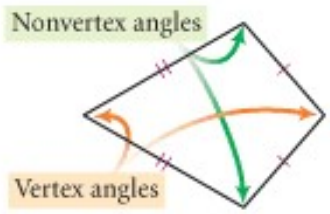
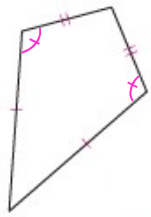
Lesson 5.3 – Kite and Trapezoid Properties

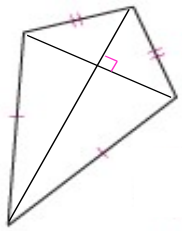
Vertex and Nonvertex Angles of a Kite - The vertex angles of a kite are the two angles between each pair of congruent sides. The nonvertex angles of a kite connect two sides that are not congruent.



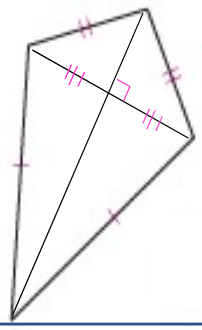
Kite Angles Conjecture - The nonvertex angles of a kite are congruent.



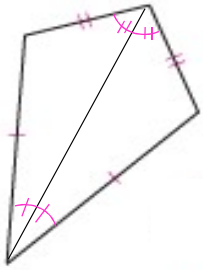
Kite Diagonals Conjecture - The diagonals of a kite are perpendicular.



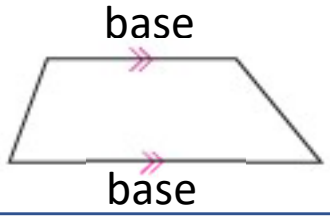
Kite Diagonal Bisector Conjecture - The diagonal connecting the vertex angles of a kite is the perpendicular bisector of the other diagonal.



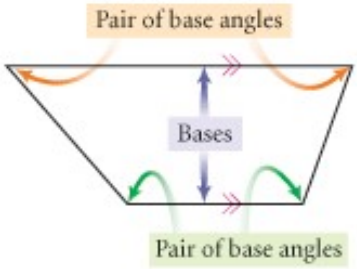
Kite Angle Bisector Conjecture - The vertex angles of a kite are bisected by a diagonal.



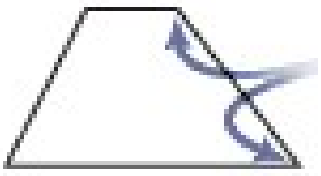
Bases of a Trapezoid - The bases of a trapezoid are the parallel sides of the trapezoid.



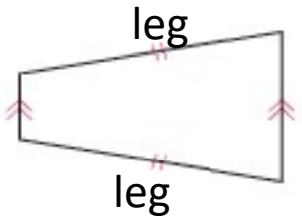
Base Angles of a Trapezoid - A pair of angles that share a base as a common side are called base angles.



Trapezoid Consecutive Angles Conjecture - The consecutive angles between the bases of a trapezoid are supplementary.

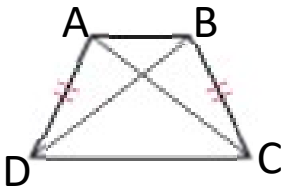


Isosceles Trapezoid - A trapezoid whose two nonparallel sides are the same length is called an isosceles trapezoid. The two congruent sides of an isosceles trapezoid are called legs.



Isosceles Trapezoid Conjecture - The base angles of an isosceles trapezoid are congruent.

Isosceles Trapezoid Diagonals Conjecture - The diagonals of an isosceles trapezoid are congruent.

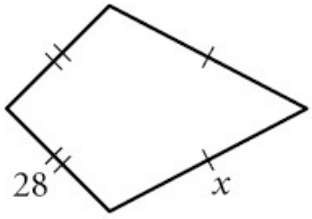


$\overline{AC} \cong \overline{BD}$

Example 1: Find the missing measures.

Perimeter = 116.

$x =$_____



Perimeter is the measures of all of the sides added together. We know that two of the sides have a measure of 28 because they are marked congruent.

$116 - 2 \cdot 28 = 116 - 56 = 60$

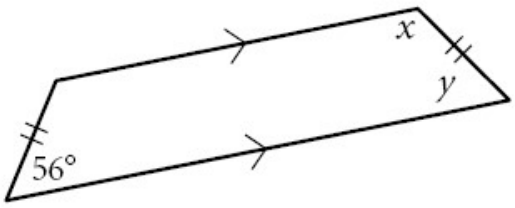
We can split the 60 that is left between the two unknown sides.

$\frac{60}{2} = 30$

$\boldsymbol{x = 30}$

Example 2: Find the missing measures.

$x =$_____, $y =$_____



Since the trapezoid is isosceles we know that each pair of base angles is congruent.

The $56°$ angle and y are both angles on the same base and therefore must be congruent.

$\boldsymbol{y = 56°}$

We know that consecutive angles between base angles of a trapezoid are supplementary. So, x and y must be supplementary.

$x + y = 180$

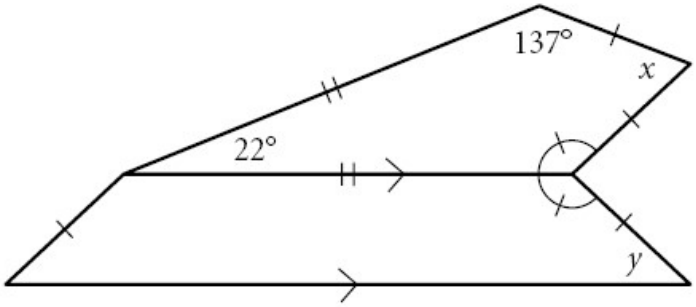
$x + 56 = 180$

$-56 \quad -56$

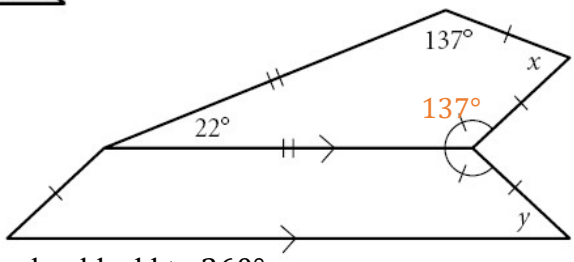
$\boldsymbol{x = 124°}$

Example 3: Find the missing measures.

$x =$_____, $y =$_____



The nonvertex angles of the kite are congruent.



Since a kite is a quadrilateral, all angles of the kite should add to 360°.

$22 + 137 + 137 = 296$

$360 - 296 = 64$

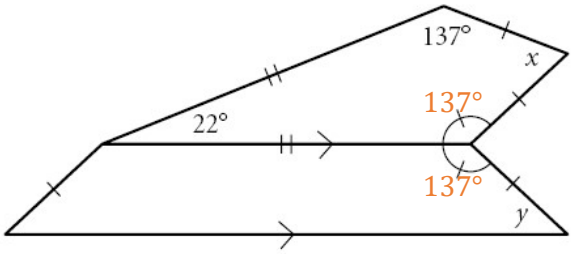
$\boldsymbol{x = 64°}$

We know that consecutive angles between base angles of a trapezoid are supplementary. So, the 137° angle and y must be supplementary.

$137 + y = 180$

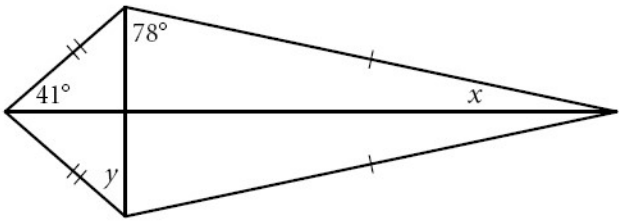
$-137 \quad -137$

$\boldsymbol{y = 43°}$

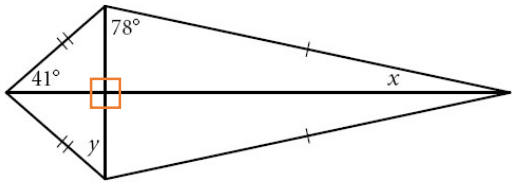


Example 4: Find the missing measures.

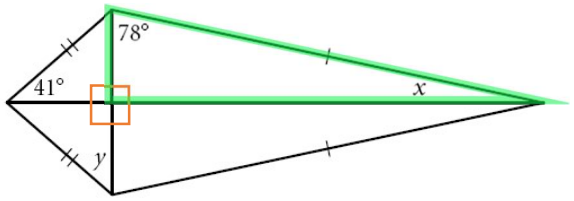
$x =$_____, $y =$_____



We know that the diagonals of a kite are perpendicular.



If we look at the triangle containing x.



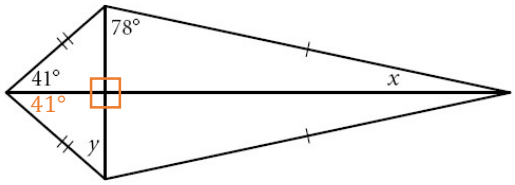
$78 + 90 + x = 180$

$168 + x = 180$

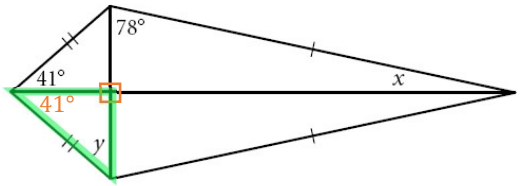
$-168 \qquad -168$

$\boldsymbol{x = 12°}$

We know that the vertex angles of a kite are bisected by the diagonal. So, the vertex angle on the left is cut in half.



If we look at the triangle containing y.



$41 + 90 + x = 180$

$131 + x = 180$

$-131 \qquad -131$

$\boldsymbol{x = 49°}$