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Area of a Triangle

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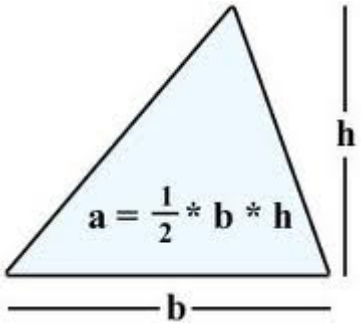
Area of a triangle when the coordinates of vertices are given

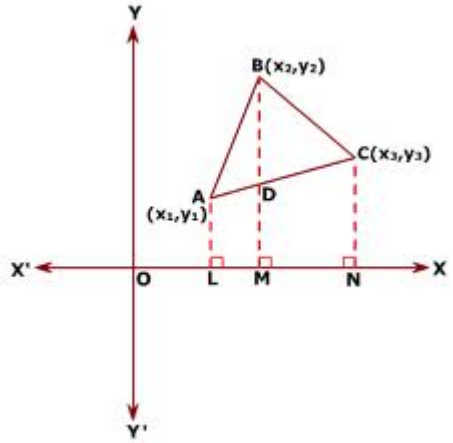


The area of a triangle, the coordinates of whose vertices are (x1, y1), (x2, y2) and (x3, y3) is

1/2 |x1 (y2 – y3) + x2 (y3 – y1) + x3 (y1 – y2)|

Proof: Let ABC be a triangle whose vertices are A (x1, y1), B (x2, y2) and C (x3, y3). Draw AL, BM and CN perpendiculars from A, B, C on the x – axis. Clearly, ABML, ALNC and BMNC are all trapeziums.

Area of triangle = ½ x Base x Altitude



Area oftrapezium = 1/2(Sum of parallel sides) (Distance between them)

Area of ?ABC = Area of trapezium ABML + Area of trapezium BMNC – Area of trapezium ALNC

? = 1/2(AL + BM) (ML) + 1/2 (BM + NC) (MN) - 1/2(AL + NC) (LN)

?= |1/2(y2 – y1) (x1 – x2) + 1/2(y1 + y3) (x3 – x1) - 1/2(y2 + y3) (x3 – x2)

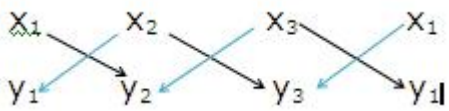
|
?= |1/2{x1 (y2 + y1 – y1 – y3) + x2 (-y¬2 – y1 + y2 + y3) + x3 (y1 + y3 – y2 –
y3)}|
= 1/2 |x1 (y2 – y3) + x2 (y3 – y1) + x3 (y1 – y2)|

Important Remarks

1. To find the area of a polygon we divide it in triangles and take numerical value of the area of each of the triangles.

2. The area of ?ABC can also be calculated by using following steps:

Step I: Write the coordinates of the vertices A (x1, y1), B (x2, y2) and c (x3, y3) in three columns as shown below and augmented the coordinates of A (x1, y1) as fourth column.



Step II: Draw lines pointing downwards from left to right and right to left.

Step III: Compute the sum of the products of numbers at the ends of the lines pointing downwards from left to right and subtract from this sum the sum of the products of numbers at the ends of the lines pointing downward from right to left,
(x1y2 + x2y3 + x3y1) – (x2y1 + x3y2 + x1y3)

Step IV: Find the absolute value of the number obtained in step III and take its half to obtain the area.

3. Three points A (x1, y1), B (x2, y2) and C (x3, y3) are collinear iff
Area of ?ABC = 0
x1(y2 – y3) + x2(y3 – y1) + x3(y1 – y2) = 0

Now try it yourself! Should you still need any help,click here to schedule live online session with e Tutor!

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Reference Links :

- http://en.wikipedia.org/wiki/Triangle
- http://en.wikipedia.org/wiki/Coordinate_system
- http://en.wikipedia.org/wiki/Vertex_
- http://en.wikipedia.org/wiki/Trapezoid#Area

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