

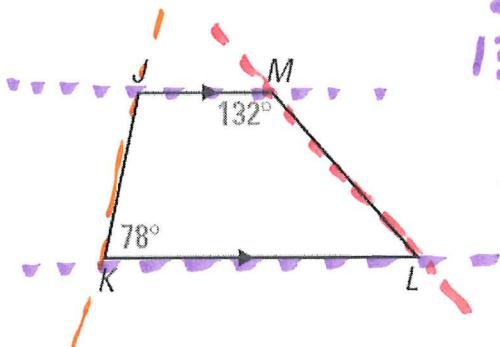
## Quadrilaterals and Polygons

### Trapezoids (6-6) Notes

Name Key

A quadrilateral that has at least one pair of parallel sides is called a trapezoid. The sides that are parallel are called Bases. The nonparallel sides are called legs. If the legs are congruent, then it is an isosceles trapezoid.

Example: Find  $m\angle J$  and  $m\angle L$

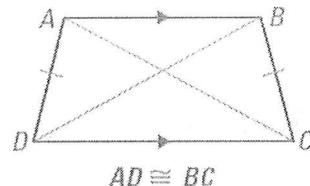
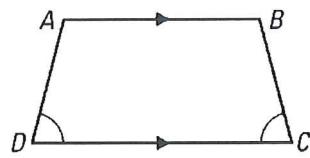
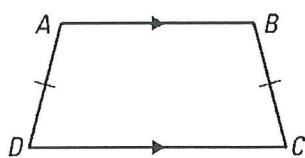


$$\begin{aligned} \angle M + \angle L &= 180 && \text{Consecutive int. } \\ 132 + \angle L &= 180 && \angle S \text{ are Suppl.} \\ \boxed{\angle L = 48^\circ} \end{aligned}$$

$$\begin{aligned} \angle J + \angle K &= 180 && \text{consecutive int } \angle S \\ \angle J + 78 &= 180 \\ \boxed{\angle J = 102^\circ} \end{aligned}$$

### ISOSCELES TRAPEZOIDS

- Each pair of base angles of an isosceles trapezoid are  $\cong$ .
- The diagonals of an isosceles trapezoid are  $\cong$ .



### EXAMPLE 1 Using Properties of Isosceles Trapezoids

PQRS is an isosceles trapezoid.

Find  $m\angle P$ ,  $m\angle Q$ , and  $m\angle R$ .

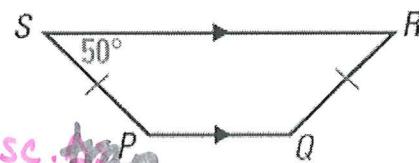
$$\begin{aligned} \angle R &\cong \angle S && \text{base } \angle \text{s of ISOSC. trap.} \\ \boxed{\angle R = 50^\circ} \end{aligned}$$

$$\angle S + \angle P = 180 \quad \text{con. in LS are suppl.}$$

$$50 + \angle P = 180$$

$$\boxed{\angle P = 130^\circ}$$

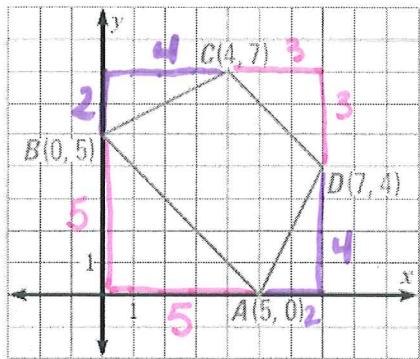
$$\angle P \cong \angle Q \quad \text{base } \angle \text{s of isosc traps are } \cong$$



$$\boxed{\angle Q = 130^\circ}$$

## EXAMPLE 2 Using Properties of Trapezoids

Show that ABCD is a trapezoid. Is it an isosceles trapezoid?



To be a trapezoid you must test for one pair of op. sides //.  
Check Slopes!

$$\text{Slope } AB = \frac{-5}{5} = -1 \text{ means } //$$

$$\text{Slope } CD = \frac{-3}{3} = -1$$

$$\text{Slope } BC = \frac{2}{4} = \frac{1}{2} \text{ NOT } //$$

$$\text{Slope } AD = \frac{4}{2} = 2$$

To be isosceles, check Non // sides for = distance

$$BC^2 = 2^2 + 4^2 \\ BC = \sqrt{20} = 2\sqrt{5}$$

$$AD^2 = 2^2 + 4^2 \\ AD = \sqrt{20}$$

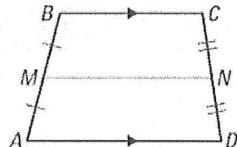
Answer:  $AB \parallel CD$  and  $AD \cong BC \therefore ABCD$  is an isosceles trapezoid.

The segment that joins the midpoints of the legs of a trapezoid is called the Midsegment.

### THEOREM

#### THEOREM 6.17 Midsegment Theorem for Trapezoids

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



$$MN \parallel AD, MN \parallel BC, MN = \frac{1}{2}(AD + BC)$$

**Example**  $MN$  is the median of trapezoid RSTU. Find  $x$ .

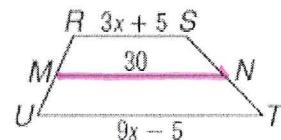
$$MN = \frac{1}{2}(UT + RS) \quad \text{Midseg is } \frac{1}{2} \text{ sum of trapezoid bases}$$

$$30 = \frac{1}{2}(9x - 5 + 3x + 5)$$

$$30 = \frac{1}{2}(12x)$$

$$60 = 12x \\ 5 = x$$

$$X = 5$$



## EXAMPLE 3 Finding Midsegment Lengths of Trapezoids



**LAYER CAKE** A baker is making a cake like the one at the right. The top layer has a diameter of 8 inches and the bottom layer has a diameter of 20 inches. How big should the middle layer be?

$$DG = \frac{1}{2}(CH + EF)$$

$$X = \frac{1}{2}(20 + 8)$$

$$X = \frac{1}{2} \cdot 28$$

$$X = DG$$

$$DG = 14 \text{ inches}$$

