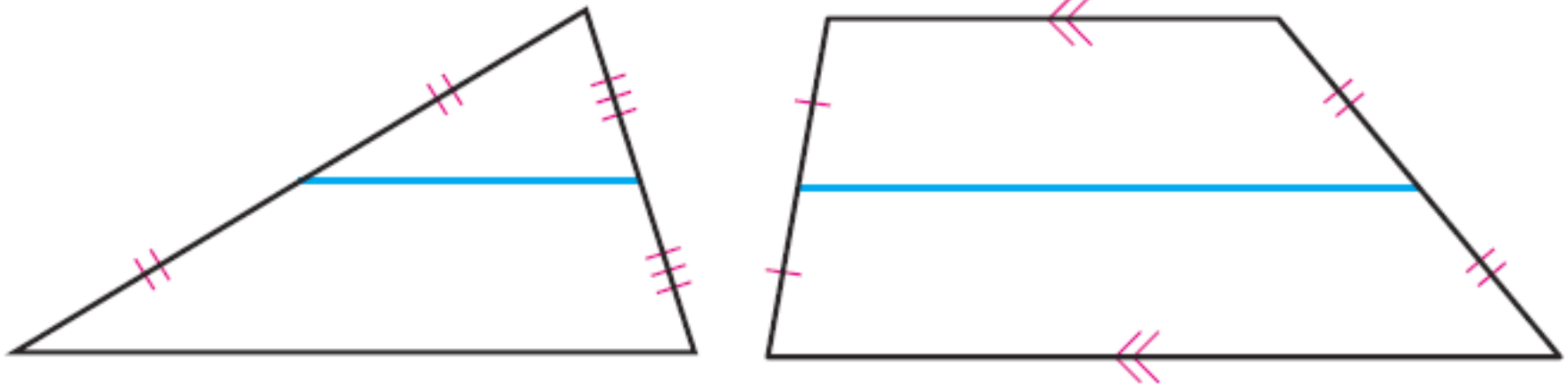


Midsegments

Vocabulary

- Midsegment – The segment connecting the midpoint of the sides of a triangle, also the segment connecting the legs of a trapezoid



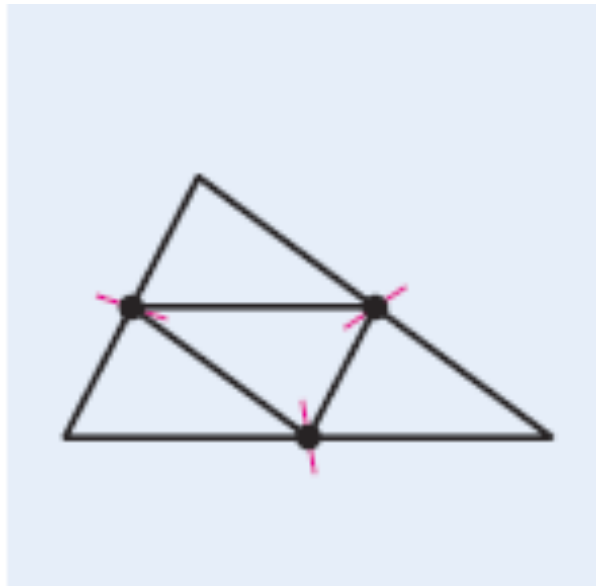
Investigation

- Get your supplies
 - 1 piece of patty paper to be cut in two (1 piece of paper and a marker)
 - Straight Edge

Midsegment Investigation

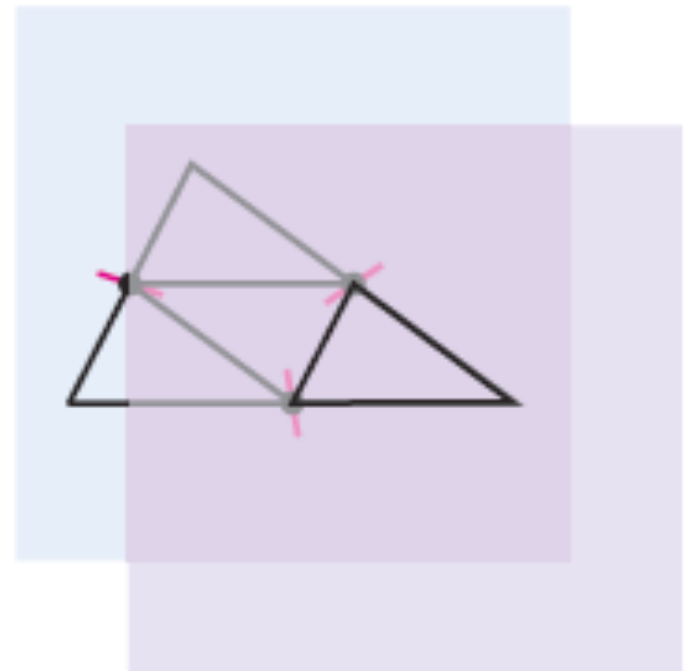
Patty Paper (Regular Paper and marker)

- Draw a large triangle on a piece of patty paper
- Fold/Pinch each of the sides to find the midpoint
- Connect all three midpoints, so you have a triangle drawn with four triangles inside



Midsegment Investigation

- Use a second sheet of patty paper to copy the entire triangle, including the midsegments
- Compare all four triangles
- What conclusions can you draw?

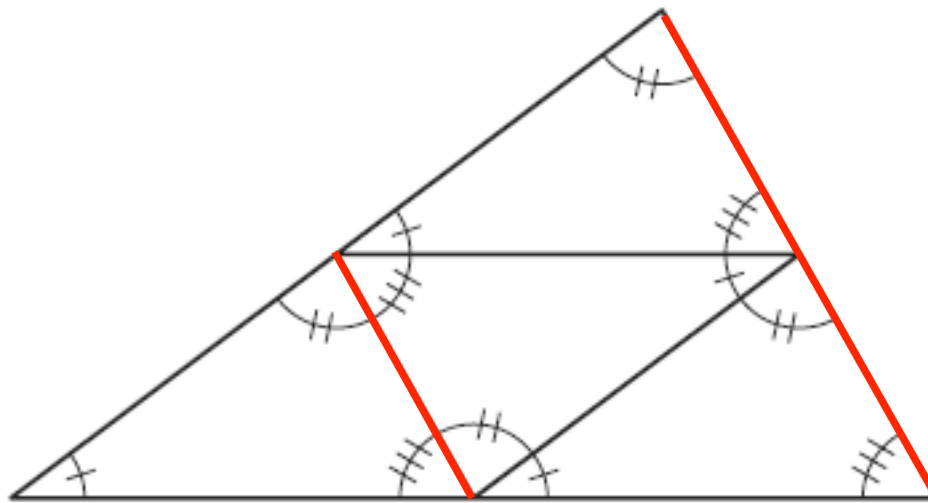


Midsegment Conjecture

- The three midsegments of a triangle divide the triangle into four congruent triangles

Midsegment Investigation

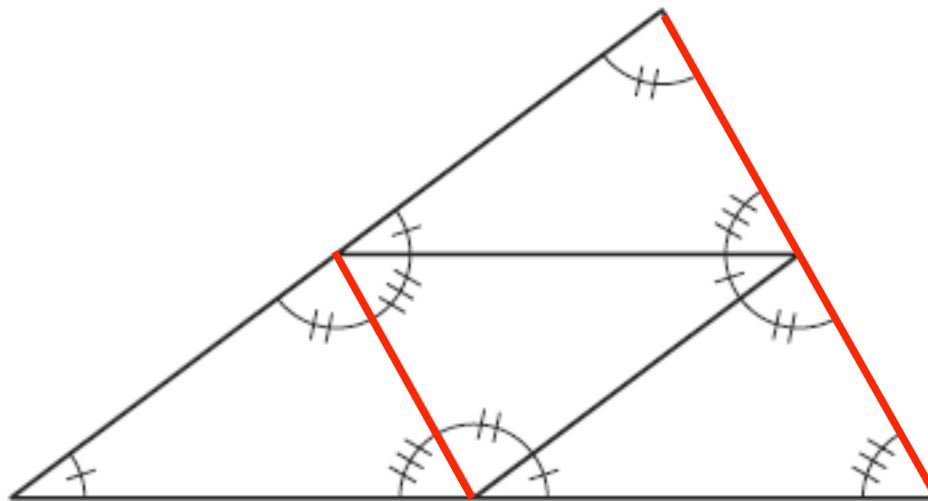
- Mark all congruent angles in the triangles.



What conclusions can be made about the direction (slope) of the two highlighted lines?

Midsegment Investigation

- Mark all congruent angles in the triangles.



What conclusions can be made about the length of the two highlighted lines?

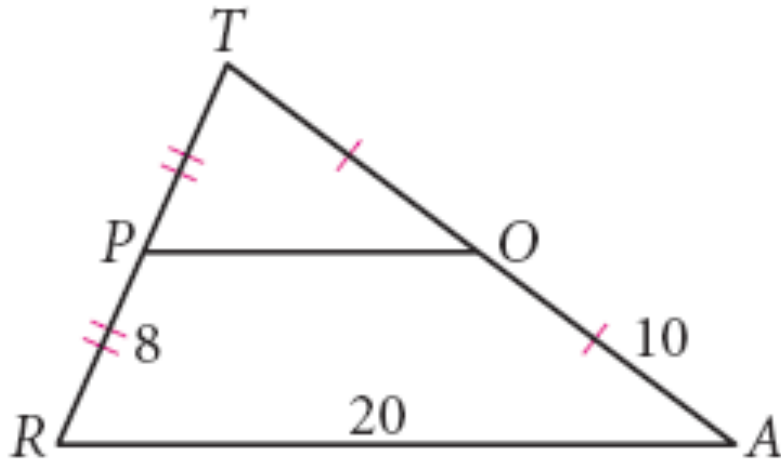
Triangle Midsegment Conjecture

- A midsegment of a triangle is parallel to the third side, and half the length of the third side

Practice Problems

Practice Problems

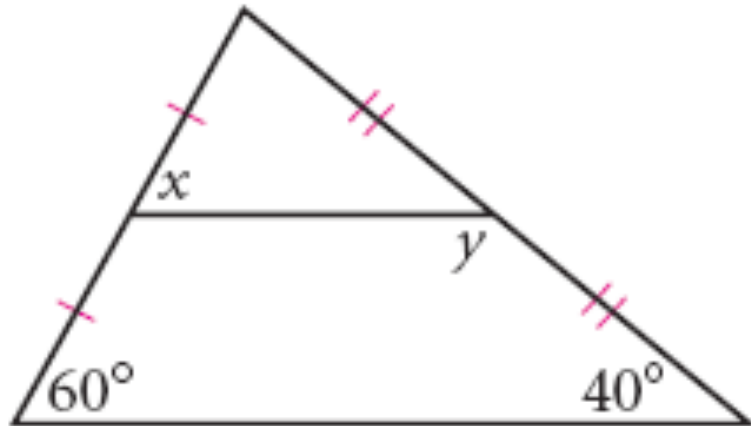
What is the perimeter of $\triangle TOP$?



28. By the Triangle Midsegment Conjecture, $PO = \frac{1}{2}(RA) = 10$. From the figure, $PT = PR = 8$, and $OT = OA = 10$, so the perimeter of $\triangle TOP$ is $8 + 10 + 10 = 28$.

Practice Problems

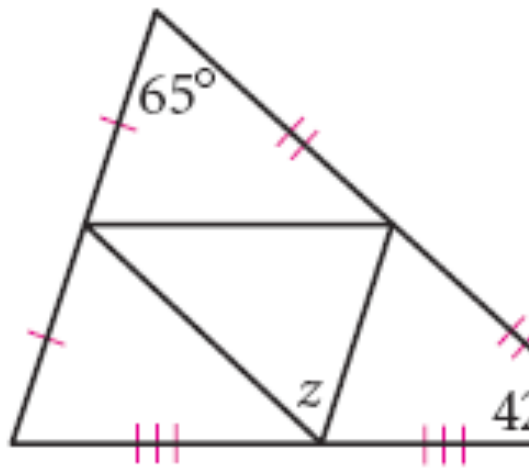
$$x = \underline{\quad? \quad}$$
$$y = \underline{\quad? \quad}$$



$x = 60^\circ$, $y = 140^\circ$. By the Triangle Midsegment Conjecture, the midsegment shown is parallel to the third side, so $x = 60^\circ$ (AIA Conjecture). Also, the angle that forms a linear pair with the angle of measure y measures 40° , so $y = 180^\circ - 40^\circ = 140^\circ$.

Practice Problems

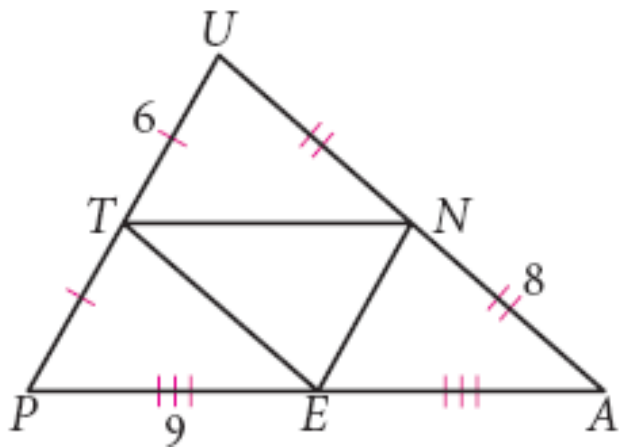
$$z = \underline{\quad?}$$



65°. By the Three Midsegments Conjecture, the midsegments divide the large triangle into four smaller congruent triangles. The three angles of the large triangle measure 65°, 42°, and $180^\circ - (65^\circ + 42^\circ) = 73^\circ$. Because all four triangles are congruent, each must have angle measures of 65°, 42°, and 73°. By the Triangle Midsegment Conjecture, each of the three midsegments is parallel to the third side. By using the CA Conjecture, you can find the angle measures in the three outer triangles. (Notice that all three of these triangles are oriented the same way, while the inner triangle is oriented differently.) From these angle measures, you can see that $42^\circ + z + 73^\circ = 180^\circ$, so $z = 65^\circ$.

Practice Problems

What is the perimeter of $\triangle TEN$?

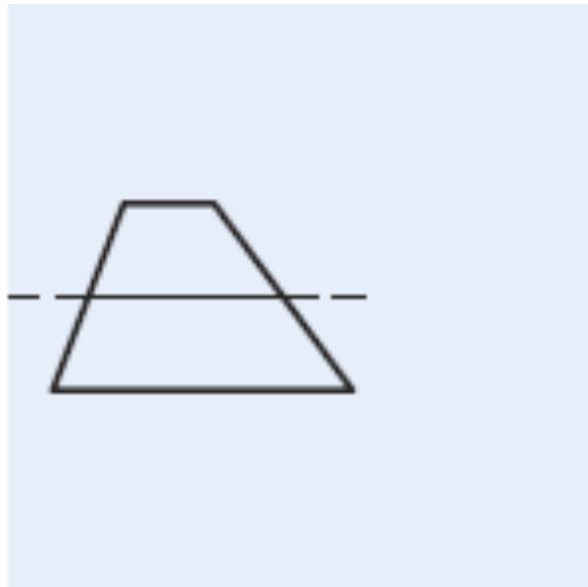


23. By the Triangle Midsegment Conjecture, each side of $\triangle TEN$ is half the length of the parallel side of $\triangle UPA$: $TN = \frac{1}{2}(PA) = 9$, $TE = \frac{1}{2}(UA) = 8$, and $NE = \frac{1}{2}(UP) = 6$. Therefore, the perimeter of $\triangle TEN$ is $9 + 8 + 6 = 23$.

Practice Problems

Trapezoid Midsegment Investigation

- 2 pieces of patty paper
- Draw a small trapezoid on the left side of your patty paper.
- Find the midsegment of the non parallel sides



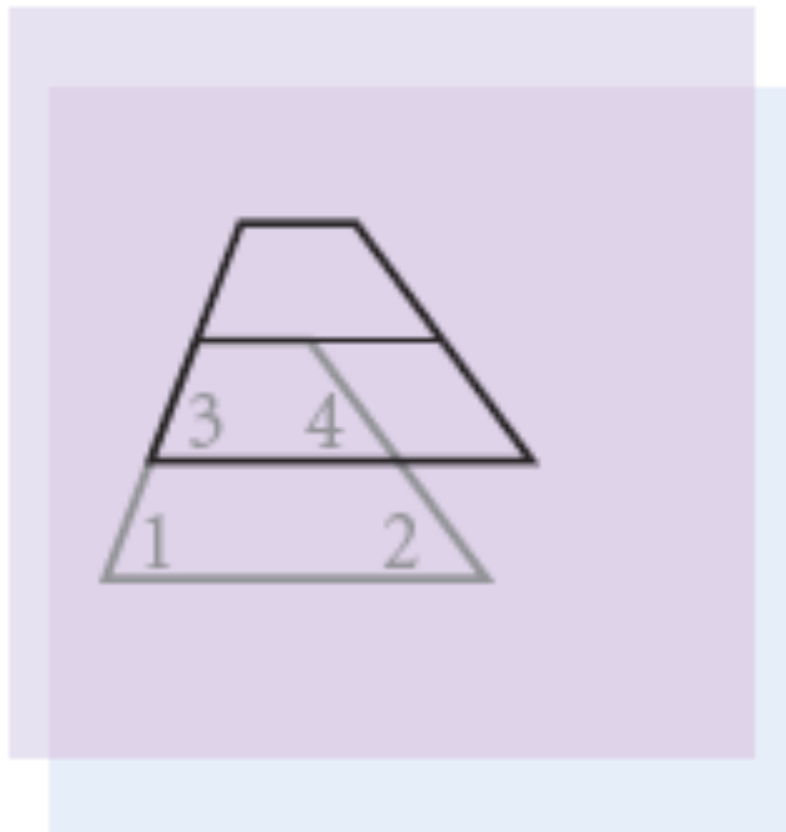
Trapezoid Midsegment Investigation

- Label the angles 1,2,3 & 4 as shown
- Copy everything onto the second piece of patty paper



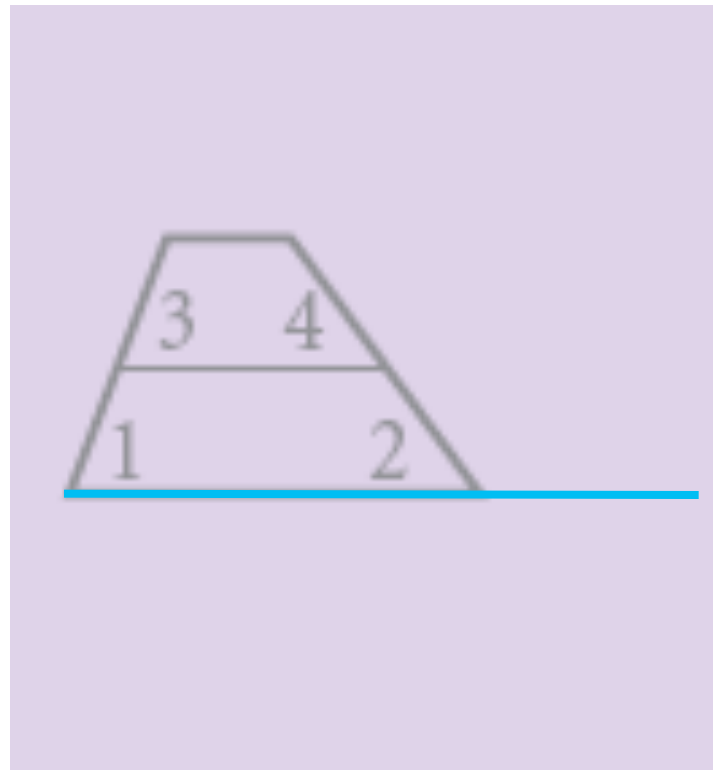
Trapezoid Midsegment Investigation

- Compare angles 1 & 3 and angles 2 & 4



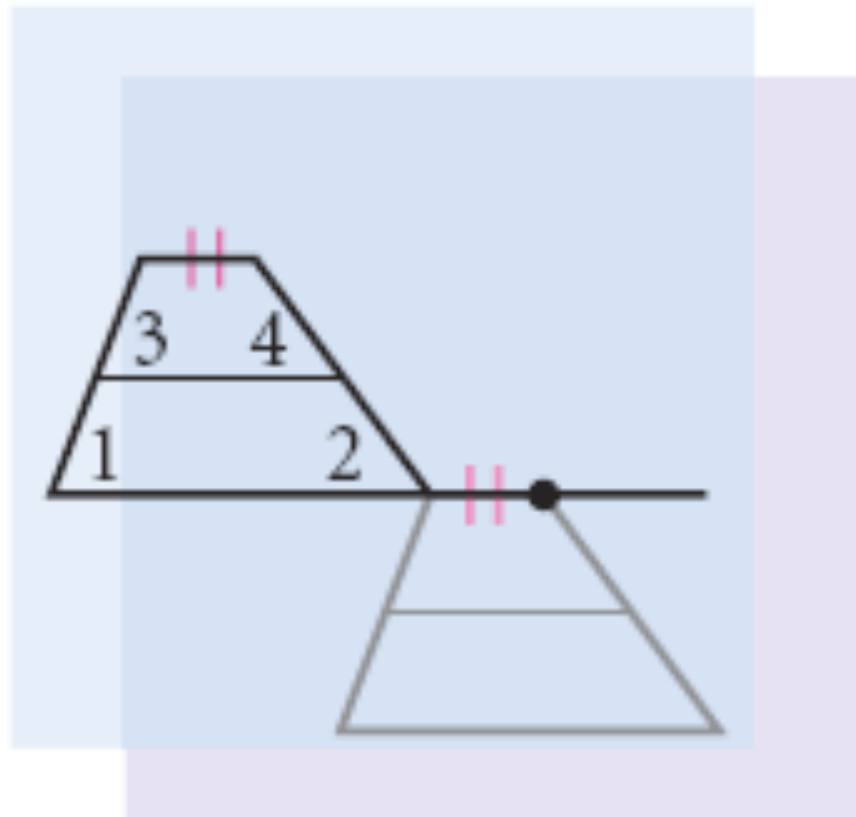
Trapezoid Midsegment Investigation

- On the original drawing, extend the longest base



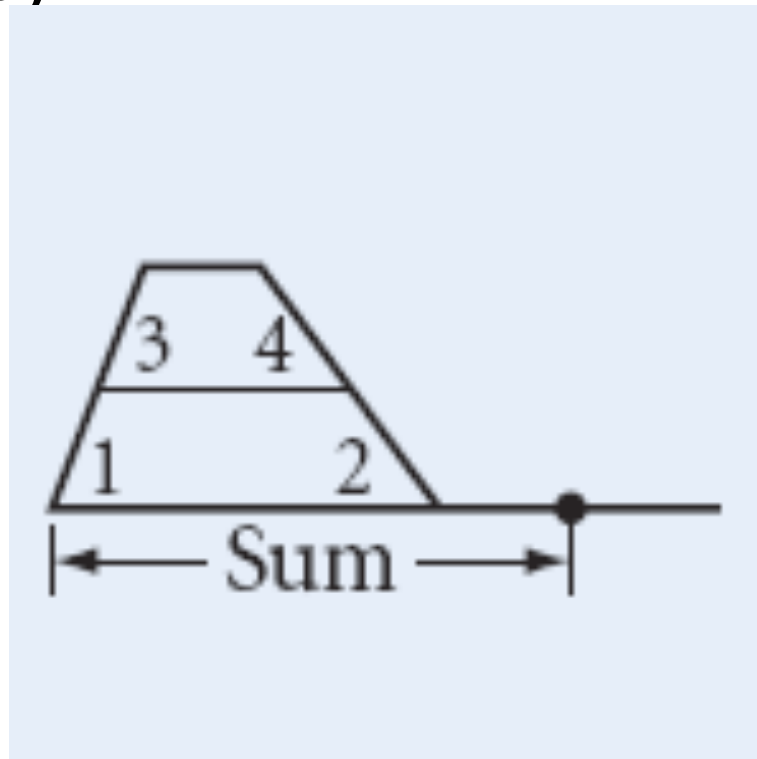
Trapezoid Midsegment Investigation

- Add the length of the shorter base onto the extended longer base



Trapezoid Midsegment Investigation

- How many times does the midsegment fit onto this extended base (the sum of the two bases)?

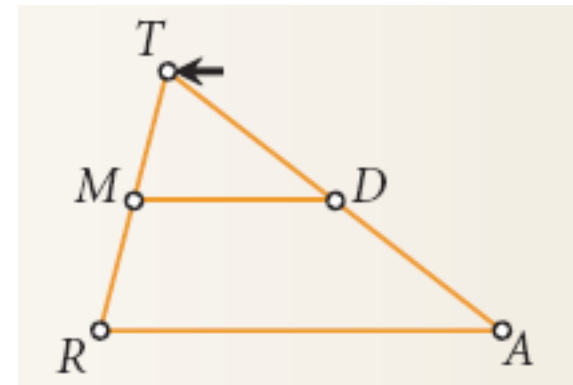
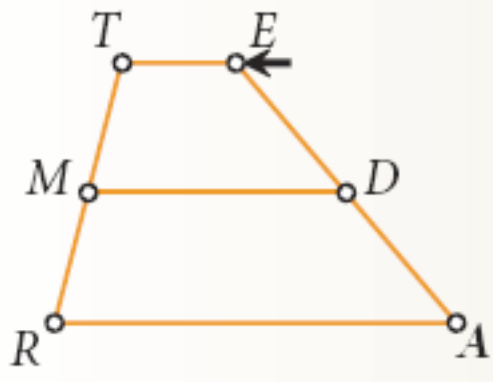
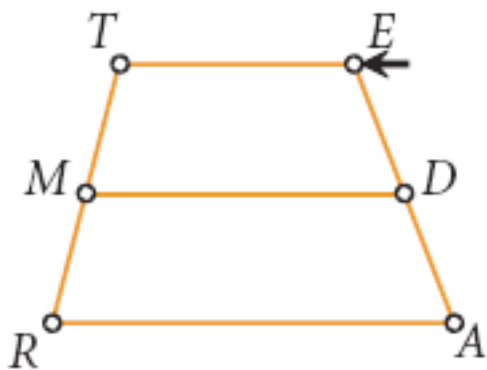


Trapezoid Midsegment Conjecture

- The midsegment of a trapezoid is parallel to the bases and equal in length to half the sum of the bases.

Trapezoid Midsegment Conjecture

- If we use software to shrink a base to a point, the trapezoid becomes a triangle. Will the same formula work for the triangle midsegment conjecture?

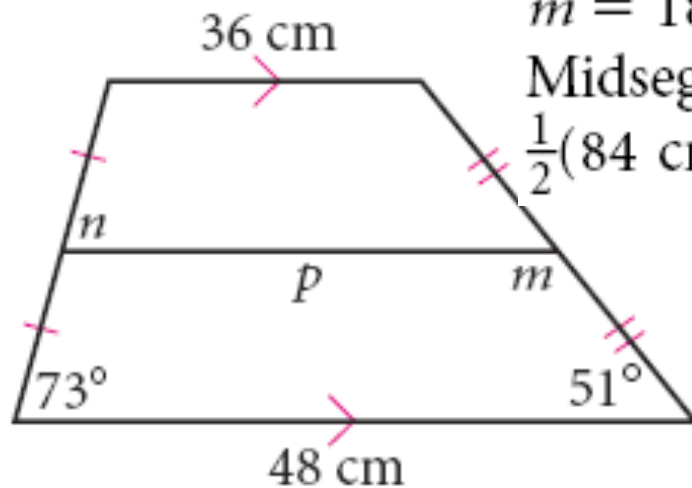


Practice Problems

$$m = \underline{\quad?}$$

$$n = \underline{\quad?}$$

$$p = \underline{\quad?}$$



$m = 129^\circ$, $n = 73^\circ$, $p = 42$ cm. By the Trapezoid Midsegment Conjecture, the midsegment is parallel to the two bases, so $n = 73^\circ$ (CA Conjecture). By the Interior Supplements Conjecture, $m = 180^\circ - 51^\circ = 129^\circ$. By the Trapezoid Midsegment Conjecture, $p = \frac{1}{2}(36 \text{ cm} + 48 \text{ cm}) = \frac{1}{2}(84 \text{ cm}) = 42 \text{ cm}$.

Practice Problems

$$q = \underline{\quad?}$$

35. By the Trapezoid Midsegment Conjecture, $24 = \frac{1}{2}(13 + q)$, so $48 = 13 + q$ and $q = 35$. Another way to find q is to notice that the length of the shorter base is 11 less than the length of the midsegment, so the length of the longer base must be 11 more than the midsegment: $q = 24 + 11 = 35$.

