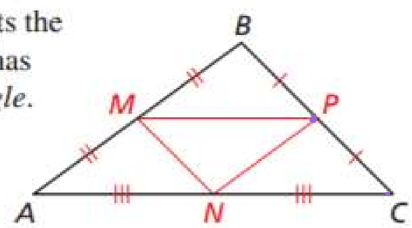
What You Will Learn

- Use midsegments of triangles in the coordinate plane.
- Use the Triangle Midsegment Theorem to find distances.

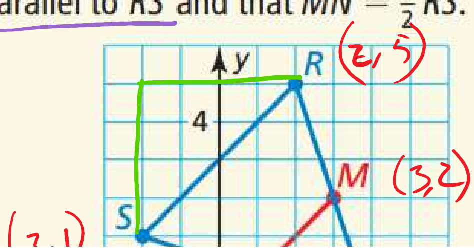
Using the Midsegment of a Triangle

A **midsegment of a triangle** is a segment that connects the midpoints of two sides of the triangle. Every triangle has three midsegments, which form the *midsegment triangle*.

The midsegments of $\triangle ABC$ at the right are $\overline{MP}$, $\overline{MN}$, and $\overline{NP}$. The *midsegment triangle* is $\triangle MNP$.



In $\triangle RST$, show that midsegment $\overline{MN}$ is parallel to $\overline{RS}$ and that $MN = \frac{1}{2} RS$.



$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$a^2 + b^2 = c^2$

$mN = \sqrt{(1-3)^2 + (0-2)^2}$

$\sqrt{(-2)^2 + (-2)^2}$

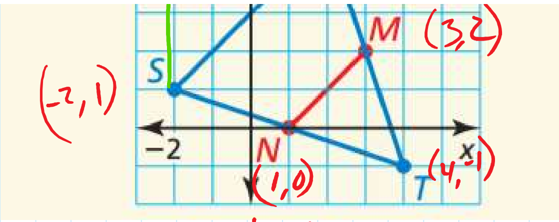
8
^
2 4

$RS = 4^2 + 4^2 = c^2$

$16 + 16 = c^2$

$\sqrt{32} = \sqrt{c^2}$

32
^
2 16



$(3,2)$ $(-2,1)$ $(1,0)$ $(4,-1)$

$\sqrt{(-2)^2+(-2)^2}$

$\sqrt{4+4}$

$\sqrt{8}$

8 → 2, 4 → 2, 2

$mN = 2\sqrt{2} \approx 2.82$

$\sqrt{32} = \sqrt{c^2}$

$\sqrt{32} = c$

$2 \cdot 2\sqrt{2}$

$RS = 4\sqrt{2} \approx 5.65$

16 → 2, 8 → 2, 4 → 2, 2

slope $= m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m\,\overline{MN} = \dfrac{0-2}{1-3} = \dfrac{-2}{-2} = 1$

$m\,\overline{RS} = \dfrac{4}{4} = 1$

$\overline{MN} \parallel \overline{RS}$

$2\sqrt{2} = \frac{1}{2} 4\sqrt{2}$

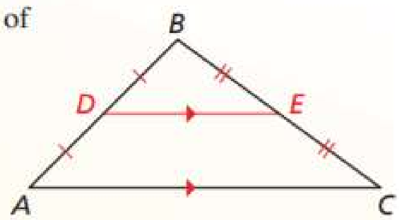
$2\sqrt{2} = 2\sqrt{2}$

Theorem

Theorem 6.8 Triangle Midsegment Theorem

The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long as that side.

$\overline{DE}$ is a midsegment of $\triangle ABC$, $\overline{DE} \parallel \overline{AC}$, and $DE = \frac{1}{2}AC$.



- midsegment is ∥ to the side it isn't connected to
- midsegment is $\frac{1}{2}$ as long as the side it isn't connected to

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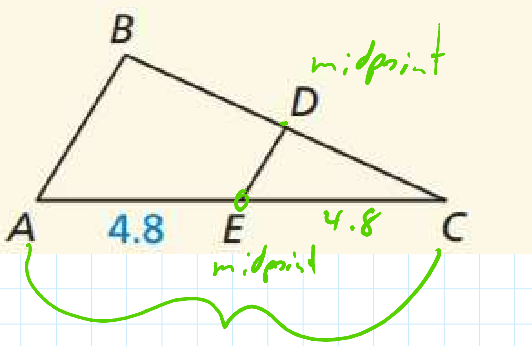
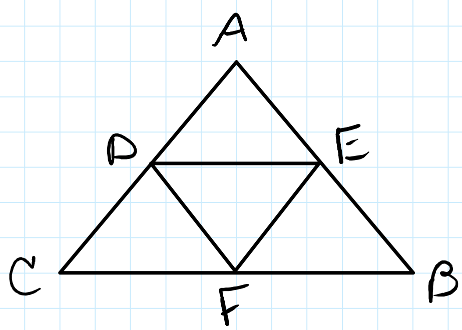
$\overline{DE}$ is a midsegment of $\triangle ABC$. Find AC. =

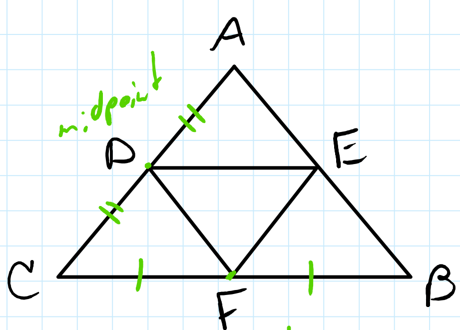


2.4

9.6

In the figure, CF=FB and CD=DA. Which segments must be parallel?





$\overline{DF} \parallel \overline{AB}$

$\overline{DF}$ is a midsegment

Practice sec 6.4 **pg. 333: 1-3A, 6-20A**