is just diagonally opposite to mango tree.

Q. 17. Which of the following statements is definitely true?

A. Papaya tree is just near to apple tree.

B. Apple tree is just next to lemon tree.

C. Raspberry tree is either left to Pomegranate or after.

D. Pomegranate tree is diagonally opposite to banana tree.

Q. 18. Which tree is just opposite to raspberry tree?

A. Papaya **B.** Pomegranate **C.** Papaya or Pomegranate **D.** Data is inadequate

Q. 19. Which tree is just opposite to banana tree?

A. Mango **B.** Pomegranate **C.** Papaya **D.** Data is inadequate

Directions to Solve (Q. 20 to Q. 22)

Each of the following questions is based on the following information:

1. A # B means B is at 1 metre to the right of A.
2. A $ B means B is at 1 metre to the North of A.
3. A * B means B is at 1 metre to the left of A.
4. A @ B means B is at 1 metre to the south of A.
5. In each question first person from the left is facing North.

Q. 20. According to X @ B * P, P is in which direction with respect to X?

A. North **B.** South **C.** North-East **D.** South-West

Q. 21. According to M # N $ T, T is in which direction with respect to M?

A. North-West **B.** North-East **C.** South-West **D.** South-East

Q. 22. According to P # R $ A * U, in which direction is U with respect to P?

A. East **B.** West **C.** North **D.** South

Directions to Solve (Q. 23 to Q. 24)

Dev, Kumar, Nilesh, Ankur and Pintu are standing facing to the North in a playground such as given below:

1. Kumar is at 40 m to the right of Ankur.
2. Dev is are 60 m in the south of Kumar.
3. Nilesh is at a distance of 25 m in the west of Ankur.
4. Pintu is at a distance of 90 m in the North of Dev.

Q. 23. Which one is in the North-East of the person who is to the left of Kumar?

A. Dev **B.** Nilesh **C.** Ankur **D.** Pintu

Q. 24. If a boy starting from Nilesh, met to Ankur and then to Kumar and after this he to Dev and then to Pintu and whole the time he walked in a straight line, then how much total distance did he cover?

A. 215 m **B. 155 m** **C. 245 m** **D. 185 m**

Directions to Solve (Q. 25 to Q. 28)

Each of the following questions is based on the following information:

1. Six flats on a floor in two rows facing North and South are allotted to P, Q, R, S, T and U.
2. Q gets a North facing flat and is not next to S.
3. S and U get diagonally opposite flats.
4. R next to U, gets a south facing flat and T gets North facing flat.

Q. 25. If the flats of P and T are interchanged then whose flat will be next to that of U?

A. P **B. Q** **C. R** **D. T**

Q. 26. Which of the following combination get south facing flats?

A. QTS **B.** UPT **C.** URP **D.** Data is inadequate

Q. 27. The flats of which of the other pair than SU, is diagonally opposite to each other?

A. QP **B.** QR **C.** PT **D.** TS

Q. 28. Whose flat is between Q and S?

A. T **B. U** **C. R** **D. P**

Directions to Solve (Q. 29 to Q. 30)

Seven poles A, B, C, D, E, F and G are put in such a way that the distance between the next two decreases by 1 meter. The distance between the first two poles, A and B, is 10 meters. Now answer the following questions.

Q. 29. If a monkey hops from pole G to pole C, then how much distance did it cover ?

A. 26 m **B. 19 m** **C. 22 m** **D. 25 m**

Q. 30. What is the distance between the first pole A and the last pole G?

A. 40 m **B. 49 m** **C. 45 m** **D. none of these**

Answer Key

Q. 1.	D	**Q. 2.**	B	**Q. 3.**	D	**Q. 4.**	C	**Q. 5.**	D
Q. 6.	C	**Q. 7.**	A	**Q. 8.**	D	**Q. 9.**	B	**Q. 10.**	D
Q. 11.	A	**Q. 12.**	C	**Q. 13.**	B	**Q. 14.**	C	**Q. 15.**	D
Q. 16.	C	**Q. 17.**	B	**Q. 18.**	C	**Q. 19.**	A	**Q. 20.**	D
Q. 21.	B	**Q. 22.**	C	**Q. 23.**	D	**Q. 24.**	A	**Q. 25.**	C
Q. 26.	C	**Q. 27.**	A	**Q. 28.**	A	**Q. 29.**	A	**Q. 30.**	C