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Distance and Direction

Introduction

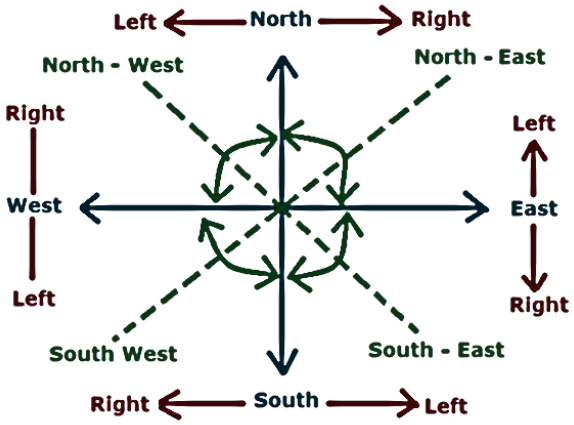
Distance and Direction as per the name this topic of reasoning deals in finding the direction and distance of a person, vehicle etc. To know how to solve the questions based on Distance and Direction, first go through the basis concept.

Basic Concept

Basically the questions based on two parts i.e. Basic Directions and Pythagoras theorem.

1. Basic Directions

There are 8 (4 main and 4 cardinal) directions North, North-East, East, South-East, South, South-West, West and North-West. To attempt questions, we must know the directions correctly. Also, if there will be no direction given in the question; always assume the person/ vehicle etc. is facing North direction.

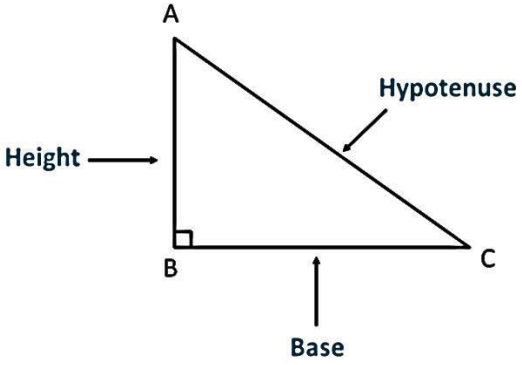


2. Pythagoras Theorem

Pythagoras theorem plays a very important role in finding direction while solving Distance and Direction questions. The longest side of the triangle is called Hypotenuse and other two sides are called base and height. Hypotenuse is always opposite to the right angle.

The Theorem says – "*The square of Hypotenuse is always equal to the sum of the squares of the other two sides of the right angle triangle*"

i.e., **Hypotenuse^2 = Height^2 + Base^2**



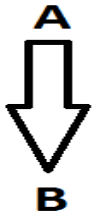
Some other basics Rules

B is to the east of A

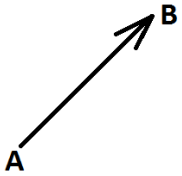
B is to the west of A

B is to the north of A

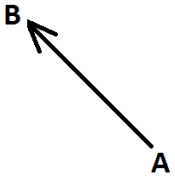
B is to the south of A



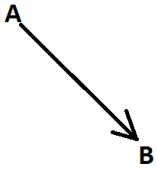
B is to the North East of A



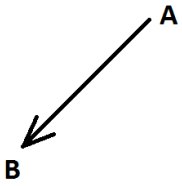
B is to the North West of A



B is to the South East of A



B is to the South West of A



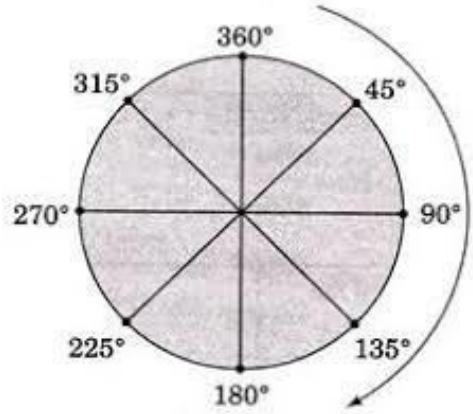
Important points to keep in mind in left right movement

- A person facing North, on taking Left will face towards West and on taking the Right turns towards East.
- A person facing West, on taking Left will face towards South and on taking Right turn towards North.
- A person facing East, on taking Left will face towards North and on taking the Right turns towards South.
- A person facing South, on taking Left will face towards East and on taking the Right turns towards West.

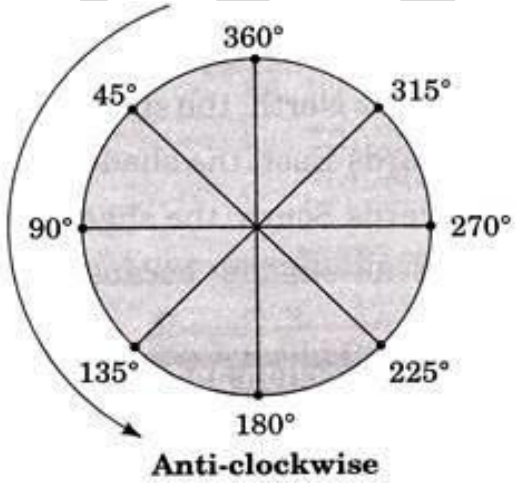
Note: If in a question, it is said that the person moved towards left or right side, and then always assume that the movement is at an angle of 90^0.

Always keep in mind, when a person moves to his left side, he or she will move in anti - clockwise direction and when a person moves to his right side, he or she will move in clockwise direction.

Clockwise Movement



Anti-Clockwise Movement



Shadow at the Time of Sunrise & Sunset

The Sun rises in the East (in Morning) and sets in the West (in Evening).

Person Facing	Shadow	
East	West/ Backside	Sunrise
West	West/ In front	
North	West/ Towards his Left	
South	West/ Towards his Right	

Person Facing	Shadow	
East	East/ In front	Sunset
West	East/ Backside	
North	East/ Towards his Right	
South	East/ Towards his Left	

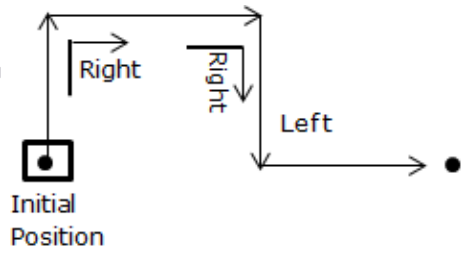
These are the basic concept that will help in solving Distance and Direction Questions. Now we are going to see types of questions that are asked in various competitive examinations.

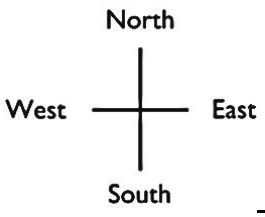
Type – 01

In this type, we are required to the find the final direction during the course of journey or direction of one person/ point/ object with respect to other.

Question 1: Akansha is moving northwards. Then she turns toward right, moves some distance and again turns to her right. After moving some distance she turns to her left. In which direction now is she going?

Solution: As per the details given in question,

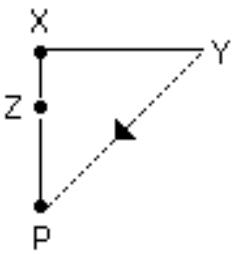




Ans.

Question 2: 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?

Solution: According to question,



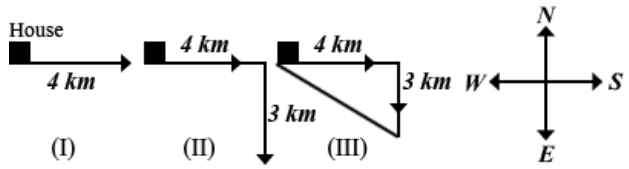
P is in South-West of Y **Ans.**

Type – 02

This type is about finding the distance between any two points during the course of journey or distance between two persons/ points/ objects.

Question 1: Tina starting from her house, goes 4 km. In the East, then she turns to her right and goes 3 km. What minimum distance will be covered by her to come back to her house?

Solution:



Minimum Distance = $\sqrt{(4)^2 + (3)^2}$

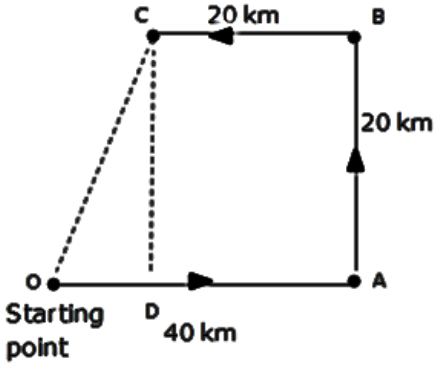
= $\sqrt{16 + 9}$

= $\sqrt{25}$

= 5 km **Ans.**

Question 2: A cyclist rides 40 km to the East, turns North and rides 20 km, again turns left and rides 20 km. How far is he from his starting point?

Solution: *According to the question*,



In ΔOCD,

OD = OA – AD = OA – BC

= 40 – 20 = 20 km

And CD = AB = 20 km

Now, required distance = OC

= $\sqrt{(CD)^2 + (OD)^2}$

= $\sqrt{(20)^2 + (20)^2}$

= $\sqrt{800}$

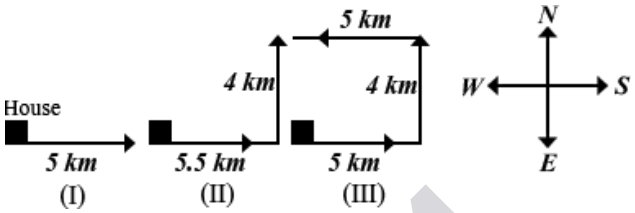
= $20\sqrt{2}$ Km **Ans.**

Type – 03

In this type, you will be asked to find the distance and direction between the initial position and final position during the course of journey or distance and direction between two persons/ points/ objects.

***Question* 1:** Priya starting from her house goes 5 km. In the East, then she turns to her left and goes 4 km. Finally she turns to her left and goes 5 km. Now how far is she from her house and in what direction?

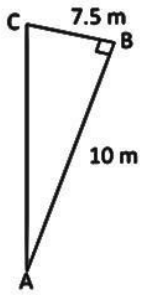
***Solution*:**



From the third position it is clear she 4km. From her house and is in the north direction **Ans.**

***Question* 2:** If you are facing north-east and move 10 m forward, turn left and move 7.5 m, and then you are

***Solution*:**



Clearly, the narrator starts from A, moves towards north-east a distance of 10 m up to B, turns left (90 degree anti-clockwise) and moves 7.5 m up to C. Clearly, C lies to the north of A. Also, ΔABC is right-angled at B. So,

$AC^2 = AB^2 + BC^2 = (10)^2 + (7.5)^2$

= 100 + 56.25 = 156.25

AC = $\sqrt{156.25}$ m = 12.5m

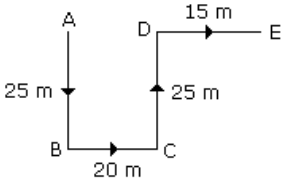
Thus the narrator is 12.5 m to the north of his initial position **Ans.**

Extra Question

Question 1: Rohit walked 25 m towards south. Then he turned to his left and walked 20 m. He then turned to his left and walked 25 m. He again turned to his right and walked 15 m. At what distance is he from the starting point and in which direction?

(a) 35 m East (b) 35 m North
(c) 30 m West (d) 45 m East

***Solution*:**



Required distance = AE

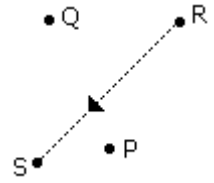
= 20 + 15

= 35 m towards east **Ans.**

***Question* 2:** Village Q is to the North of the village P. The village R is in the East of Village Q. The village S is to the left of the village P. In which direction is the village S with respect to village R?

(a) West (b) South-West
(c) South (d) North-West

***Solution*:**

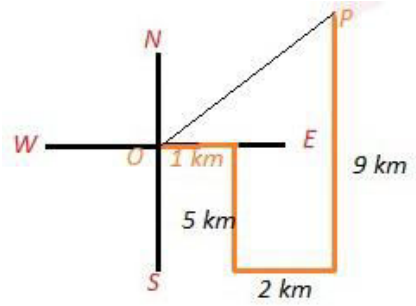


S is to the South-West of R **Ans.**

Question 3: A man walks 1 km to East and then he turns to South and walks 5 km. Again he turns to East and walks 2 km. After this he turns to North and walks 9 km. Now, how far is he from his starting point?

(a) 3 km (b) 4 km
(c) 5 km (d) 7 km

***Solution*:** Man's Movement



The last position of the man is P and OEP is a Right angled triangle in which
EP = 3 km and OE = 4 km
Thus,
OP = √(32 +42)
OP = √25
OP = 5 km. **Ans.**

***Direction* (4-8):** Study the following information and answer the questions given below:

Eight friends A,B,C,D,E,F,G,H purchased their own housed in a city.

The house of A is south-west of C. The house of C is exactly in between the houses of D and E vertically.

The house of F is 3m north of G. The distance between the house of H and G is 10m.

The total distance between the houses of D and E is 8m. The house of B is in west of the house of C at a distance of 5m. House of B is in north of the house of H.

If G starts walking from his house to F's house and form there both of them turns to the left and walk 5m then they reached at E's house.

Now D decided to meet B, and start walking. On the way of his journey he first visits C's house and then takes a right turn. And then reached at B's house he realized that B is not at his home, so he turns immediately to left and walks 6m and finally reached A's house.

Question 4. If A wants to go to E's house from his house via shortest distance then what distance he needs to travel?

(a) $\sqrt{31}$m (b) $\sqrt{29}$m (c) $\sqrt{23}$m
(d) $\sqrt{37}$m (e) None of these

Question 5. B's house in which direction from G's house?

(a) North-West (b) South- East (c) East
(d) North- East (e) None of these

Question 6. How far is D's house from A's house?

(a) $4\sqrt{3}$m (b) $5\sqrt{5}$m (c) $2\sqrt{7}$m
(d) $43\sqrt{3}$m (e) None of these

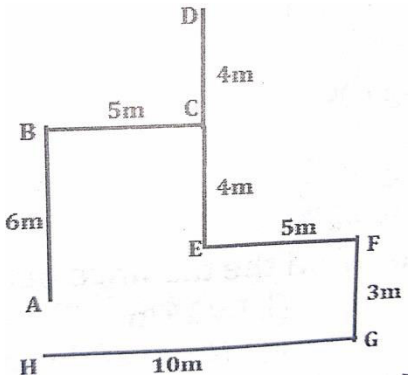
Question 7. E's house is how far and in which direction from H's house?

(a) $\sqrt{31}$m, South- West (b) $\sqrt{51}$m, South-East
(c) $\sqrt{71}$m, North-West (d) $\sqrt{34}$m, North-East
(e) None of these

Question 8. C's house is how far and in which direction from F's house?

(a) $\sqrt{31}$m, South- East (b) $\sqrt{41}$m, North-West
(c) $\sqrt{71}$m, South- West (d) $\sqrt{37}$m, South
(e) None of these

***Solution*:**



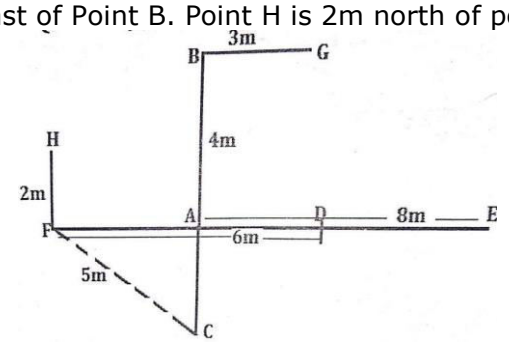
***Answers*:**

4. (b) **5.** (a) **6.** (b)
7. (d) **8.** (b)

***Direction* (Q. No. 9-13):** Study the following information and answer the questions given below:

Point B is to the north of point A at a distance of 4m. Point D is to east of point A. Point D is to the west of E. Point C is to the south of A. Point F is to the west of point D. The total distance between F and D is 6m and distance between A and E is 8m. Point B is to north-east of point F. Point C is to the south-west of point E. The shortest

distance between F and C is 5m. Point G is 3m to the east of Point B. Point H is 2m north of point F.



***Question* 9:** If AD= 3m then find the distance between A and C?

(a) 4m (b) 5m (c) 8m
(d) 6m (e) None of these

***Solution*:** (a); AF= 6 – 3 = 3m

$(AC)^2 = (FC)^2 - (AF)^2 = (5)^2 - (3)^2 = 16$

AC = 4m **Ans.**

***Question* 10:** Which among the following are inline?

(a) A, F and H (b) A, B, G and D
(c) F, A, D and E (d) D, B and E
(e) None of these

***Solution*:** (c); **Ans.**

***Question* 11:** If AF = 4m then find the distance between D and C?

(a) $\sqrt{15m}$ (b) $\sqrt{11m}$ (c) $\sqrt{17m}$
(d) $\sqrt{13m}$ (e) None of these

***Solution*:** (d); $(AC)^2 = (FC)^2 - (AF)^2$
$= 25 – 16 = 9$

AC= 3m

$(DC)^2 = (AD)^2 + (AC)^2 = (2)^2 + (3)^2 = 13$

DC = $\sqrt{13}$ m **Ans.**

***Question* 12:** 1f A is the midpoint of FD then find the distance between D and E2?

(a) 4 m (b) 5 m (c) 8 m
(d) 6 m (e) None of these

***Solution*:** (b); If A is the midpoint of FD then AD=3m

So, DE = 8 -3 = 5m **Ans.**

***Question* 13:** If the shortest distance between H and A is V13m then find point G is how far and in which direction from point D?

(a) 5m, south (b) 3m, south-east
(c) 4m, north (d) 5m, west
(e) 6m, north

***Solution*:** (c); $(AF)^2 = (HA)^2 - (HF)^2$
$= 13 - 4 = 9$

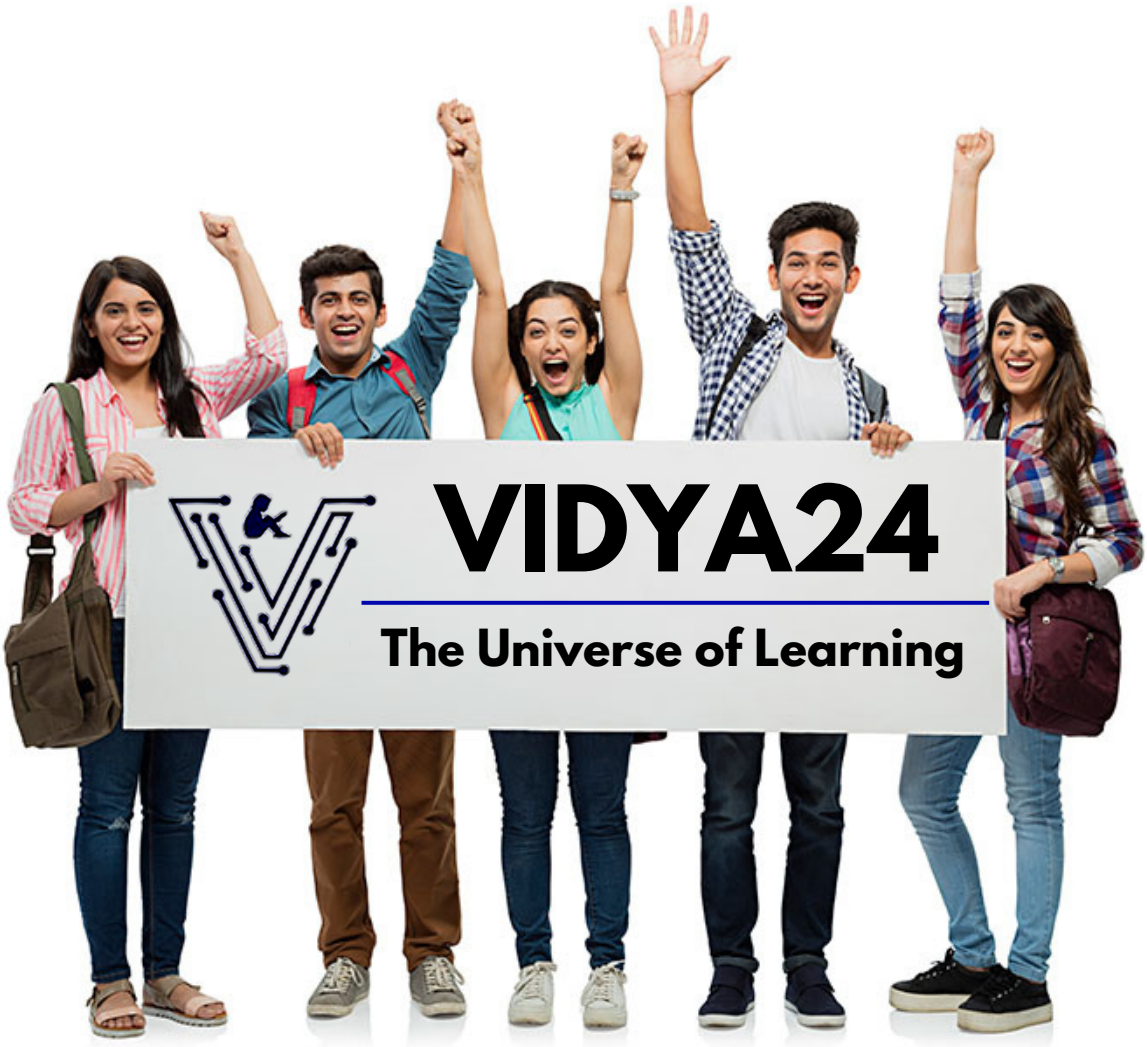
AF = 3mn

Now, AD= FD – AF = 6 – 3 = 3m

So, G is in north and 4m away from H **Ans.**

→******←

THANK YOU!



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