

# Mathematics

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(OTBA - 2017) (Theme 1: Solving Mystery of messed up fields)  
(Class – IX)

## Question 1:

Listening to the Ram's statement.

“In my field I used, to join, the opposite corners with ropes of equal length and the areas of the opposite triangles formed were equal.”

Roshni concluded that his farm might be rectangle or square. Do you agree with her opinion? Give the properties of quadrilateral to arrive this conclusion.

## Answer 1:

Here,

### Properties of Quadrilateral

Diagonals of square (and rectangle) are equal in length.

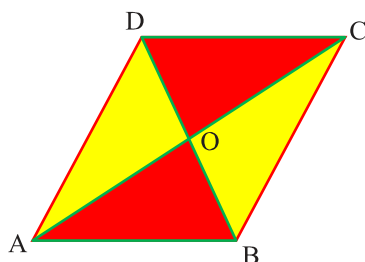
Diagonals of parallelogram divide it into two equal areas.

**Given:** A quadrilateral ABCD with AC and BD as its diagonals such that

$$AC = BD$$

$$ar(\triangle AOB) = ar(\triangle COD)$$

$$ar(\triangle AOD) = ar(\triangle BOC)$$



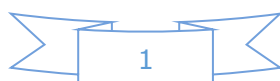
**To find:** Type of quadrilateral ABCD.

**Proof:** Given that

$$ar(\triangle AOD) = ar(\triangle BOC) \quad [\text{Area of Yellow region}]$$

Adding  $ar(\triangle AOB)$  both sides

$$ar(\triangle AOD) + ar(\triangle AOB) = ar(\triangle BOC) + ar(\triangle AOB)$$



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$$\Rightarrow ar(\Delta ABD) = ar(\Delta ABC)$$

Now  $\Delta ABD$  and  $\Delta ABC$  are on the same base and equal in area, so  $AB \parallel DC$ .

[**Theorem:** If two triangles are on the same base and equal area, it will be lie between the same parallel lines.]

Similarly  $AD \parallel BC \Rightarrow ABCD$  is a parallelogram.

[**Theorem:** If opposite sides of a quadrilateral are parallel, it is parallelogram.]

Also it is given that the diagonals  $AC$  and  $BD$  are equal. So it is a rectangle.

[**Theorem:** A parallelogram with equal diagonals is a rectangle.]

