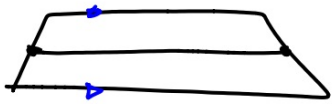
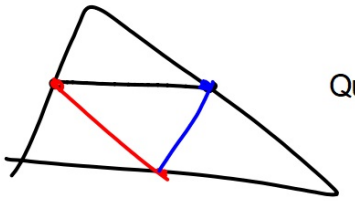
Geometry 7.4
Use proportional parts within triangles
Use proportional parts with parallel lines



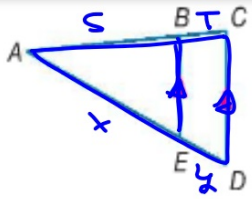
triangle midsegment
trapezoid midsegment
parallel
transversal
midsegment
proportion



Quiz 7.1-7.2

Theorem 7.5 Triangle Proportionality Theorem

If a line is parallel to one side of a triangle and intersects the other two sides, then it divides the sides into segments of proportional lengths.

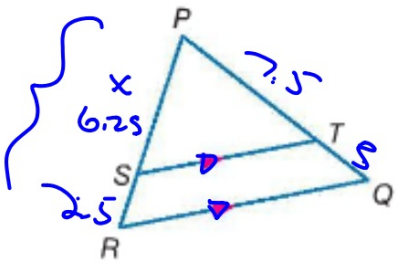


Example If $\overline{BE} \parallel \overline{CD}$, then $\frac{AB}{BC} = \frac{AE}{ED}$.

$$\frac{x}{y} = \frac{s}{t}$$

Example 1 Find the Length of a Side

In $\triangle PQR$, $\overline{ST} \parallel \overline{RQ}$. If $PT = 7.5$, $TQ = 3$, and $SR = 2.5$, find PS.



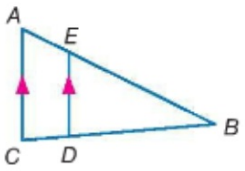
$$\frac{x}{2.5} = \frac{7.5}{3}$$

$$\frac{3x}{3} = \frac{18.75}{3}$$

$$x = 6.25$$

Theorem 7.6 Converse of Triangle Proportionality Theorem

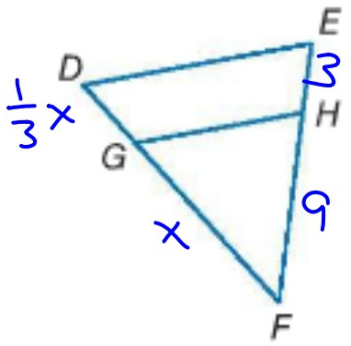
If a line intersects two sides of a triangle and separates the sides into proportional corresponding segments, then the line is parallel to the third side of the triangle.



Example If $\frac{AE}{EB} = \frac{CD}{DB}$, then $\overline{AC} \parallel \overline{ED}$.

Example 2 Determine if Lines are Parallel

In $\triangle DEF$, $EH = 3$, $HF = 9$, and DG is one-third the length of $\overline{GF}$. Is $\overline{DE} \parallel \overline{GH}$?

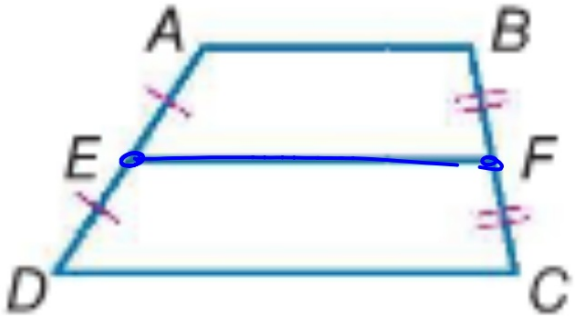


$$\frac{\frac{1}{3}x}{x} = \frac{3}{9}$$

$$3x = \frac{1}{3}x \cdot 9$$

$$3x = 3x$$

(Lesson 6-6)



$\overline{EF} \parallel \overline{AB} \parallel \overline{DC}$

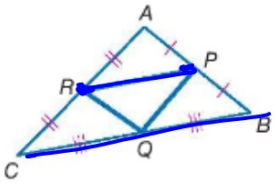
$EF = \frac{1}{2}(AB + DC)$

StudyTip

Midsegment Triangle

The three midsegments of a triangle form the *midsegment triangle.*

A **midsegment of a triangle** is a segment with endpoints that are the midpoints of two sides of the triangle. Every triangle has three midsegments. The midsegments of $\triangle ABC$ are $\overline{RP}$, $\overline{PQ}$, $\overline{RQ}$.

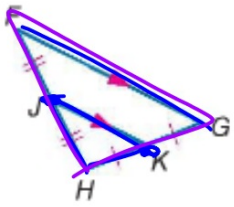


A special case of the Triangle Proportionality Theorem is the Triangle Midsegment Theorem.

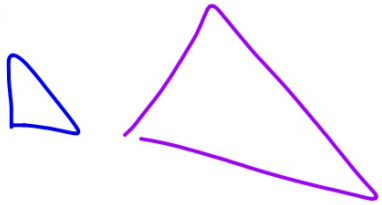
Theorem 7.7 Triangle Midsegment Theorem

A midsegment of a triangle is parallel to one side of the triangle, and its length is one half the length of that side.

Example If J and K are midpoints of $\overline{FH}$ and $\overline{HG}$, respectively, then $\overline{JK} \parallel \overline{FG}$ and $JK = \frac{1}{2}FG$.



You will prove Theorem 7.7 in Exercise 32.



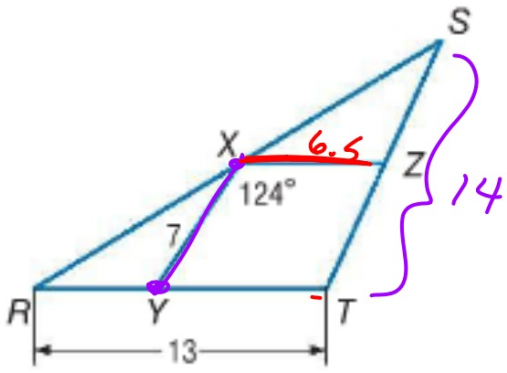
Example 3 Use the Triangle Midsegment Theorem

In the figure, $\overline{XY}$ and $\overline{XZ}$ are midsegments of $\triangle RST$. Find each measure.

a. XZ

b. ST

c. $m\angle RYX$



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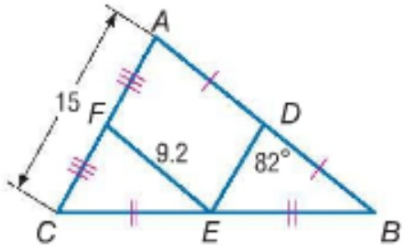
GuidedPractice

Find each measure.

3A. DE

3B. DB

3C. $m\angle FED$

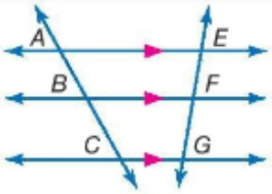


extend the transversals…

Corollary 7.1 Proportional Parts of Parallel Lines

If three or more parallel lines intersect two transversals, then they cut off the transversals proportionally.

Example If $\overline{AE} \parallel \overline{BF} \parallel \overline{CG}$, then $\frac{AB}{BC} = \frac{EF}{FG}$.



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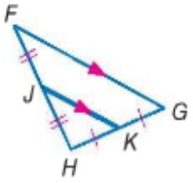
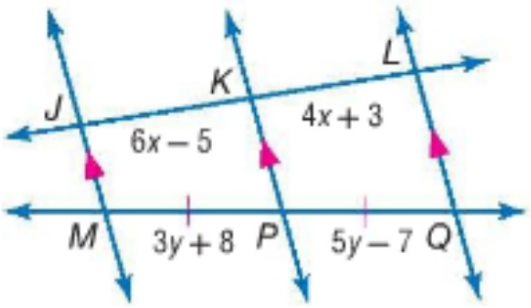


You will prove Theorem 7.7 in Exercise 32.

Real-World Example 5 Use Congruent Segme

ALGEBRA Find x and y.



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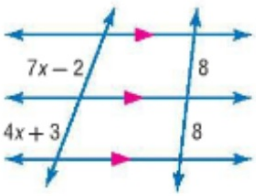
5A.



5B.