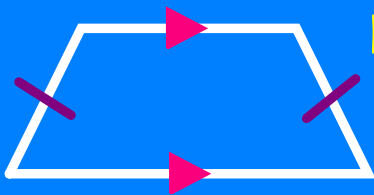
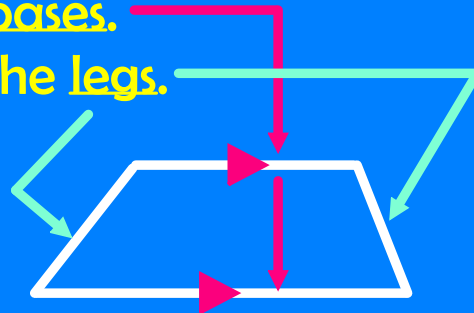


SECTION 8.5

A trapezoid is a quadrilateral with exactly one pair of parallel sides.

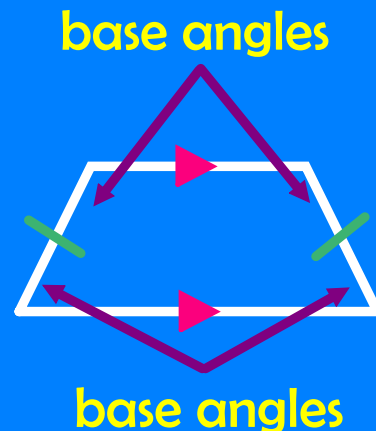
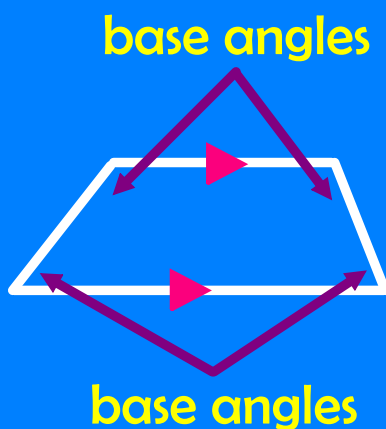
The parallel sides are the bases.

The nonparallel sides are the legs.

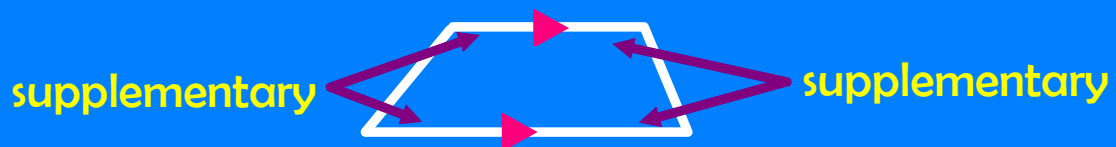


If the legs are congruent, the trapezoid is called an isosceles trapezoid.

Base angles are the angles that lie on the same base.



Consecutive angles
(not including pairs
of base angles) are
supplementary.



Theorem 8.14

If a trapezoid is isosceles, then each pair of base angles is congruent.

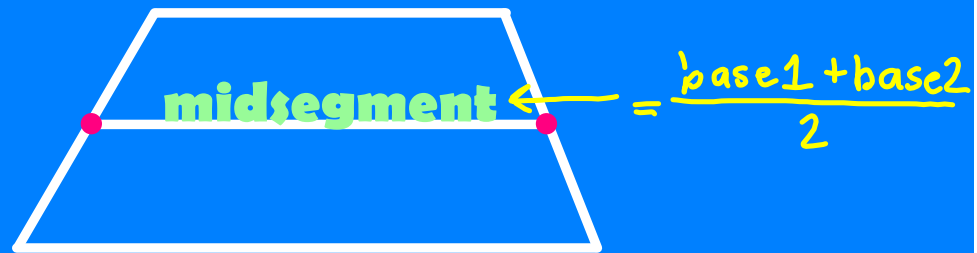
Theorem 8.15

If a trapezoid has a pair of congruent base angles, then it is an isosceles trapezoid.

Theorem 8.16

A trapezoid is isosceles if and only if its diagonals are congruent.

The midsegment of a trapezoid is the segment that joins the midpoints of its legs.



Theorem 8.17

The midsegment of a trapezoid is parallel to the bases, and its length is one-half the sum of the lengths of the bases.

Example 1

Given trapezoid EZOI with midsegment \overline{AB} , find the value of x .

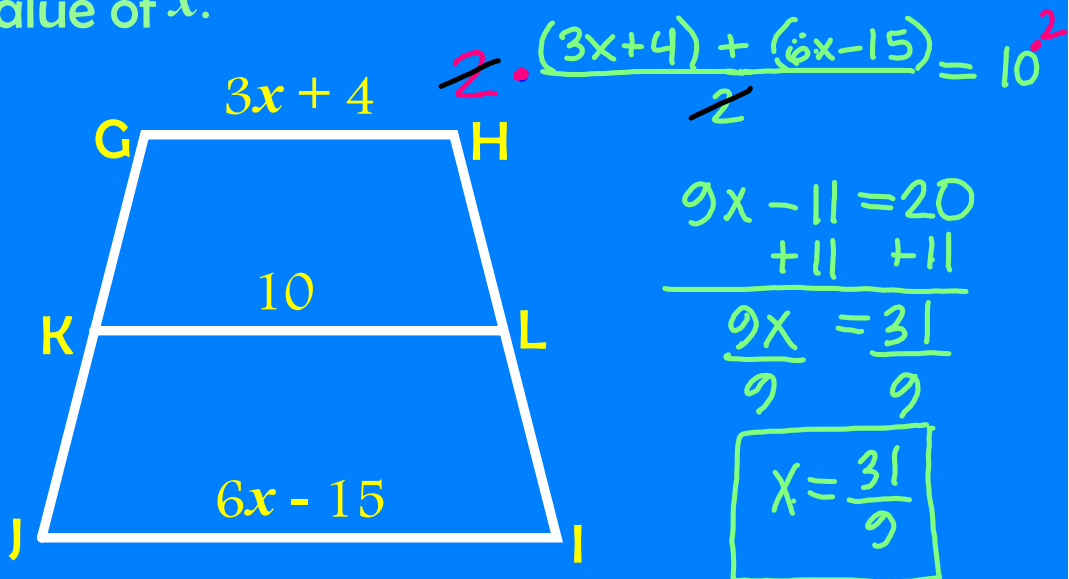
$$2 \cdot \frac{(4x - 10) + (3x + 8)}{2} = 13 \cdot 2$$

$$(4x - 10) + (3x + 8) = 26$$

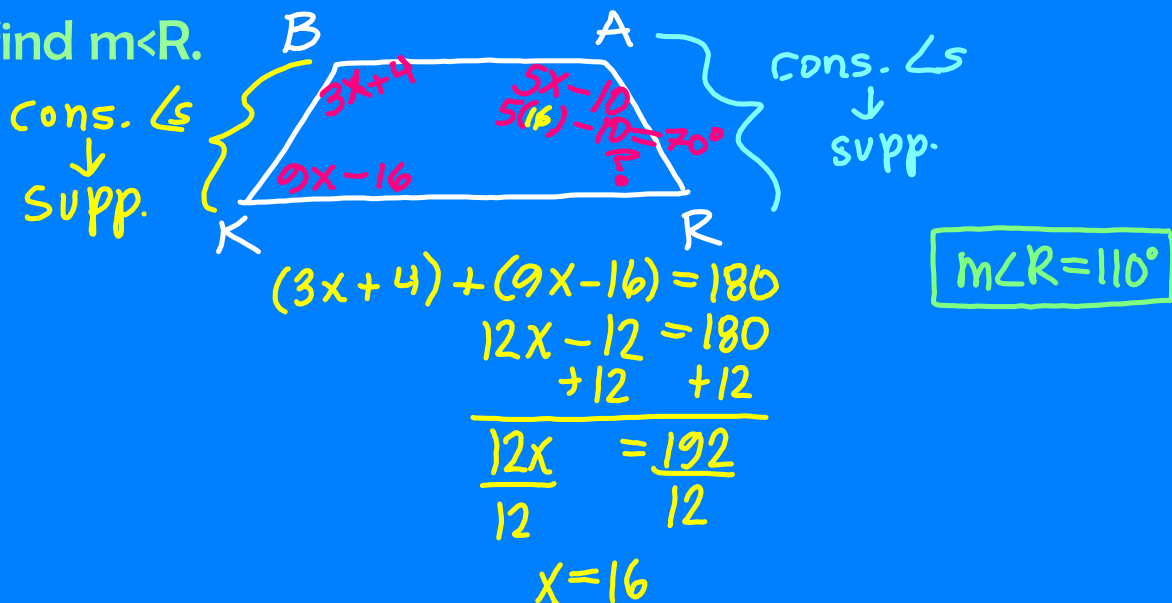
$$\begin{array}{r} 7x - 2 \\ + 2 \\ \hline 7x = 28 \\ \hline x = 4 \end{array}$$

Example 2

Given trapezoid $GHIJ$ with midsegment \overline{KL} , find the value of x .

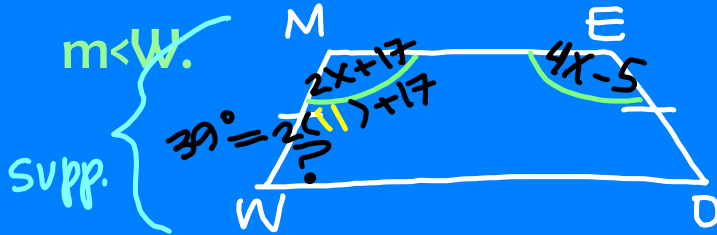
**Example 3**

$BARK$ is a trapezoid with bases \overline{BA} and \overline{RK} . If $m\angle B = 3x + 4$, $m\angle A = 5x - 10$, and $m\angle K = 9x - 16$, find $m\angle R$.



Example 4

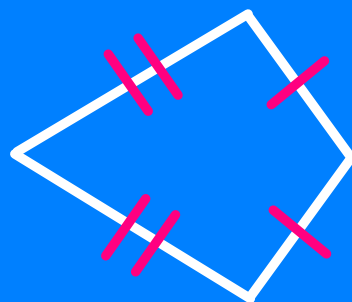
\overline{MEOW} is an isosceles trapezoid with bases \overline{ME} and \overline{OW} . If $m\angle M = 2x + 17$ and $m\angle E = 4x - 5$, find $m\angle W$.



$$m\angle W = 141^\circ$$

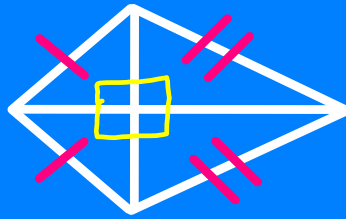
$$\begin{array}{r} 2x + 17 = 4x - 5 \\ -2x \quad \quad -2x \\ \hline 17 = 2x - 5 \\ +5 \quad \quad +5 \\ \hline 22 = 2x \\ \frac{22}{2} = \frac{2x}{2} \\ 11 = x \end{array}$$

A **kite** is a quadrilateral that has two pair of consecutive congruent sides, but opposite sides are not congruent.

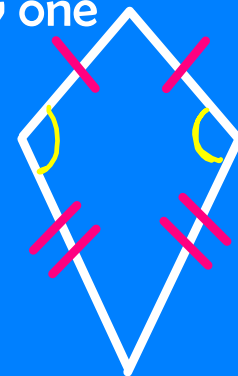


Theorem 8.18

If a quadrilateral is a kite, then its diagonals are perpendicular.

**Theorem 8.19**

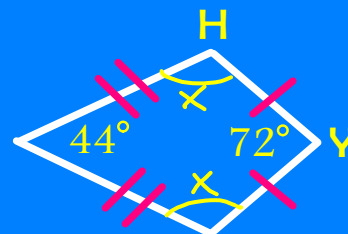
If a quadrilateral is a kite, then exactly one pair of opposite angles are congruent.

**Example 5**

Find $m\angle B$ and $m\angle H$.

$$\begin{aligned} 44 + 72 + 2x &= 360 \\ 116 + 2x &= 360 \\ \underline{-116} \quad \underline{-116} & \\ 2x &= 244 \\ \frac{2x}{2} &= \frac{244}{2} \end{aligned}$$

$$x = 122$$



$$\begin{aligned} m\angle B &= 122^\circ \\ m\angle H &= 122^\circ \end{aligned}$$

Example 6

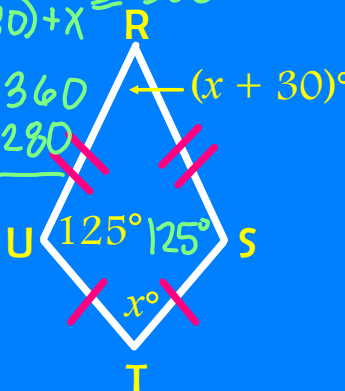
RSTU is a kite. Find $m\angle R$, $m\angle S$, and $m\angle T$.

$$125 + 125 + (x + 30) + x = 360$$

$$\begin{aligned} 280 + 2x &= 360 \\ \underline{-280} \quad \underline{-280} & \end{aligned}$$

$$\frac{2x}{2} = \frac{80}{2}$$

$$x = 40$$



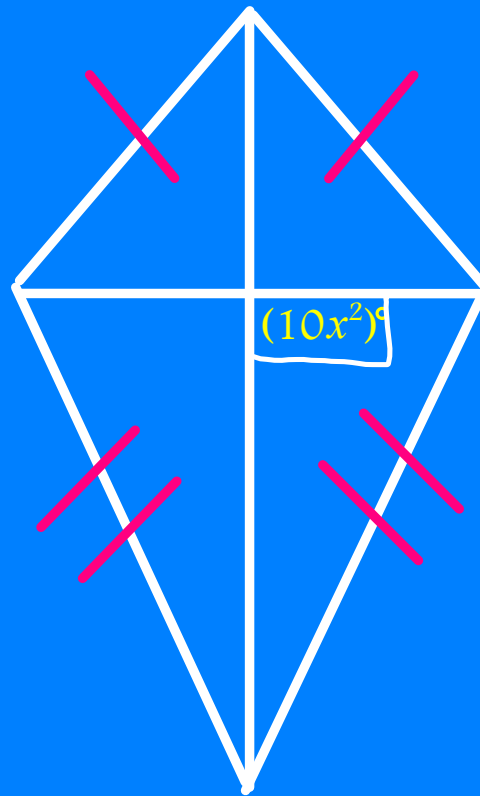
$$\begin{aligned} m\angle R &= 70^\circ \\ m\angle S &= 125^\circ \\ m\angle T &= 40^\circ \end{aligned}$$

Example 7Find the value of x .

$$\frac{10x^2}{10} = \frac{90}{10}$$

$$\sqrt{x^2} = \sqrt{9}$$

$$x = \pm 3$$

**Example 8**Find the value of x .

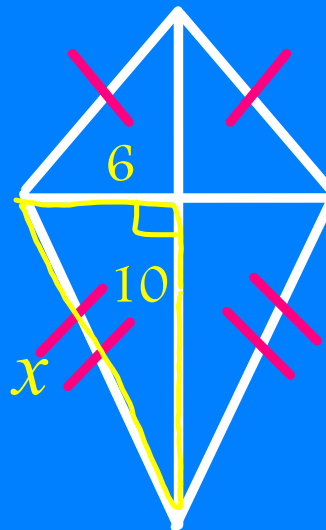
$$6^2 + 10^2 = x^2$$

$$36 + 100 = x^2$$

$$\sqrt{136} = \sqrt{x^2}$$

$$\pm 2\sqrt{34} = x$$

$$+2\sqrt{34} = x$$



$$\begin{array}{r} 2 \overline{) 136} \\ \underline{2} \\ 2 \\ \underline{2} \\ 17 \end{array}$$