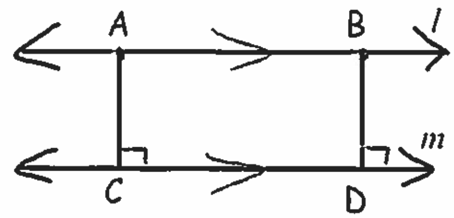
Theorem: If two lines are parallel, then all points on one line are equidistant from the other line.

Given: $l \parallel m$; $\overline{AC} \perp m$; $\overline{BD} \perp m$

A and B are any points on l

Prove: $AC = BD$

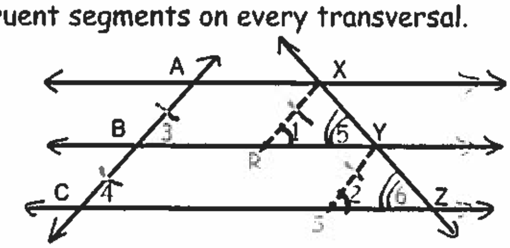


	Statements	Reasons
1	$l \parallel m$; $\overline{AC} \perp m$; $\overline{BD} \perp m$	Given
2	$\overline{AC} \parallel \overline{BD}$	In a plane, 2 lines ⊥ to the same line are ∥.
3	ABDC is a ▱	Def. of ▱
4	$\overline{AC} \cong \overline{BD}$	Opp. sides of a ▱ are ≅.
5	$AC = BD$	Def. of ≅ seg.

Theorem: If three (or more) parallel lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.

Given: $\overline{AX} \parallel \overline{BY} \parallel \overline{CZ}$;
$\overline{AB} \cong \overline{BC}$

Prove: $\overline{XY} \cong \overline{YZ}$

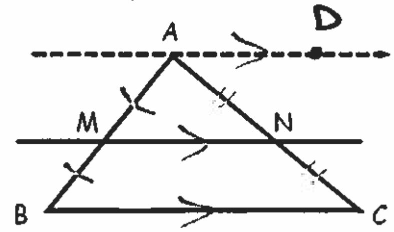


	Statements	Reasons
1	$\overline{AX} \parallel \overline{BY} \parallel \overline{CZ}$, $\overline{AB} \cong \overline{BC}$	Given
2	Draw $\overline{RX}$ and $\overline{SY}$ parallel to $\overline{AC}$.	∥ Post.
3	▱ABRX , ▱BCSY	Def. of ▱
4	$\overline{AB} \cong \overline{XR}$, $\overline{BC} \cong \overline{SY}$	Opp. sides of a ▱ are ≅
5	$\overline{RX} \cong \overline{SY}$	Trans. Prop. of ≅
6	$\angle 1 \cong \angle 3$, $\angle 3 \cong \angle 4$, $\angle 4 \cong \angle 2$, $\angle 5 \cong \angle 6$	Corr. ∠s Post.
7	$\angle 1 \cong \angle 2$	Trans. Prop. of ≅
8	$\triangle XRY \cong \triangle YSZ$	AAS ≅ Thm
9	$\overline{XY} \cong \overline{YZ}$	CPCTC

Theorem: A line that contains the midpoint of one side of a triangle and is parallel to another side passes through the midpoint of the third side.

Given: M is the midpoint of $\overline{AB}$; $\overleftrightarrow{MN} // \overleftrightarrow{BC}$.

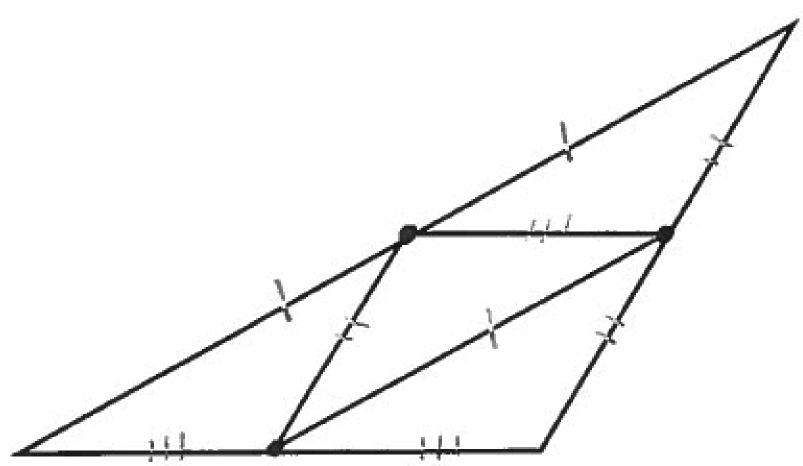
Prove: N is the midpoint of $\overline{AC}$.



	Statements	Reasons
1	M is the midpoint of $\overline{AB}$: $\overleftrightarrow{MN} // \overleftrightarrow{BC}$	Given
2	Draw $\overleftrightarrow{AD}$ parallel to $\overleftrightarrow{MN}$.	// Post
3	$\overline{AM} \cong \overline{MB}$	Def. of midpt
4	$\overline{AN} \cong \overline{NC}$	If 3 // lines cut off ≅ seg. on 1 trans., they cut off ≅ seg. on every transversal.
5	N is the midpoint of $\overline{AC}$.	Def. of midpt.

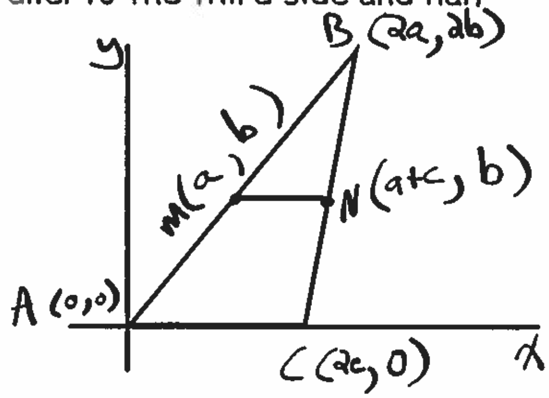
A midsegment connects any two midpoints of two sides of a triangle.

How many midsegments does a triangle have? 3



Triangle Midsegment Theorem:

The midsegment of a triangle is parallel to the third side and half as long as the third side.



$a, b, c > 0$

① Show $\overline{MN} \parallel \overline{AC}$.

m of $\overline{MN} = \frac{\Delta y}{\Delta x} = \frac{b-b}{a+c-a} = \frac{0}{c} = 0$

m of $\overline{AC} = \frac{\Delta y}{\Delta x} = \frac{0-0}{2c-0} = \frac{0}{2c} = 0$

Same slope $\rightarrow \overline{MN} \parallel \overline{AC}$

② Show $MN = \frac{1}{2} AC$.

$MN = a+c-a$ $\quad AC = 2c-0$

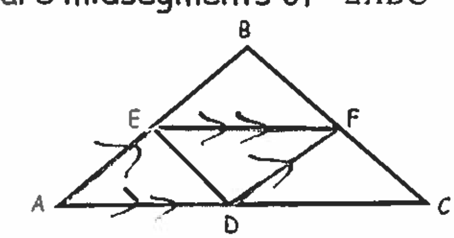
$MN = c$ $\quad AC = 2c$

$c = \frac{1}{2}(2c)$

$c = c$ ✓

In the diagram, $\overline{DE}$, $\overline{EF}$, and $\overline{DF}$ are midsegments of $\triangle ABC$.

1. Prove: AEFD is a parallelogram



Statements	Reasons
① $\overline{DE}$, $\overline{EF}$, and $\overline{DF}$ are midsegments	Given
② $\overline{EF} \parallel \overline{AC}$, $\overline{FD} \parallel \overline{AB}$	Δ Midsegment Thm
③ AEFD is a ▱	Def. of ▱