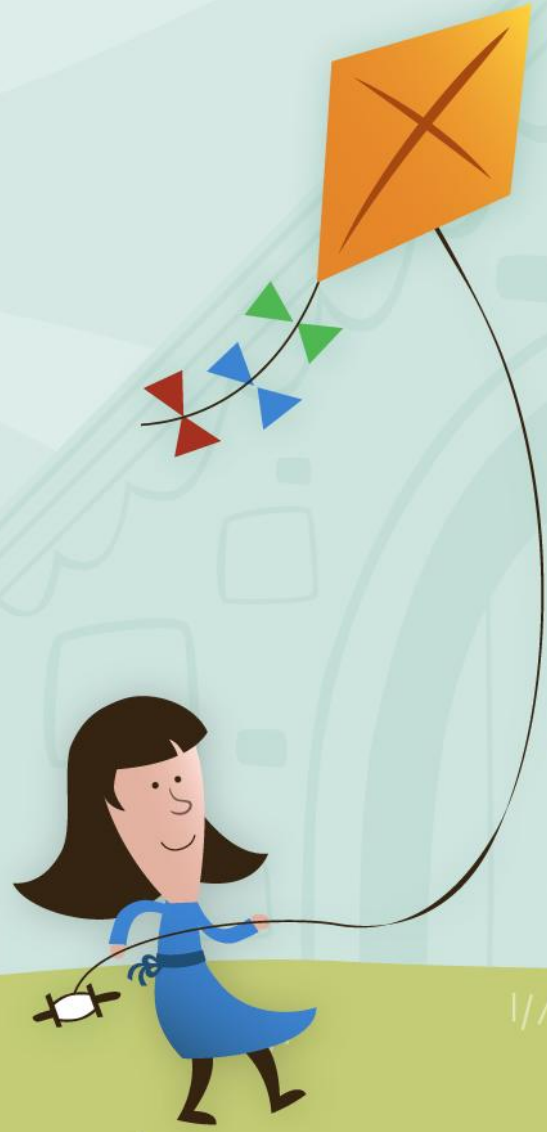
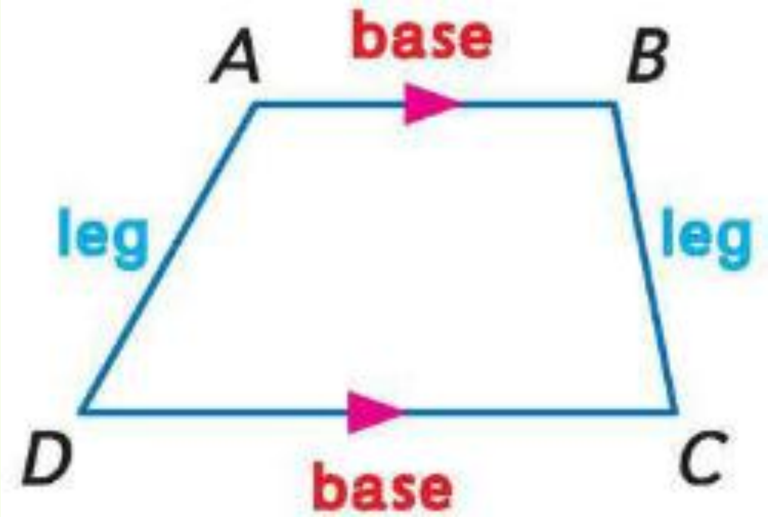
Trapezoids & Kites



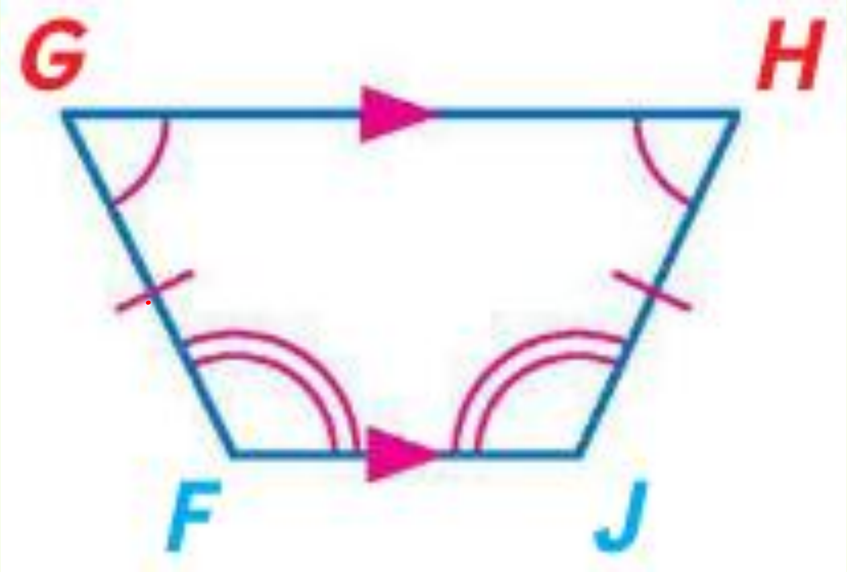
Trapezoid

- A trapezoid is a quadrilateral with exactly one pair of parallel sides. The parallel sides are called bases. The nonparallel sides are called legs. The base angles are formed by the base and one of the legs.



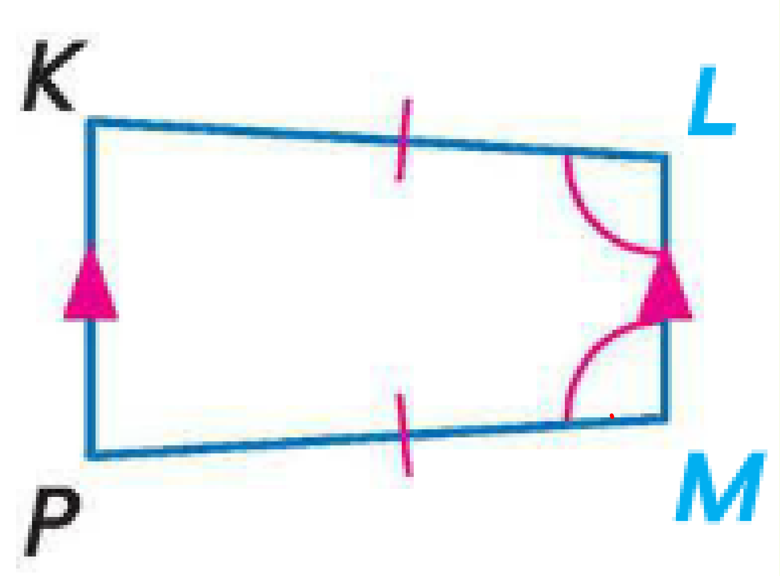
Isosceles Trapezoid

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



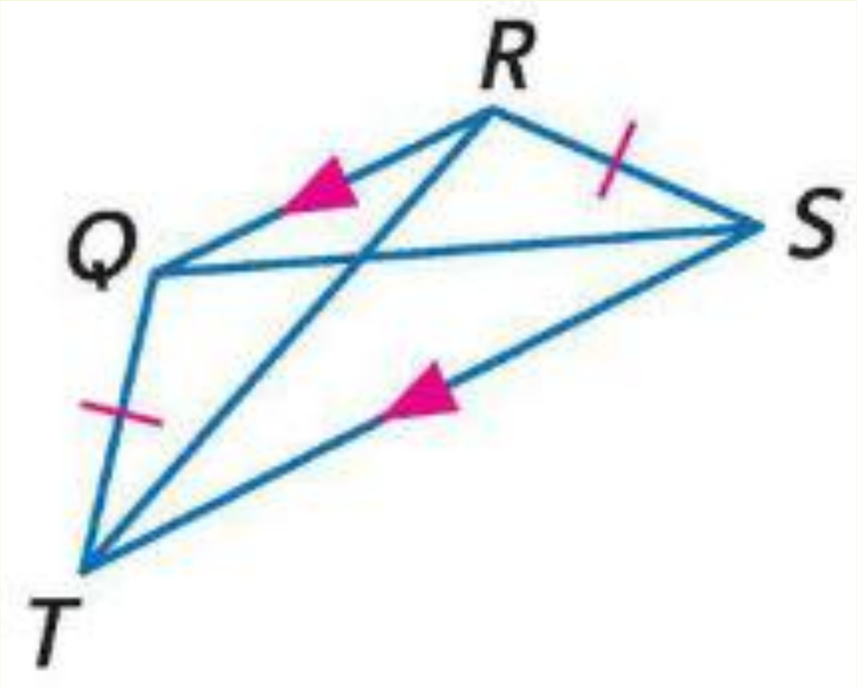
Isosceles Trapezoid

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



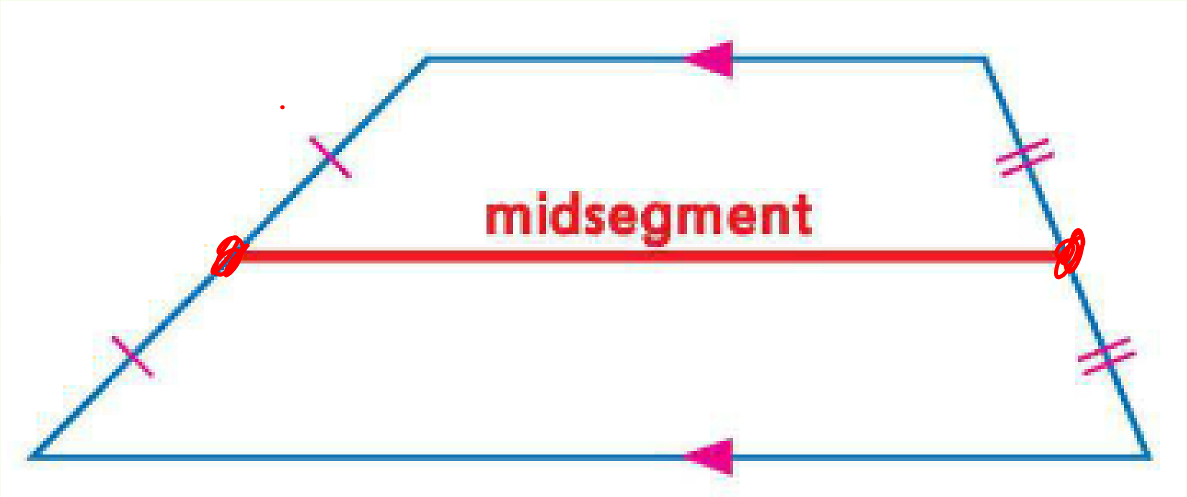
Isosceles Trapezoid

- If a trapezoid is isosceles if and only if its diagonals are congruent.



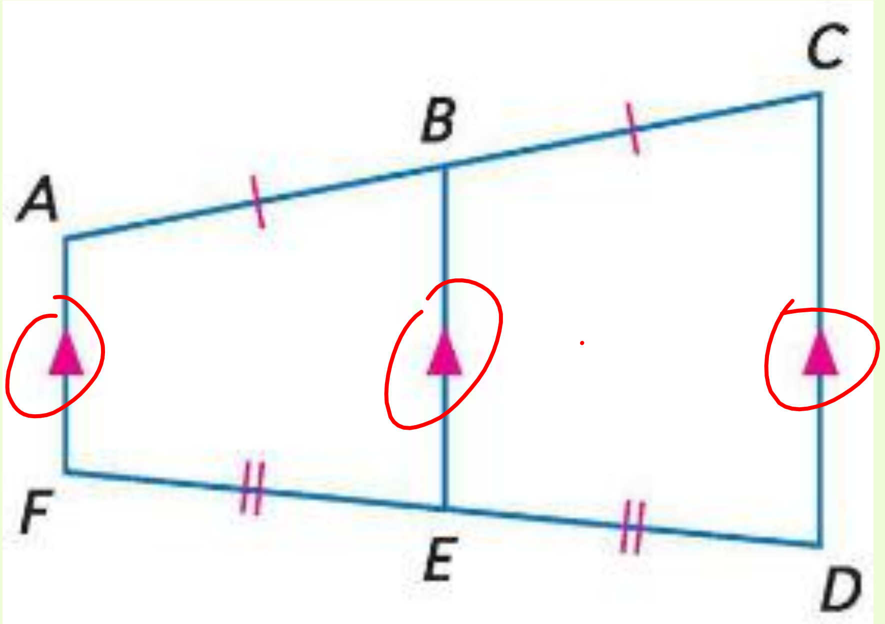
Midsegment of a Trapezoid

- The midsegment of a trapezoid is the segment that connects the midpoints of the legs of the trapezoid.



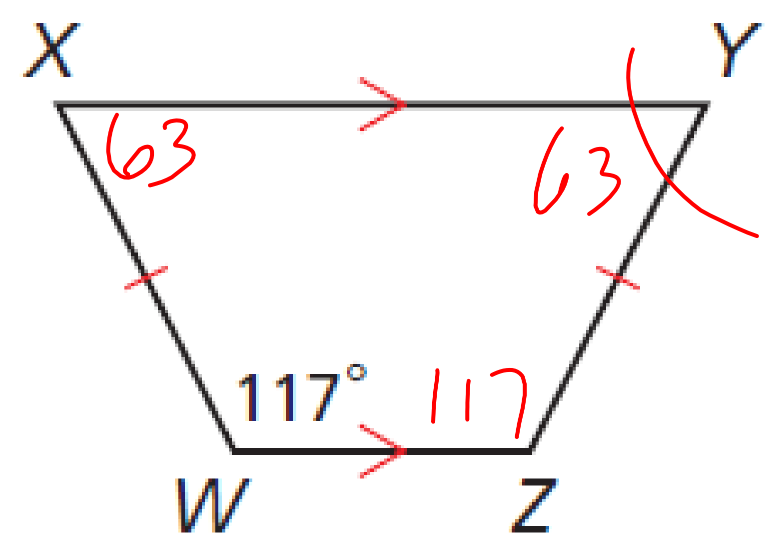
Trapezoid Midsegment Theorem

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



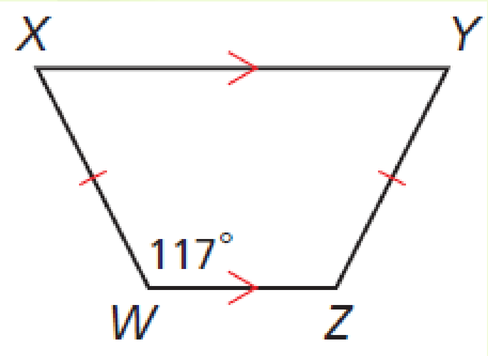
Examples

- Find $m\angle Y$.



Examples

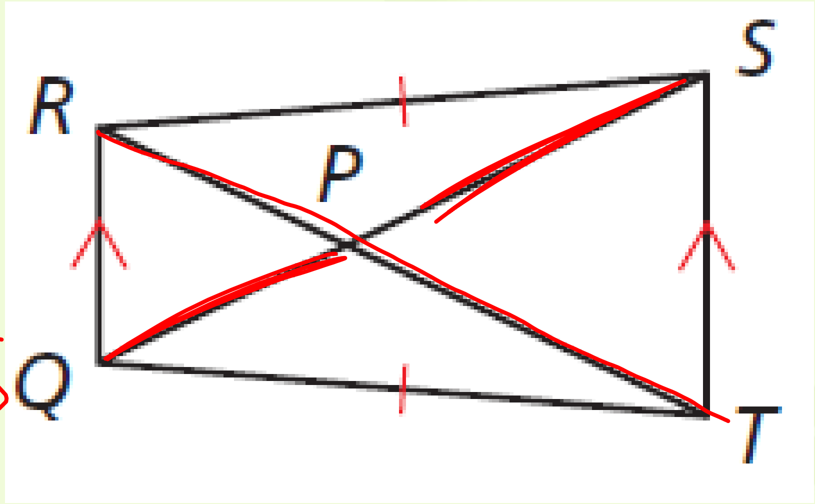
- Find $m\angle Y$.



• $m\angle W + m\angle X = 180°$	*Same-Side Int. Thm.*
• **117** $+ m\angle X = 180$	*Substitute 117 for $m\angle W$.*
• $m\angle X = 63°$	*Subtract 117 from both sides.*
• $\angle Y \cong \angle X$	*Isosc. trap. → base $\angle$ $\cong$*
• $m\angle Y = m\angle X$	*Def. of $\cong$ $\angle$s*
• $m\angle Y =$ **63°**	*Substitute 63 for $m\angle X$.*

Examples

- *RT* = 24.1, and *QP* = 9.6. Find *PS*.

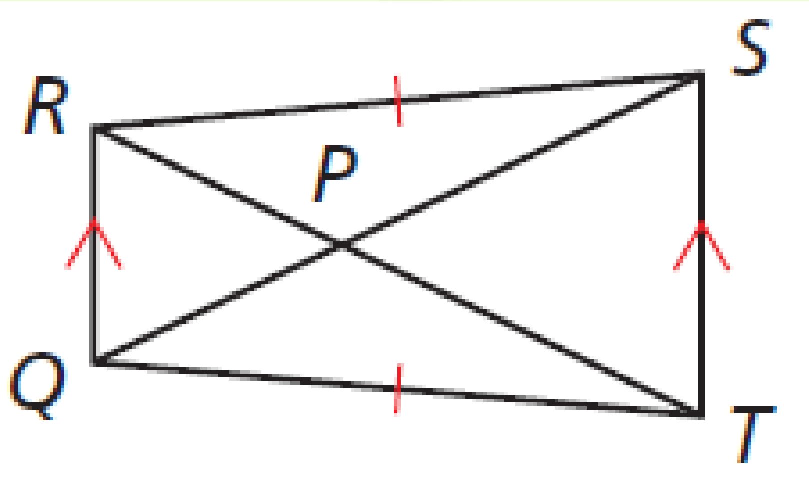


$$24.1 - 9.6 = 14.5$$

$$24.1 = 9.6 + PS$$

Examples

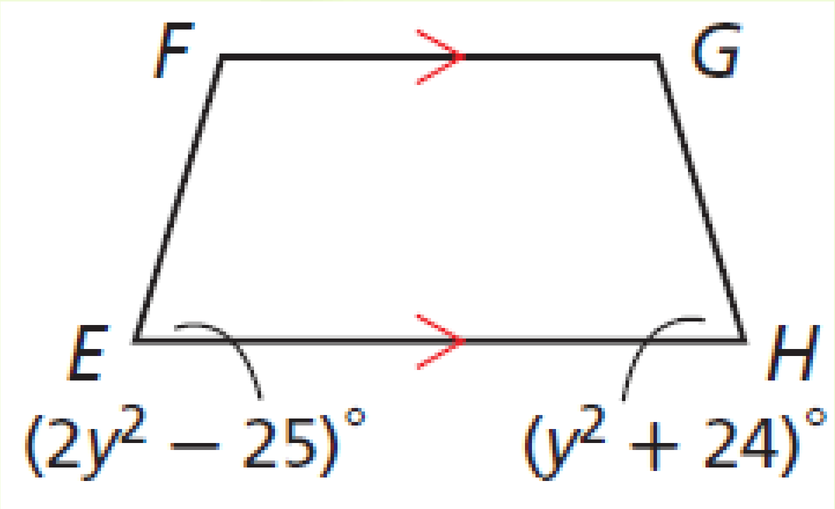
- *RT* = 24.1, and *QP* = 9.6. Find *PS*.



- *QS* ≅ *RT* — *Isosc. trap. → diags.*
- *QS* = *RT* — *Def. of ≅ segs.*
- *QS* = **24.1** — *Substitute 24.1 for RT.*
- *QP* + *PS* = *QS* — *Seg. Add. Post.*
- **9.6** + *PS* = **24.1** — *Substitute 9.6 for QP and 24.1 for QS.*
- *PS* = 14.5 — *Subtract 9.6 from both sides.*

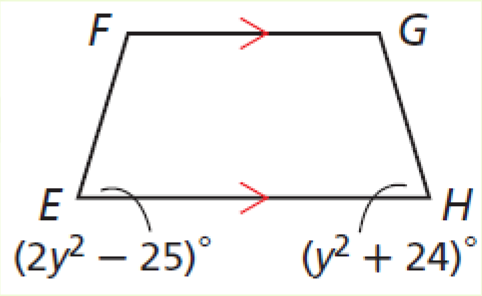
Examples

- **Find the value of *y* so that *EFGH* is isosceles.**



$$2y^2 - 25 = y^2 + 24$$
$$-y^2 + 25 \quad -y^2 + 25$$
$$\sqrt{y^2} = \sqrt{49}$$
$$y = \pm 7$$

Examples

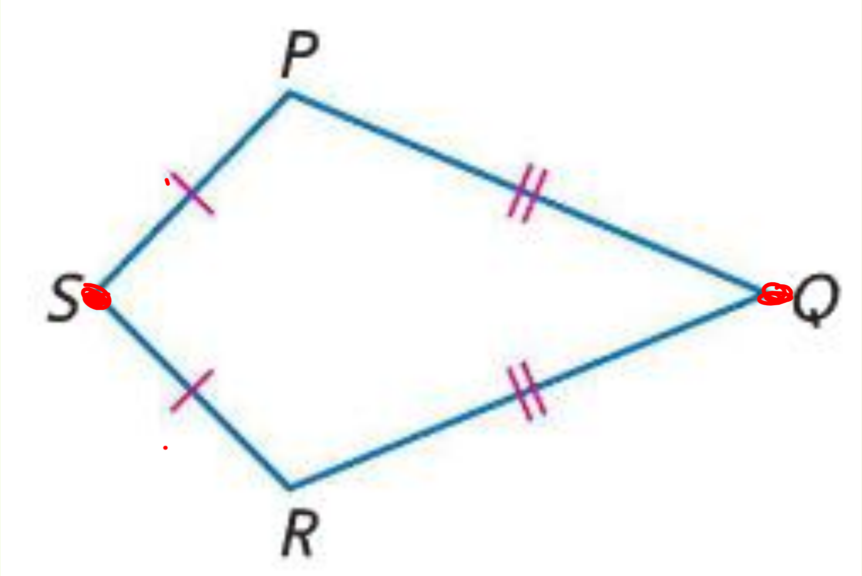


- **Find the value of *y* so that *EFGH* is isosceles.**

- $\angle E \cong \angle H$ — *Trap. with pair base → isosc. trap.*
- $m\angle E = m\angle H$ — *Def. of ≅ ∠s*
- $2y^2 - 25 = y^2 + 24$ — *Substitute $2y^2 - 25$ for m∠E and $y^2 + 24$ for m∠H.*
- $y^2 = 49$ — *Subtract y^2 from both sides and add 25 to both sides.*
- $y = 7$ or $y = -7$ — *Find the square root of both sides.*

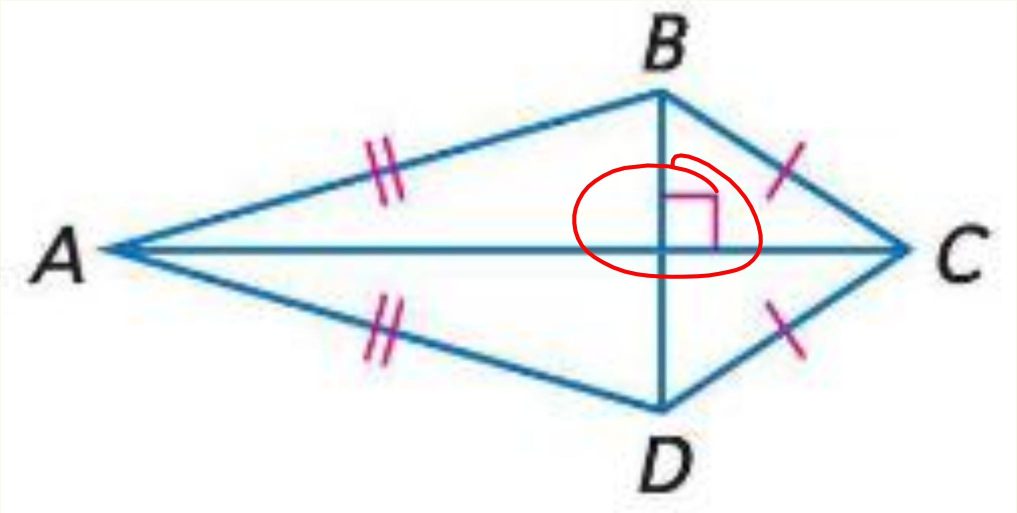
Kites

- A kite is a quadrilateral with exactly two pairs of consecutive congruent sides. Opposite sides are not congruent or parallel.



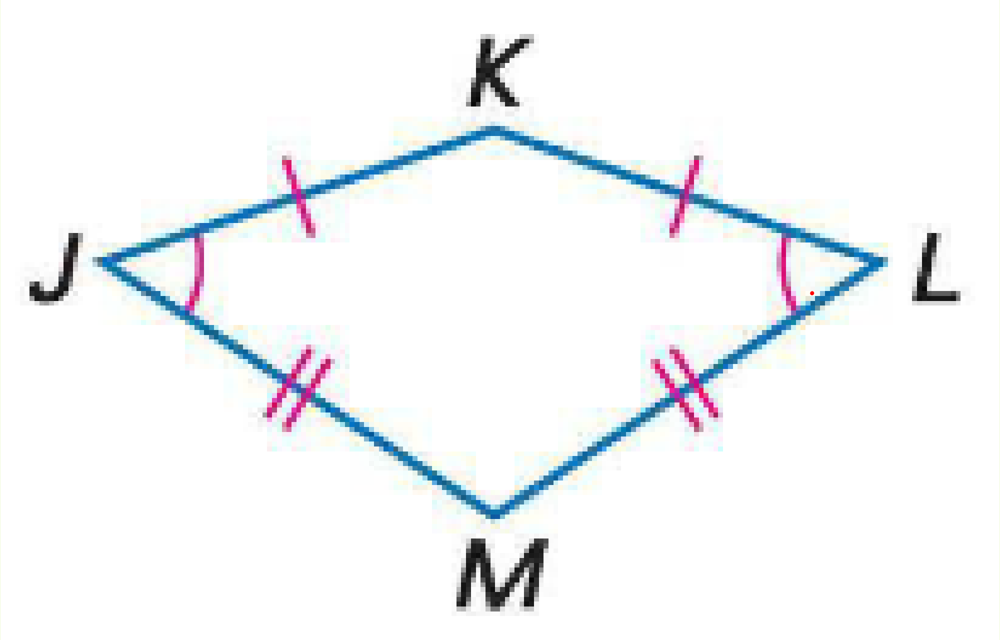
Kites

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



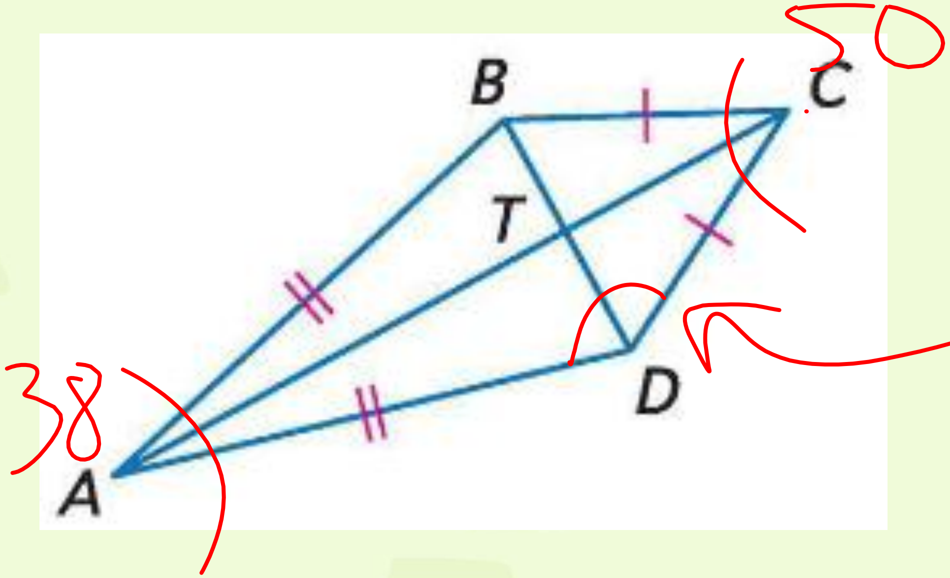
Kites

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



Examples

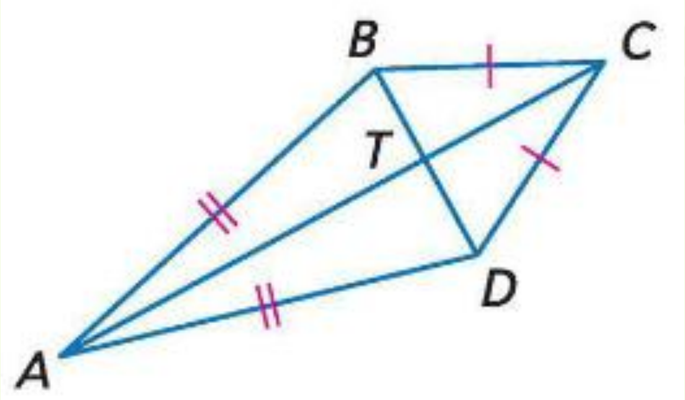
- If $m\angle BAD = 38$ and $m\angle BCD = 50$, find $m\angle ADC$.



360
− 88
2 / 272
136

Examples

- If $m\angle BAD = 38$ and $m\angle BCD = 50$, find $m\angle ADC$.



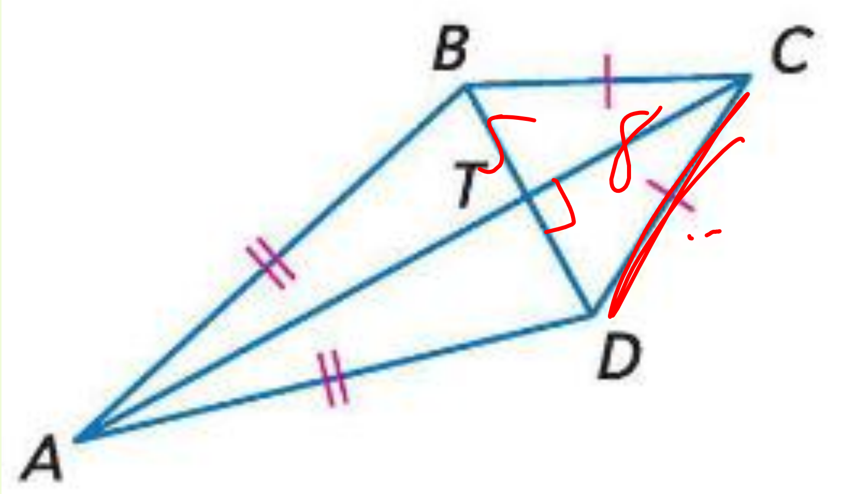
- Since $m\angle BAD \neq m\angle BCD$,

  then $m\angle ABC = m\angle ADC$.
- $360 - 50 - 38 = 272$;
- $m\angle ADC = 272/2 = 136$

Examples

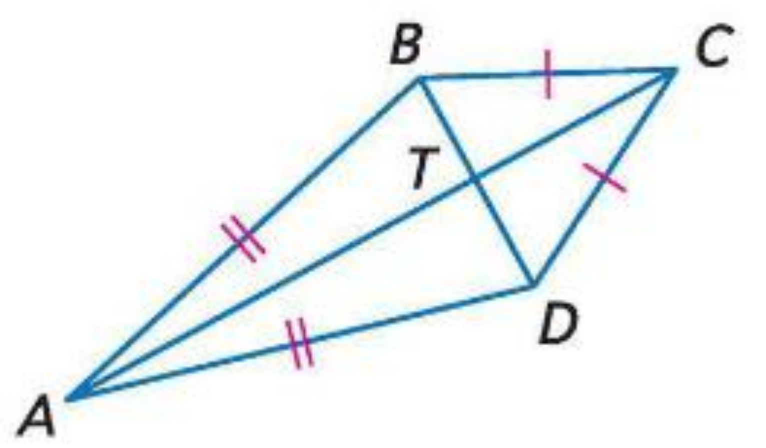
$5^2 + 8^2 = CD^2$

- If *BT* = 5 and *TC* = 8, find *CD*.



Examples

- If $BT = 5$ and $TC = 8$, find CD.



- Since the diagonals are perpendicular, the triangles are right triangles.
- $5^2 + 8^2 = CD^2$
- $CD = \sqrt{5^2 + 8^2}$
- $CD = \sqrt{89}$