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# CLASS – 9

## MATHEMATICS

## Chapter – 8

## Quadrilaterals

### Part - 11

### The Mid-point Theorem

Vikas Saini

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# OVERVIEW

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1. Types of Quadrilaterals
2. Properties of a Parallelogram
3. The Mid-point Theorem

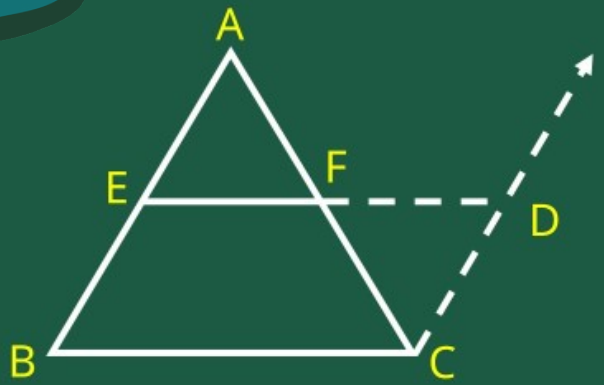
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# THE MID-POINT THEOREM

## Theorem-8.8

The line segment joining the mid-points of two sides of a triangle is parallel to the third side.



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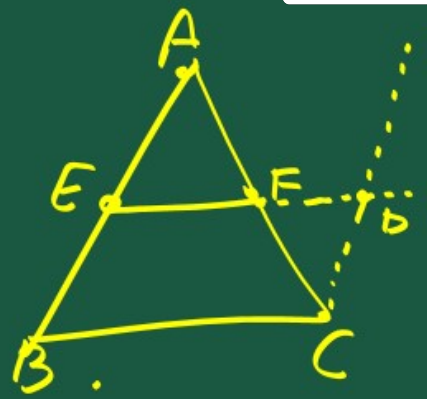
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**Given :→** ABC is triangle

where E & F are mid-points of AB & AC respt.

$AE = BE$

$AF = FC$




**To prove :→** $EF \parallel BC$

**Construction :→** draw a line from C s.t line is parallel AB line & Extenten EF line so it will intersect at D

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Soln:→ $CD \parallel AB$ [Const.]

$CD \parallel AE$

In $\triangle AEF$ & $\triangle CDF$

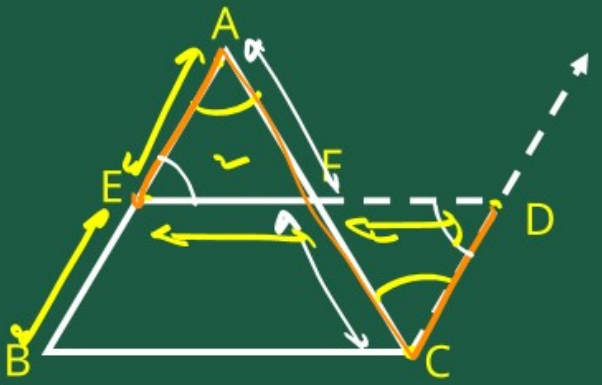
$\angle FAE = \angle FCD$ [A·I·A]

$\angle AEF = \angle CDF$ [A·I·A]

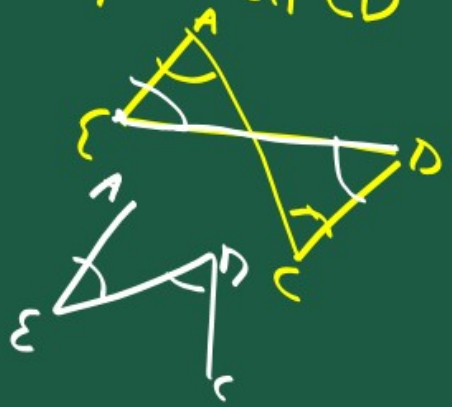
$AF = FC$ [Given]

$\triangle AEF \cong \triangle CDF$

$EF = DF$ [C·P·C·T]




$\therefore AE \parallel CD$



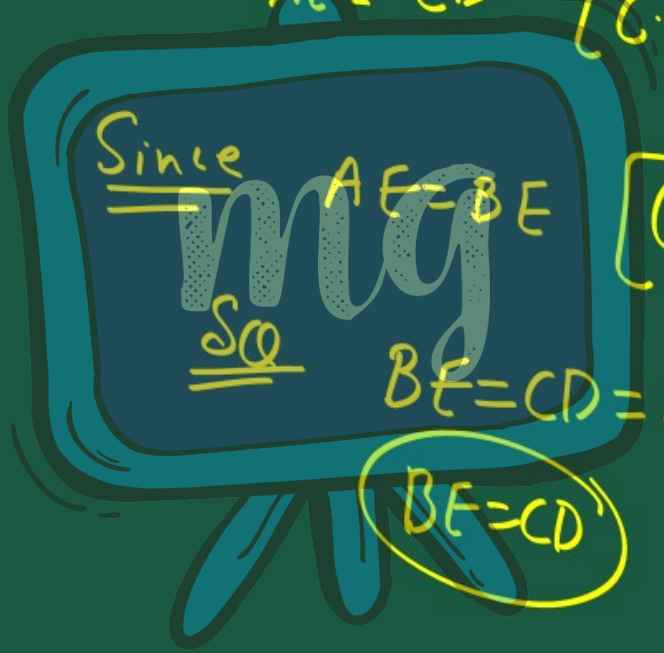
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Since,

$\triangle AEF \cong \triangle CDF$ [Proved above]

$AE = CD$ [C.P.C.T].



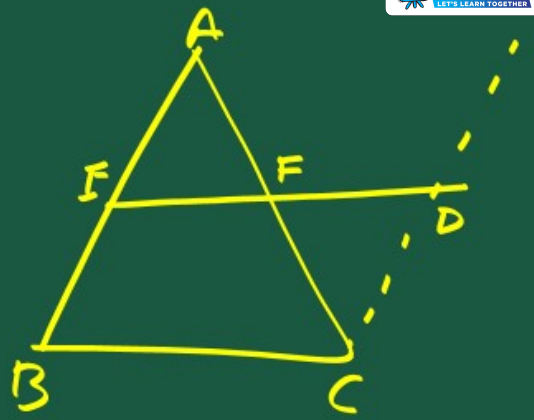
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Since CD || AB

& CD || BE

BE = CD




Since In Quadilateral BEDC

pair of opp. Sides are equal & parallel.

So BEDC is ||gm

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BEDC is llgm [Proved above]

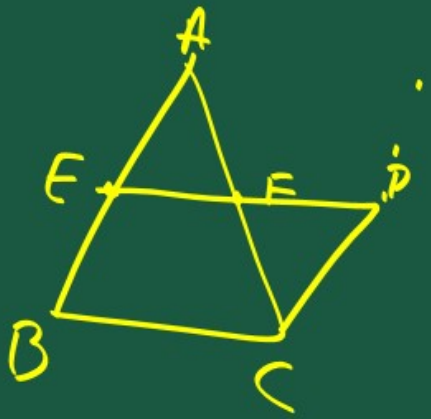
We know that

Opp. Sides of llgm are Equal & parallel.

(DE = BC) & DE ∥ BC.

$\frac{DE}{2} = \frac{BC}{2}$ & DE ∥ BC

$EF = \frac{BC}{2}$ & EF ∥ BC




EF = DF

EF + DF = ED

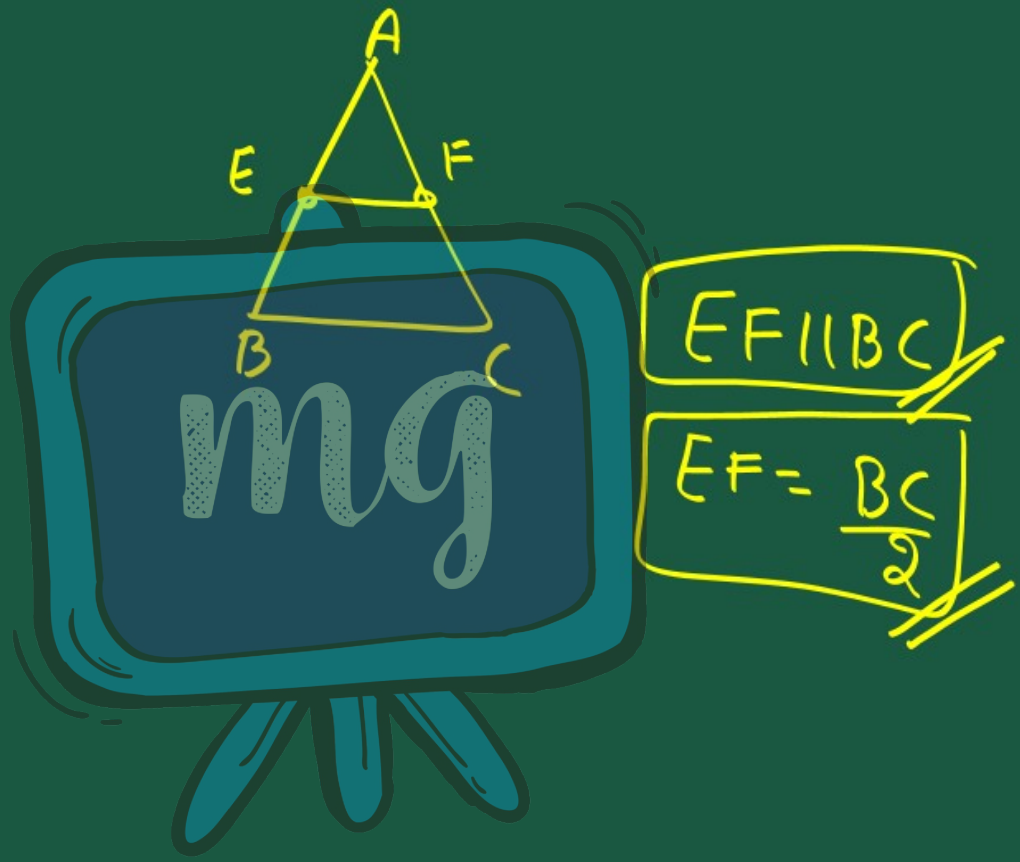
EF + EF = ED

2EF = ED

$EF = \frac{ED}{2}$

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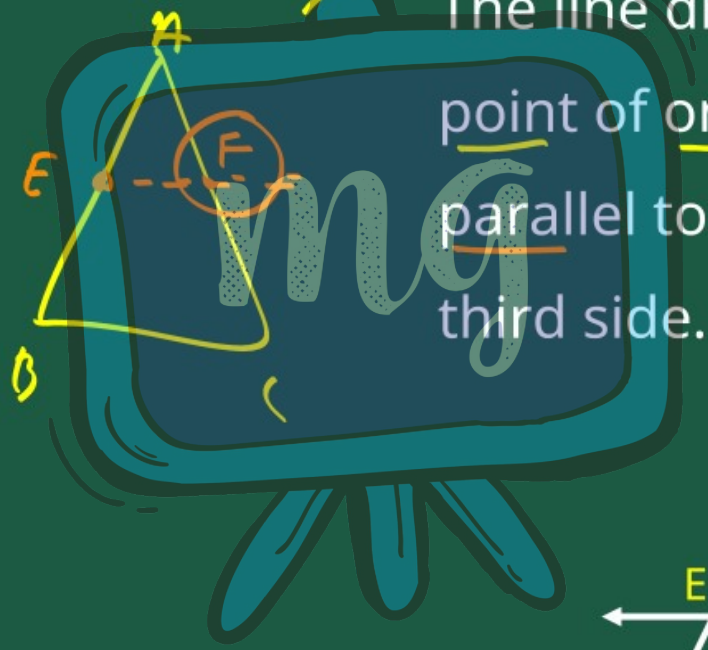


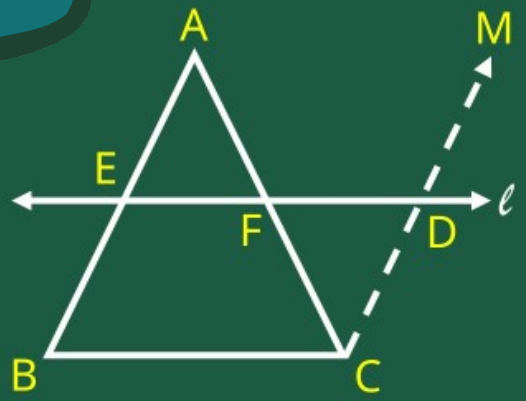
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# Theorem–8.9

The line drawn through the mid-point of one side of a triangle, parallel to another side bisects the third side.



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Given :- $\Delta ABC$, in which

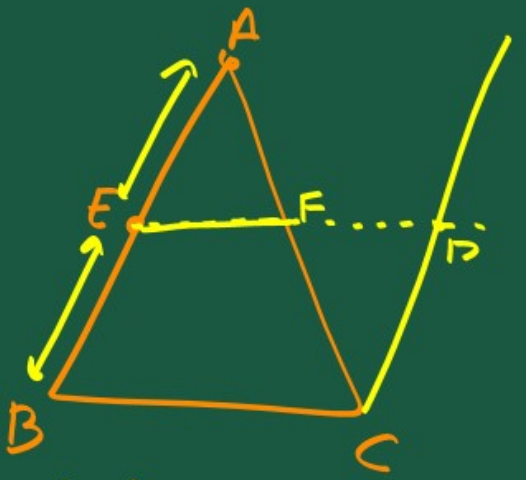
E is mid point AB

by

$AE = BF$

a line drawn from E s.t

$EF \parallel BC$ which intersect AC at F




To prove :- F mid-point of AC

$AF = FC$.

Construction :- draw a line From C point

S.t it is parallel AB or

EF extended further

which intersect at D

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Now $AB \parallel CD$ [By Const.] $AE = BF = CD$

$AE \parallel CD$

$BF \parallel CD$

&

$EF \parallel BC$ [Given].

Since In $\triangle AEF$ & $\triangle CDF$

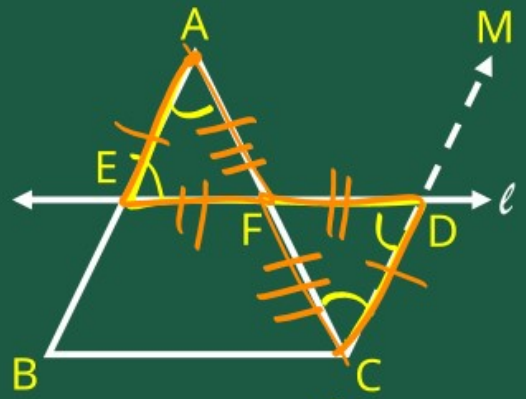
$\angle FAE = \angle FCD$ [A-I-A]

$\angle AEF = \angle CDF$ [A-I-A]

$AE = CD$

In quad. $BEDC$, $EF \parallel BC$, $CD \parallel BE$

$\therefore BEDC$ is ||gm).






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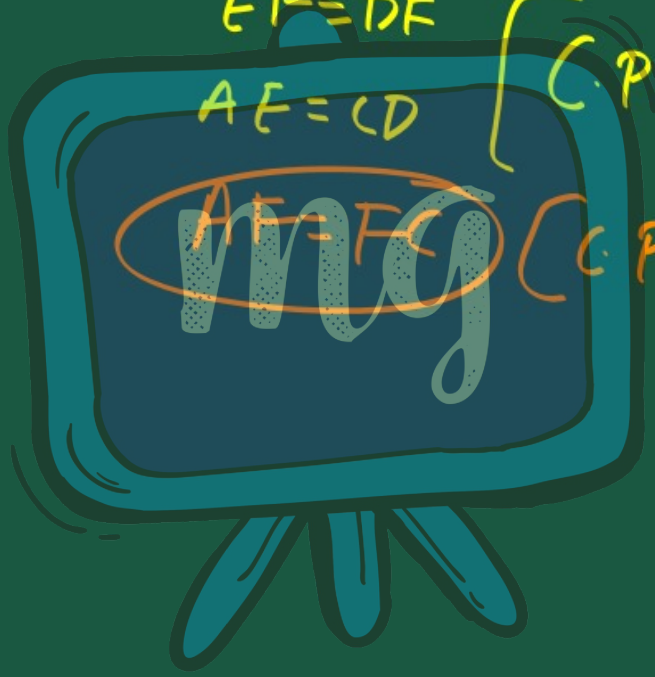
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$\triangle AEF \cong \triangle CDF$ By AAS Rule

$EF = DF$ [C.P.C.T]

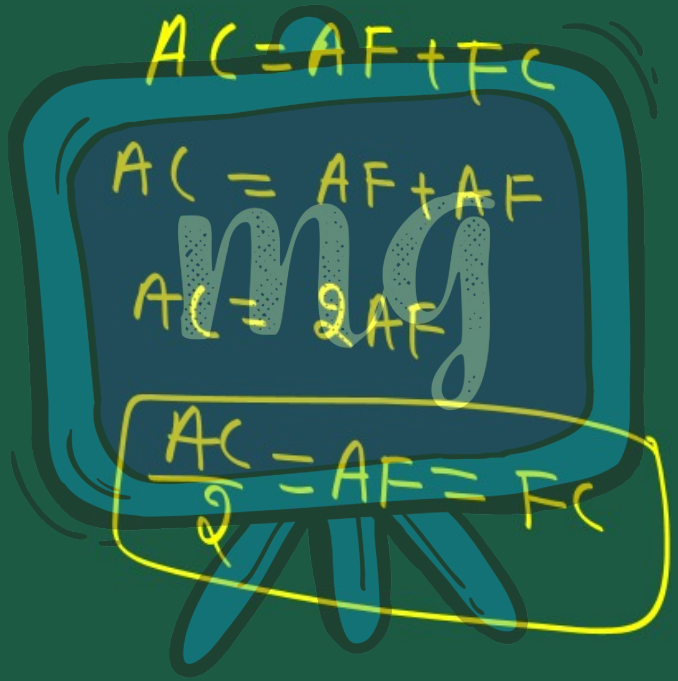
$AE = CD$

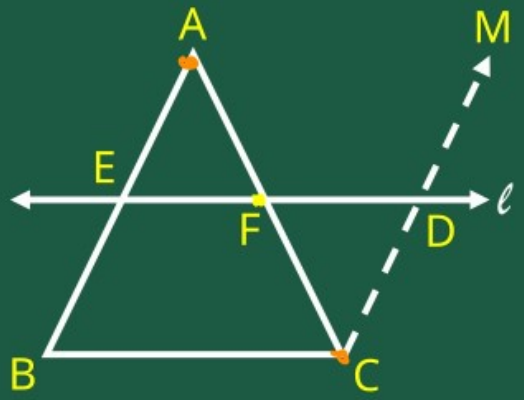
$AF = FC$ [C.P.C.T]



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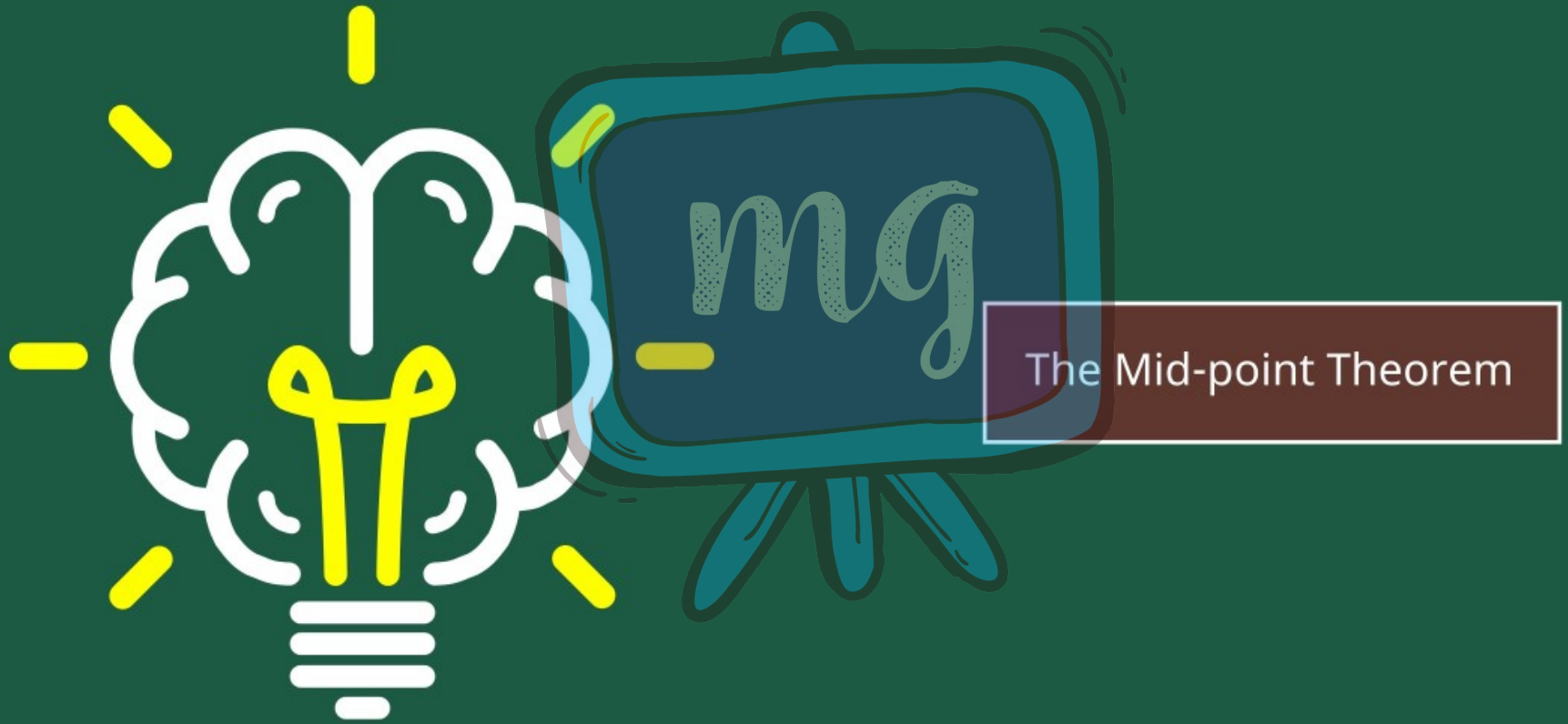




∴ F mid point of AC

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# LEARNING OUTCOME

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The Mid-point Theorem

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# ASSESSMENT

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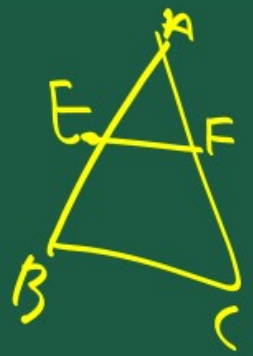
1 If a line segment joins the midpoint of two sides of the triangle, then it is equal to the third side of the triangle.

A Vertical will be

B There will be parallel

C Will be linear

D None of these.



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# ASSESSMENT

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2 If DE||BC and D and E are the midpoints of sides AB and AC respectively. What is the length of DE?

A 18 cm

B 15 cm

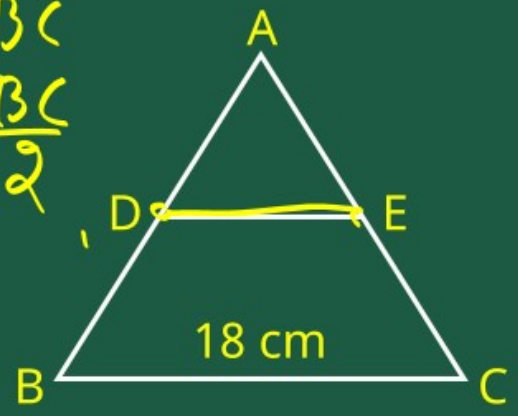
C 9 cm

D 20 cm

DE||BC

$DE = \frac{BC}{2}$

$\frac{18}{2} = 9$



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# ASSESSMENT

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3 A triangle ABC has AB = 3 cm, BC = 4 cm and CA = 5 cm. If D and E are the mid-points of sides AB and BC respectively, then the length of DE is

A 1.5 cm

B 2 cm

C 2.5 cm

D 3.5 cm

