

# GUIDED NOTES: Properties of Trapezoids and Kites

A trapezoid is a quadrilateral with exactly one pair of parallel sides, called *bases*, and two nonparallel sides, called *legs*.

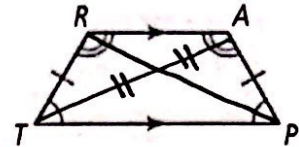
## Isosceles Trapezoids

An **isosceles trapezoid** is a trapezoid with congruent legs.

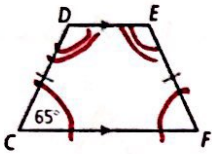
A trapezoid is isosceles if there is only:

- One set of parallel sides
- Base angles are congruent
- Legs are congruent
- Diagonals are congruent
- Opposite angles are supplementary

$$\angle T \cong \angle P, \angle R \cong \angle A$$



**EX1:** CDEP is an isosceles trapezoid and  $m\angle C = 65$ . What are  $m\angle D$ ,  $m\angle E$ , and  $m\angle F$ ?



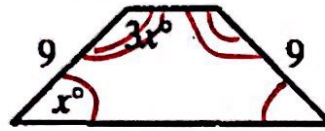
$$m\angle F = 65^\circ$$

$$180 - 65 = 115$$

$$m\angle D = 115^\circ$$

$$m\angle E = 115^\circ$$

**EX2:** The following is an isosceles trapezoid. What is the value of  $x$ ?



$$x + 3x = 180$$

$$4x = 180$$

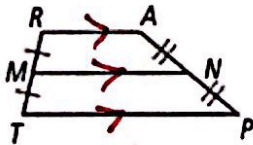
$$\frac{4x}{4} = \frac{180}{4}$$

$$x = 45$$

## Trapezoid Midsegment

The **median** (also called the midsegment) of a trapezoid is a segment that connects the midpoint of one leg to the midpoint of the other leg.

**Theorem:** If a quadrilateral is a trapezoid, then a) the midsegment is parallel to the bases and b) the length of the midsegment is half the sum of the lengths of the bases

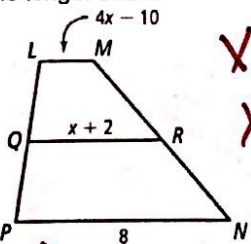


$$(1) \overline{MN} \parallel \overline{TP}, \overline{MN} \parallel \overline{RA}, \text{ and}$$

$$(2) MN = \frac{1}{2}(TP + RA)$$

$$\text{mid} = \frac{1}{2}(\text{top} + \text{bottom})$$

**EX3:** QR is the midsegment of trapezoid LMNP. What is  $x$  and the length of LM?



$$x + 2 = \frac{1}{2}(8 + 4x - 10)$$

$$x + 2 = 4 + 2x - 5$$

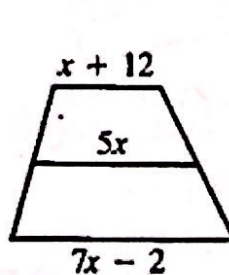
$$x + 2 = 2x - 1$$

$$x = 3$$

$$4(3) - 10$$

$$LM = 2$$

**EX4:** Find the length of the midsegment.



$$5x = \frac{1}{2}(x + 12 + 7x - 2)$$

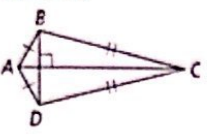
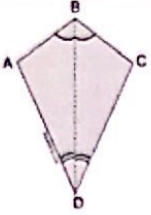
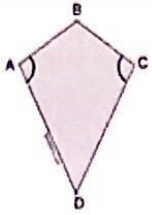
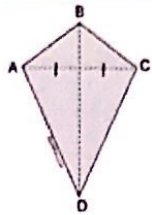
$$5x = \frac{1}{2}(8x + 10)$$

$$5x = 4x + 5$$

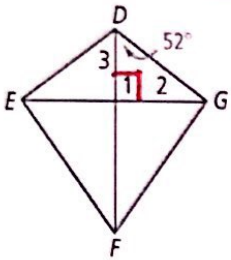
$$-4x \quad -4x$$

$$x = 5$$

$$5(5) = 25$$

K i t e	<p>A kite is a quadrilateral with two pairs of adjacent, congruent sides.</p>	If a quadrilateral is a kite, then:			
		Its diagonals are perpendicular.	Its diagonals bisect the opposite angles.	One pair of opposite angles are congruent.	One diagonal bisects the other.
		$\overline{AC} \perp \overline{BD}$ 			

EX 5: Quadrilateral DEFG is a kite. What are  $m\angle 1$ ,  $m\angle 2$ , and  $m\angle 3$ ?



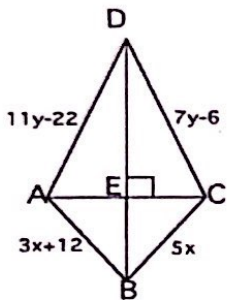
$$m\angle 1 = 90^\circ$$

$$m\angle 3 = 52^\circ$$

$$180 - 90 - 52 = 38$$

$$m\angle 2 = 38^\circ$$

EX6: Quadrilateral ABCD is a kite. Solve for x and y.



$$11y - 22 = 7y - 6$$

$$-7y + 22 = -7y + 22$$

$$4y = 16$$

$$\frac{4y}{4} = \frac{16}{4}$$

$$y = 4$$

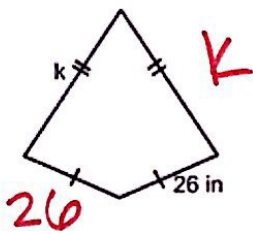
$$3x + 12 = 5x$$

$$-3x + 12 = -3x + 5x$$

$$\frac{12}{2} = \frac{2x}{2}$$

$$x = 6$$

EX7: Find k if the perimeter of the kite is 118 inches



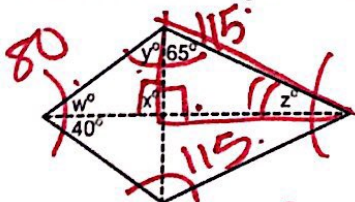
$$118 = 2k + 2(26)$$

$$-52$$

$$\frac{66}{2} = \frac{2k}{2}$$

$$k = 33$$

EX8: Find the missing information for the following kite.



$$x = 90^\circ$$

$$w = 40^\circ$$

$$180 - 90 - 40 = y$$

$$y = 50^\circ$$

$$360 - 115(2) - 80 = \frac{50}{2} = 25^\circ = z$$