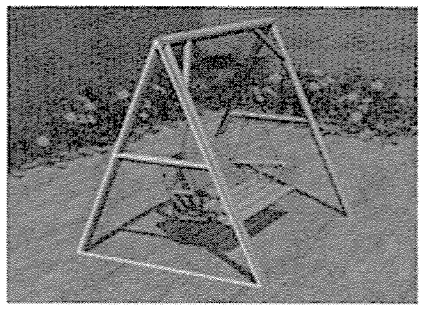
Geometry (H) date_______________
Chap: Special Parts of the Triangle

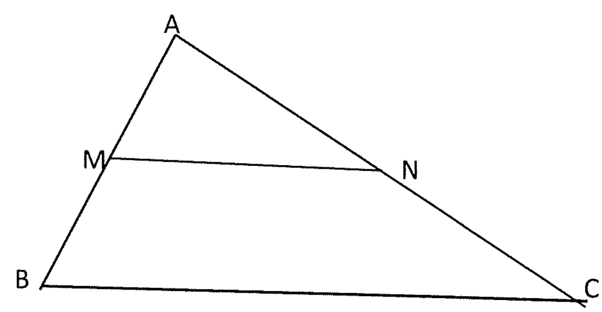
The Midsegment of a Triangle

The **midsegment** of a triangle is a line segment that connects the midpoints of two sides of the triangle. Every triangle has three midsegments. Midsegments are often used to add rigidity to structures. In the support for the garden swing shown, the crossbar $\overline{DE}$ is a midsegment of $\triangle ABC$



The Midsegment Theorem:

The segment that joins the midpoints of two sides of a triangle
(1) is parallel to the third side;
(2) is half as long as the third side.



Given: M is the midpoint of $\overline{AB}$
N is the midpoint of $\overline{AC}$

You conclude: (1) $\overleftrightarrow{MN} \parallel \overline{BC}$

(2) MN = $\frac{1}{2}BC$

Ex 1: Verifying the Midsegment Theorem Algebraically:

ΔABC has vertices A(-7, -1), B(-5, 5), and C(1, 3). D and E are the midpoints of $\overline{AC}$, and $\overline{BC}$ respectively. Verify the midsegment theorem.

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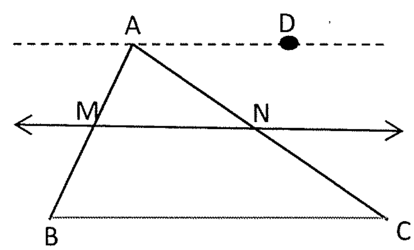
Two More Theorems

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 $\overline{AB}$

$\overleftrightarrow{MN} \parallel \overline{BC}$

You conclude: N is the midpoint of $\overline{AC}$



Theorem: If 2 lines are parallel, then all points on one line are equidistant from the points on the other line.

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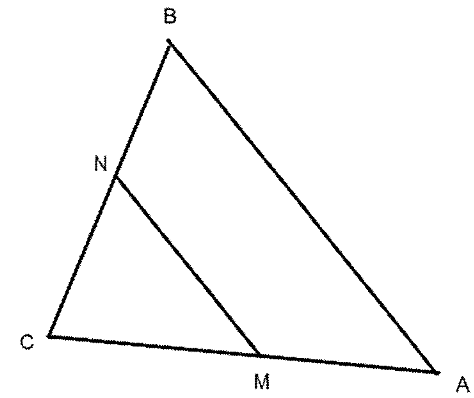
Ex 2: D and E are midpoints of $\overline{AC}$ and $\overline{BC}$, of ΔABC respectively. AB+DE=36. Find AB and DE.

Ex 3: $\overline{MN}$ is a midsegment of the given triangle. $AM = x + 5, MC = 2y + 6,$

$MN = 2x - 5, and\ AB = y + 8$. Find MN and AB.

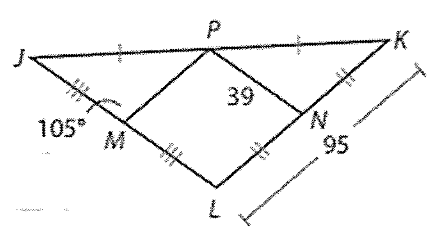


Ex4: Explore: P, Q, and R are midpoints of the sides of ΔDEF, respectively.

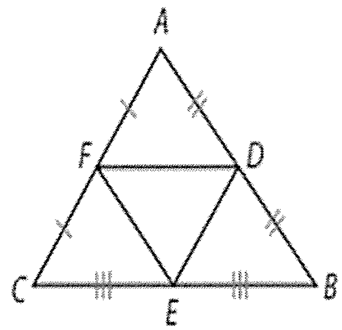
a. What kind of figure is DPQR?

b. If DF = 8, DE = 12, and FE = 10, what is the perimeter of DPQR?

EX5: Find JL, PM, and m∠MLK.



EX6: How does the perimeter of △DEF compare to that of △ABC? Explain.



Ex7: ΔABC has vertices A(-1, 6), B(-4, -3), and C(7, -5). D and E are the midpoints of $\overline{AC}$, and $\overline{BC}$ respectively. Verify the midsegment theorem.

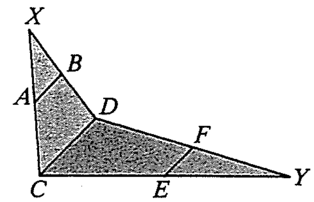
MIDSEGMENT THEOREM HOMEWORK

Tonight: Do problems on this WS on looseleaf.

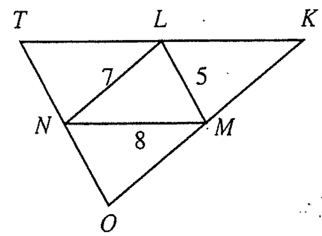
Extra practice: Text pp 343-345/# 4-9, 15, 17, 22, 23

Written Exercises

Points A, B, E, and F are the midpoints of $\overline{XC}$, $\overline{XD}$, $\overline{YC}$, and $\overline{YD}$. Complete.

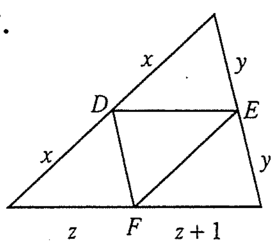


1. If $CD = 24$, then $AB =$ __?__ and $EF =$ __?__.
2. If $AB = k$, then $CD =$ __?__ and $EF =$ __?__.
3. If $AB = 5x - 8$ and $EF = 3x$, then $x =$ __?__.
4. If $CD = 8x$ and $AB = 3x + 2$, then $x =$ __?__.



5. Given: L, M, and N are midpoints of the sides of $\triangle TKO$. Find the perimeter of each figure.
   a. $\triangle TKO$ b. $\triangle LMK$
   c. ▱$TNML$ d. quad. $LNOK$
6. a. Name all triangles congruent to $\triangle TNL$.
   b. Suppose you are told that the area of $\triangle NLM$ is 17.32 cm^2. What is the area of $\triangle TKO$?

Name all the points shown that *must* be midpoints of the sides of the large triangle.

7.


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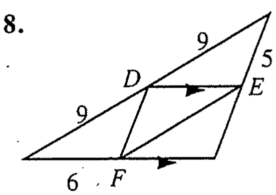

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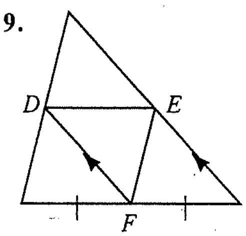
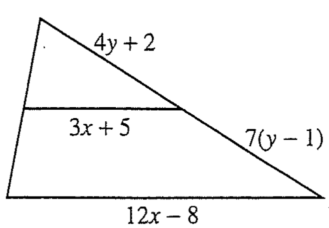
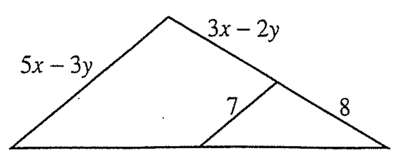
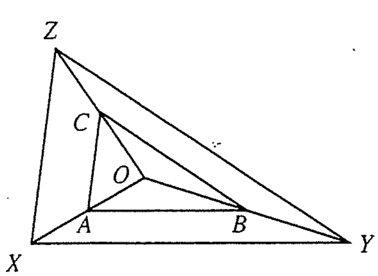


In Exercises 16–17 a segment joins the midpoints of two sides of a triangle. Find the values of x and y.

16.


17.


18. Given: A is the midpoint of $\overline{OX}$;
    $\overline{AB} \parallel \overline{XY}$; $\overline{BC} \parallel \overline{YZ}$
    Prove: $\overline{AC} \parallel \overline{XZ}$



19. Given: ▱$ABCD$; $\overline{BE} \parallel \overline{MD}$;
    M is the midpoint of $\overline{AB}$.
    Prove: $DE = BC$