7.5 Properties of Trapezoids and Kites

In your own words, write the meaning of each vocabulary term. refer to your vocab cards

trapezoid

a polygon with one set of || lines

bases

the parallel lines on a trapezoid

base angles

the two angles touching the base

legs

the non-parallel sides on a trapezoid

isosceles trapezoid

when the legs are ≅

midsegment of a trapezoid

the segment connecting the midpoints of the two legs.

kite

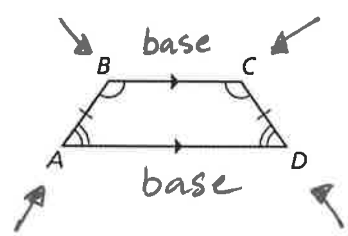
a polygon with two adjacent congruent sides

Theorems

Theorem 7.14 Isosceles Trapezoid Base Angles Theorem

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

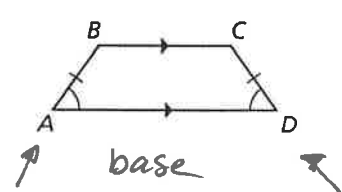
If trapezoid $ABCD$ is isosceles, then $\boxed{\angle A \cong \angle D}$ and $\boxed{\angle B \cong \angle C}$.



Theorem 7.15 Isosceles Trapezoid Base Angles Converse

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

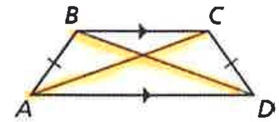
If $\boxed{\angle A \cong \angle D}$ (or if $\angle B \cong \angle C$), then trapezoid $ABCD$ is isosceles.



Theorem 7.16 Isosceles Trapezoid Diagonals Theorem

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

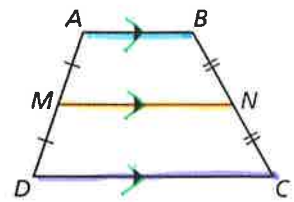
Trapezoid $ABCD$ is isosceles if and only if $\boxed{\overline{AC} \cong \overline{BD}}$.



Theorem 7.17 Trapezoid Midsegment Theorem

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

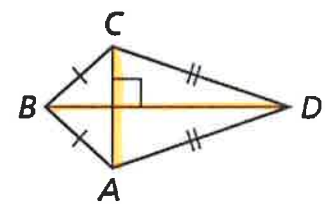
If $\overline{MN}$ is the midsegment of trapezoid $ABCD$, then $\boxed{\overline{MN} \parallel \overline{AB}}$ and $\boxed{\overline{MN} \parallel \overline{DC}}$ and $\boxed{MN = \frac{1}{2}(AB + CD)}$.



Theorem 7.18 Kite Diagonals Theorem

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

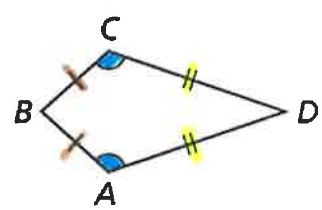
If quadrilateral $ABCD$ is a kite, then $\boxed{\overline{AC} \perp \overline{BD}}$.



Theorem 7.19 Kite Opposite Angles Theorem

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

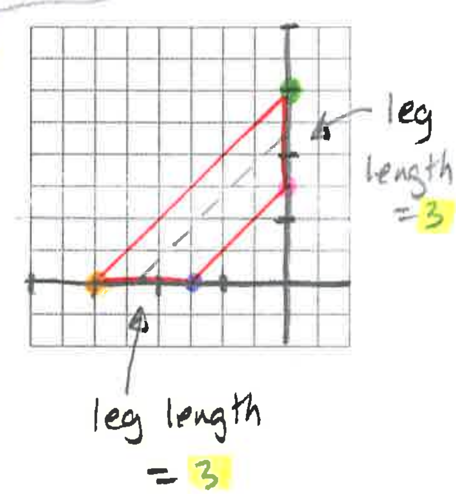
If quadrilateral $ABCD$ is a kite and $\overline{BC} \cong \overline{BA}$, then $\boxed{\angle A \cong \angle C}$ and $\angle B \ncong \angle D$.



pay attention to the location

Extra Practice

1. Show that the quadrilateral with vertices at $Q(0, 3)$, $R(0, 6)$, $S(-6, 0)$, and $T(-3, 0)$ is a trapezoid. Decide whether the trapezoid is isosceles. Then find the length of the midsegment of the trapezoid.



$\boxed{\text{Yes}}$.. it is an isosceles trapezoid

length = distance formula for $(-4.5, 0)$ $(0, 4.5)$

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

$$(-4.5-0)^2+(0-4.5)^2$$

$$(-4.5)^2+(4.5)^2$$

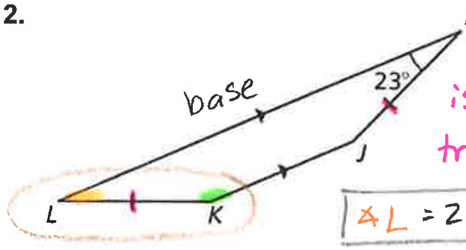
$$20.25+20.25 = \sqrt{40.5} \approx \boxed{6.36}$$ midsegment

7.5

Extra Practice

In Exercises 2 and 3, find $m\angle K$ and $m\angle L$.

2.



we have an isosceles trapezoid

$\boxed{\angle L = 23^\circ}$ since base $\angle$ are $\cong$

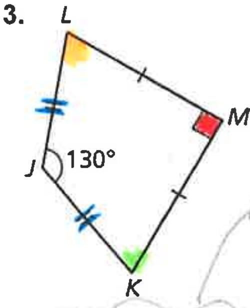
$180 = \angle L + \angle K$

$180 = 23 + \angle K$

$-23 \quad -23$

$\boxed{157^\circ = \angle K}$

3.



a kite has 1 pair of $\cong$ opp $\angle$

every quadrilateral

$360 = \angle L + \angle K + \angle M + \angle J$

$360 = x + x + 90 + 130$

$360 = 2x + 220$

$-220 \quad -220$

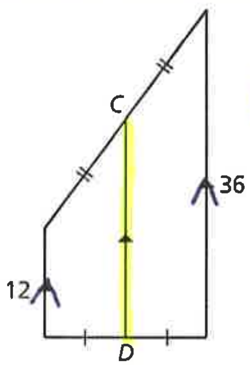
$140 = 2x$

$\frac{140}{2} = \frac{2x}{2}$

$70 = x$ so $\boxed{\angle L = 70^\circ \quad \angle K = 70^\circ}$

In Exercises 4 and 5, find *CD*.

4.



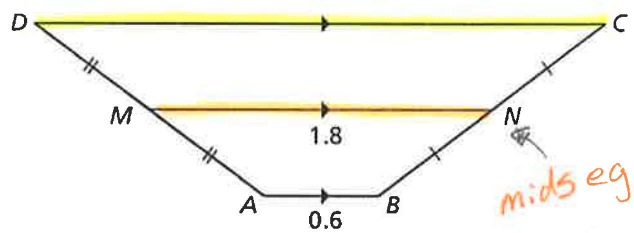
$\text{midsegment} = \frac{1}{2}(b_1 + b_2)$

$= \frac{1}{2}(12 + 36)$

$= \frac{1}{2}(48)$

$\boxed{CD = 24}$

5.



$1.8 = \frac{1}{2}(CD + AB)$

$2[1.8] = [\frac{1}{2}(x + .6)]2$

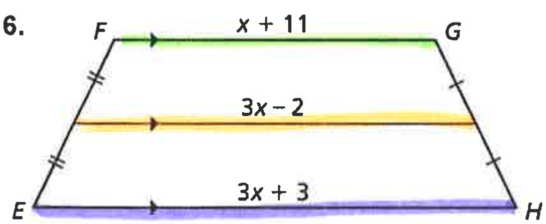
$3.6 = x + .6$

$-.6 \quad -.6$

$3 = x$ so $\boxed{3 = CD}$

In Exercises 6 and 7, find the value of *x*.

6.



$\text{midsegment} = \frac{1}{2}(\text{base} + \text{base})$

$3x - 2 = \frac{1}{2}(x + 11 + 3x + 3)$

$= \frac{1}{2}(4x + 14)$

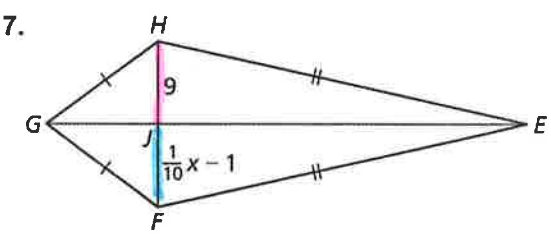
$\frac{1}{2}(4x) + \frac{1}{2}(14)$

$3x - 2 = 2x + 7$

$-2x + 2 \quad -2x \quad +2$

$\boxed{x = 9}$

7.



the one diagonal $\overline{HF}$ is bisected

so $9 = \frac{x}{10} - 1$

$+1 \qquad +1$

$10(10) = \left(\frac{x}{10}\right)10$

$\boxed{100 = x}$