

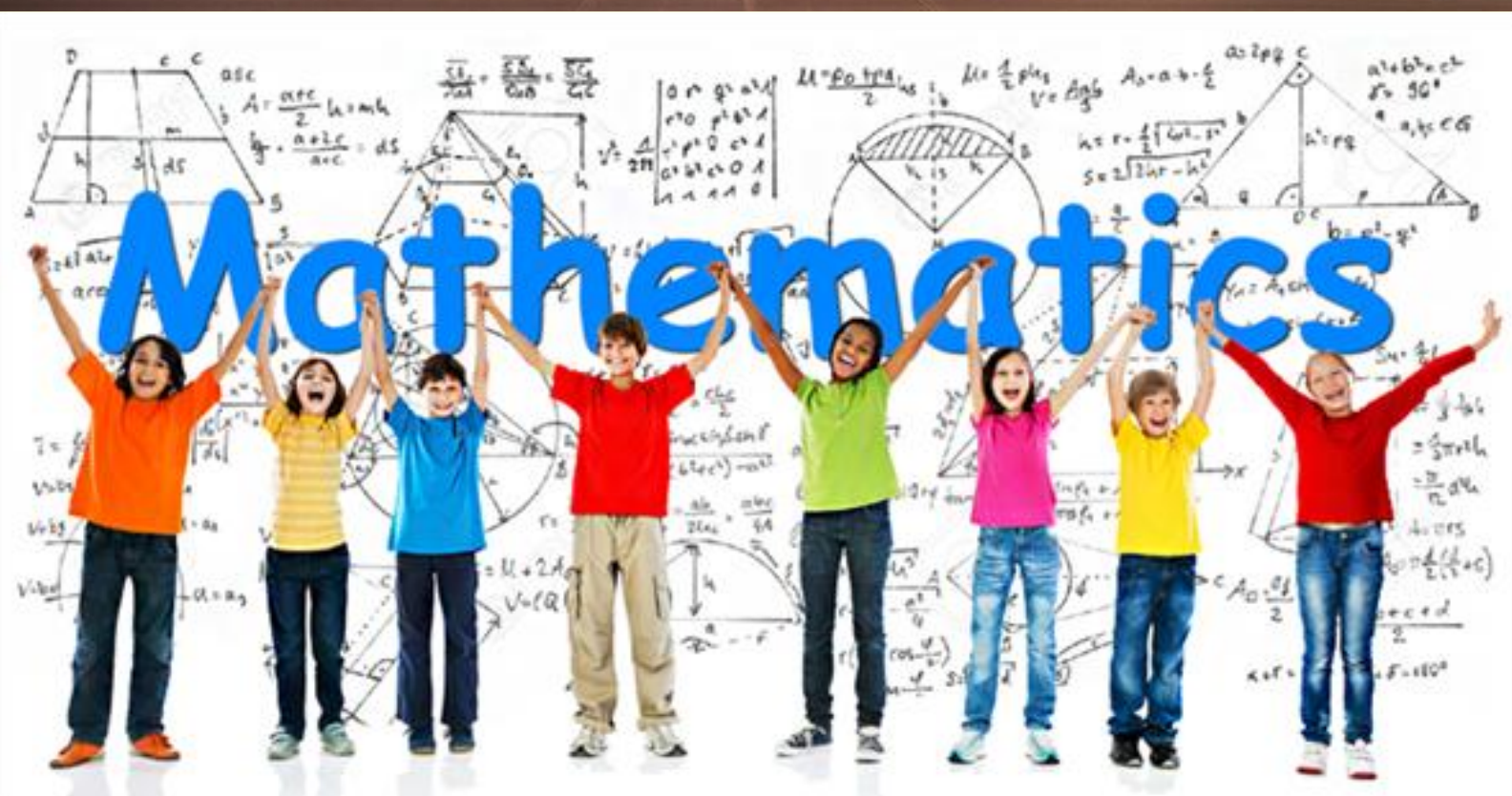
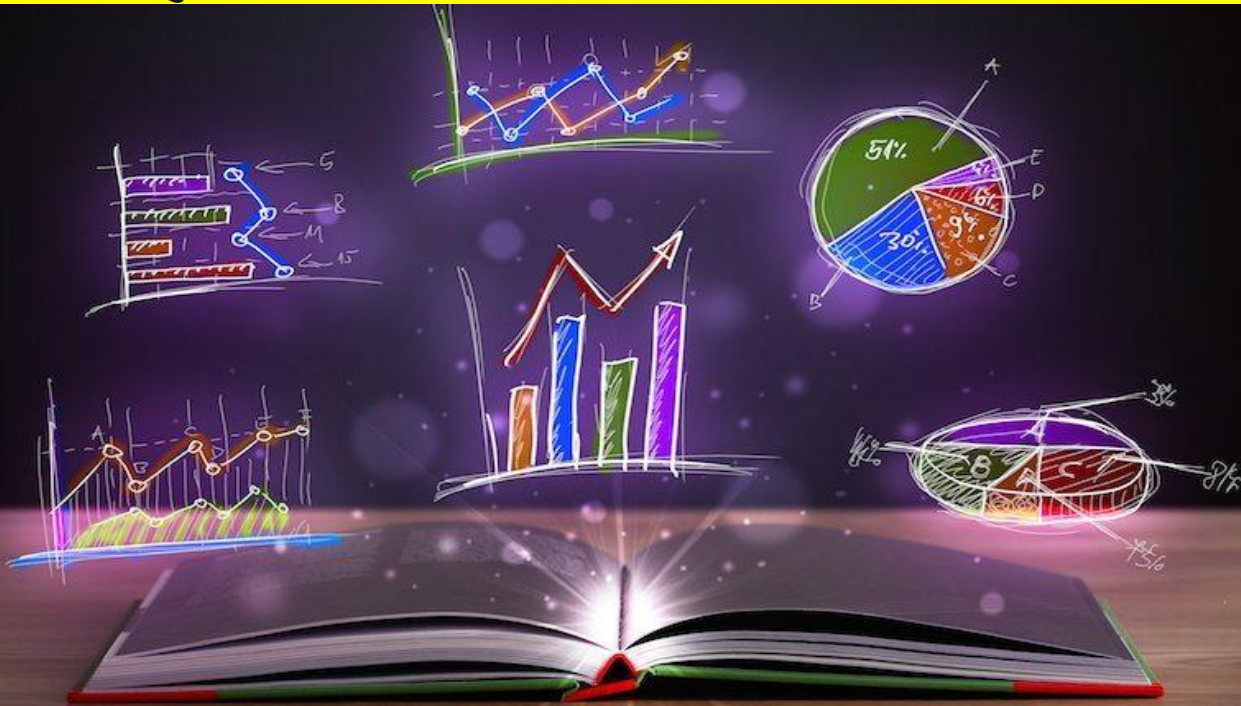
# MATHLETE



(अक्सर पूछा करते हैं.....)

Classes - 9<sup>th</sup> to 10<sup>th</sup>

Series  
9



MATHEMATICAL LITERACY GROUP- CHANDIGARH

# COORDINATE GEOMETRY

## IN REAL SPACE

Alia and Shagun were watching the news about a passenger plane which went missing with 104 passengers on flight. The two got worried and wondered how air traffic is managed and regulated, and how the current location of an aircraft is calculated.



When Shagun's uncle overheard the discussion, he told the girls that he had answers to all their questions. He said that he would answer their questions only if the two girls could first answer his questions which had clues to their questions. The two of them got excited and agreed to answer the questions:



### **SITUATION 1:**

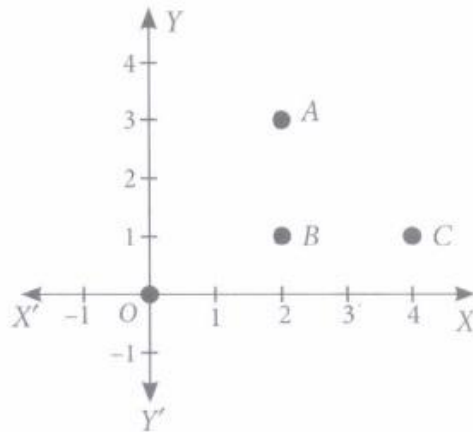
Alia and Shagun live on the same street in Patel Nagar. They both study in the same school which is not far from Shagun's house.

You may refer to the figure below for more details.

- Suppose the school is situated at the point  $(0,0)$  i.e., the origin,
- Alia's house is at A.
- Shagun's house is at B

- The library is at C.

Shagun exclaims: Oh! Alia that's location of your house and mine! And uncle has given us coordinates to locate exact position



Based on the above information,  
answer the following questions



Help the girls find answers

(i) How far is Alia's house from Shagun's house?

- a) 3units
- b) 4units
- c) 5units
- d) 2units

(ii) How far is the library from Shagun's house?

- a) 3units
- b) 4units
- c) 5units
- d) 2units



(iii) How far is the library from Alia's house?

- a) 3units
- b) 4units
- c) 2units
- d) None of the above

(iv) Which of the following is true?

- a) ABC forms a scalene triangle
- b) ABC forms an isosceles triangle
- c) ABC forms an equilateral triangle
- d) None of these

(v) How far is the school from Alia's house than Shaguns house

- a)  $\sqrt{13}$  units
- b)  $\sqrt{5}$  units
- c)  $\sqrt{13} + \sqrt{5}$  units
- d)  $\sqrt{13} - \sqrt{5}$  units



That's interesting uncle! Can we have one more clue.....

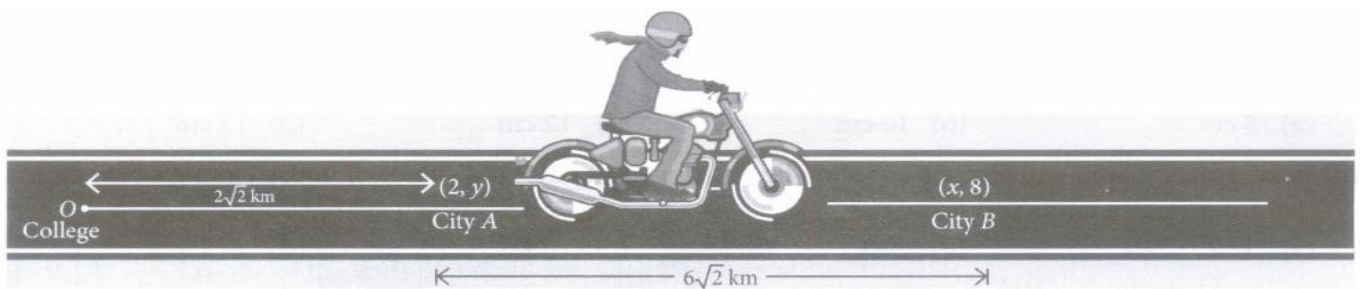


Here is another one for  
you



### SITUATION 2\*(HINT GIVEN BELOW)

A person is riding his bike on a straight road towards East from his college to city A and then to city B. At some point in between city A and city B, he suddenly realizes that there is not enough petrol for the journey. Also, there is no petrol pump on the road between these two cities.



Based on the above information, answer the following questions.

- (i) The value of  $y$  is equal to  
(a) 2    (b) 3    (c) 4    (d) 5
- (ii) The value of  $x$  is equal to  
(a) 4    (b) 5    (c) 8    (d) 7
- (iii) If  $M$  is any point exactly in between city A and city B, then coordinates of  $M$  are  
(a) 3,3    (b) 4,4    (c) 5,5    (d) 6,6

Alia and Shagun, can you tell me what  
concepts of mathematics have you used to  
solve the above questions?



It is **coordinate geometry**! To find position of any **object and distance formula**\*  $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$  to find distance between two points



That's right my girls!

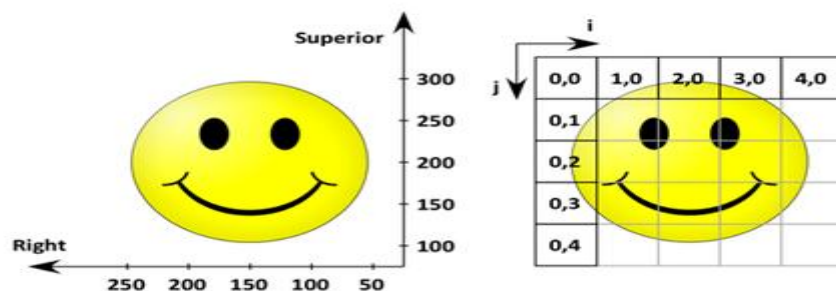
Coordinate system can be used to find the position of any object from its original place (called origin) to its present location.

All the air traffic is controlled by air traffic controller. A Controller must know the location of every aircraft at any particular instant of time in the sky. Coordinates of any particular vehicle are used to describe its current location of the aircraft. Even if an aircraft moves a small distance (up, down, forward or backward), its coordinates are updated in the system.

Now imagine what if coordinate system didn't exist! Pilots, aircraft controller, passengers in the flight, persons waiting for the flight - none will be able to get the location or position of the aircraft. This would also definitely increase the chances of aircrafts crashing. So, we can easily say that coordinate system is one of the most important concepts for air transport.

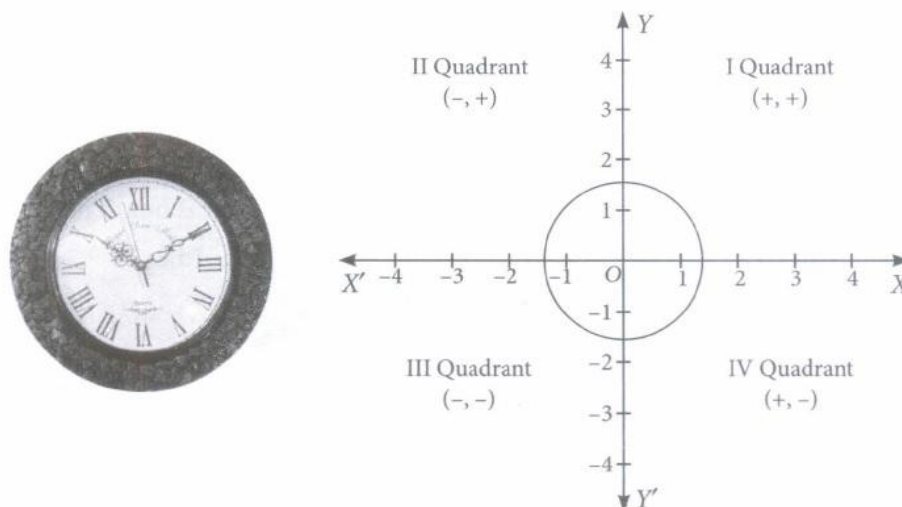
We have some more uses of coordinates in real world.

The text file or PDF file which we open is itself an example of cartesian plane. In these, the words or images are written or modified with the use of coordinate geometry. Any PDF file, which contains text, images and different shapes, are placed according to the 2-dimensional coordinate (x, y) system.



### HERE I WILL GIVE YOU SITUATION 3

1. A round clock is traced on a graph paper as shown below. The boundary intersects the coordinate axis at a distance of  $\frac{4}{3}$  units from origin.



Based on the above information, answer the following questions:

- (i) Circle intersects the positive y-axis at

(a)  $(\frac{2}{3}, 0)$ , (b)  $(0, \frac{2}{3})$  (c)  $(0, \frac{4}{3})$  (d)  $(\frac{4}{3}, 0)$

- (ii) The centre of circle is the

a) mid-point of points of intersection with x-axis

b) mid-point of points of intersection with y-axis

c) both (a) and (b)

d) none of these

- (iii) The radius of the circle is

(a)  $\frac{4}{3}$  units

(b)  $\frac{3}{2}$  units

(c)  $\frac{2}{3}$  units

(d)  $\frac{3}{4}$  units

(iv) Area of the circle is

(a)  $16\pi/2\text{sq.units}$ .      (b)  $16\pi/9\text{sq.units}$       (c)  $49\pi/2\text{sq.units}$       (d)  $4\pi\text{sq.units}$

(v) If  $(1, 7\sqrt{3})$  is one of the ends of a diameter, then its other end on x-axis is

(a)  $(-1, 7\sqrt{3})$       (b)  $(1, -7\sqrt{3})$       (c)  $(1, 7\sqrt{3})$       (d)  $(-1, -7\sqrt{3})$



Uncle you have explained about coordinates in space  
...Do we have coordinates on Earth also?

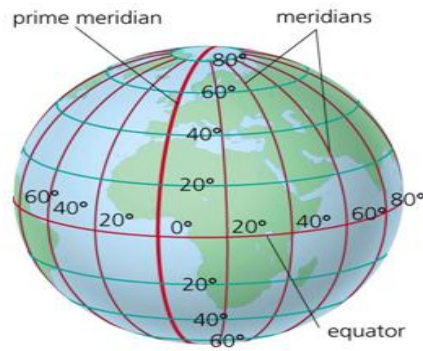
OF COURSE!



Our Earth is also part of a bigger coordinate system called the geographical coordinate system.

For the real world locations, describing the accurate location and shape of geographical features will require a coordinate framework called geographical coordinate system is used to assign geographic locations to objects. You might have studied latitudes and longitude in geography, these measurements are actually used to accurately point any place or object on the earth's surface. These are much similar as the normal  $(x, y)$  coordinate system or the polar form of the coordinate system.





Apart from all these, most of us have used GPS in our smart phones. The Global Positioning System (GPS) is a space based satellite navigation system that provides location and time information in all weather conditions.

In a GPS, the longitude and the latitude of a place are its coordinates. The distance formula is used to find the distance between 2 places in a GPS.



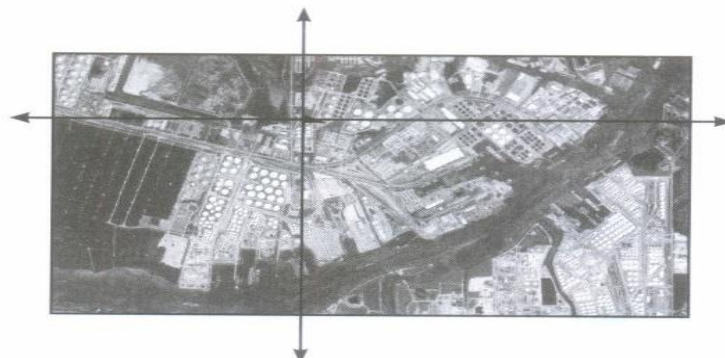
## NOW WE HAVE SITUATION 4

Satellite image of a colony is shown below. In this view, a particular house is pointed out by a flag, which is situated at the point of intersection of x and y-axes. If we go 2 m east and 3 m north from the house, then we reach a Grocery store. If we go 4 m west and 6 m south from the house, then we reach to a Electrician's shop. If we go 6m east and 8 m south from the house, then we reach to a food cart. If we go 6 m west and 8m north from the house, then we reach a bus stand.

Scale

x-axis : 1 cm = 1 unit

y-axis : 1 cm = 1 unit



Based on the above information, answer the following questions.

- (i) The distance between grocery store and food cart is
- a) 12cm
  - b) 15cm
  - c) 18cm
  - d) none of these
- (ii) The distance of the bus stand from the house is
- a) 5cm
  - b) 10cm
  - c) 12cm
  - d) 15cm
- (iii) If the grocery store and electrician's shop lie in a line, the ratio of distance of house from grocery store to that from electrician's shop is
- a) 3:2
  - b) 2:3
  - c) 1:4
  - d) 4:1
- (iv) Ratio of distances of house from bus stand to food cart is
- a) 1:2
  - b) 2:1
  - c) 1:1
  - d) none of the above

That was indeed interesting!

*We have been using coordinate system every day in our lives Thank you Uncle for this Informative session!!!!*



# ANSWER KEY

## **Situation 1**

- (i) d
- (ii) d
- (iii) d
- (iv) b
- (v) d

## **Situation 2**

- (i) a
- (ii) c
- (iii) c

## **Situation 3**

- (i) c
- (ii) c
- (iii) a
- (iv) b
- (v) a

## **Situation 4**

- (i) d
- (ii) b
- (iii) c
- (iv) c