When using coordinates of points how do you show each of the following?

1. Two segements are congruent?

   Use distance formula to show they have the same length.

2. Two segements are parallel?

   Use slope formula to show they have the same slope.

When using coordinates of points how do you show each of the following?

3. Two segements are perpendicular?

   Use slope formula to show their slopes are opposite reciprocals.

4. Two segements bisect each other?

   Use midpoint formula to show they have the same midpoint.

Without using graph paper, use the coordinates of the vertices of Quadrilateral ABCD to determine if ABCD is a Parallelogram.

A(1,5)
B(2,1)
C(-3,-1)
D(-4,3)

mdpt DB $\left(\frac{2+-4}{2}, \frac{1+3}{2}\right)$ (-1, 2)

mdpt AC $\left(\frac{1+-3}{2}, \frac{5+-1}{2}\right)$ (-1, 2)

Is ABCD a Parallelogram?

Yes, ABCD is a parallelogram because the diagonals have the same midpoint which means that they bisect each other.

This is only one way to show that ABCD is a parallelogram.

Without using graph paper, use the coordinates of the vertices of Quadrilateral ABCD to determine if ABCD is a Parallelogram.

A(-12,23)
B(-6,19)
C(-8,15)
D(-17,21)

mdpt AC $\left(\frac{-12+-8}{2}, \frac{23+15}{2}\right)$ (-10, 19)
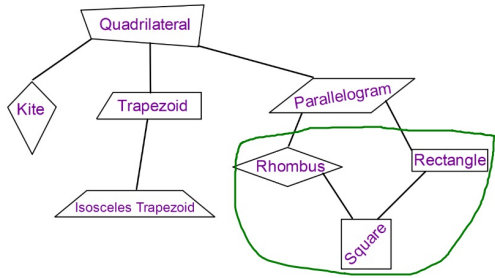
mdpt DB $\left(\frac{-6+-17}{2}, \frac{19+21}{2}\right)$ (-11.5, 20)

Is ABCD a Parallelogram?

No, ABCD is not a parallelogram because the diagonals don't have the same midpoint which means that they don't bisect each other.

Sec 6-4: Special Parallelograms

Quadrilateral Hierarchy:

Rhombus

def:

Fill in the left side w/ the information on th next four pages.

<u>Definition of a Rhombus</u>: A quadrilateral with four congruent sides.

Since a Rhombus is a Parallelogram it has all the properties of a parallelogram PLUS some additional properties.
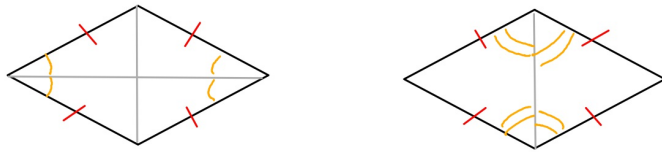
If a quad is a Rhombus then:
- Opp sides are parallel
- Opp sides are congruent
- Opp angles are congruent
- Diagonals bisect each other   AND

Theorem 6-9

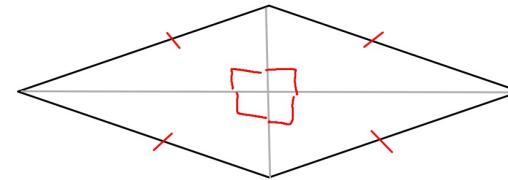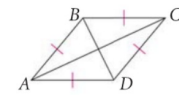Each diagonal of a rhombus bisects two angles of the rhombus.

Since opp ∠s are ≅ when they are bisected you create 4 ≅ ∠s

Theorem 6-10

The diagonals of a rhombus are perpendicular.

$$\overline{AC} \perp \overline{BD}$$

Find the measure of each numbered angle in this Rhombus.

use Thm 6-9:

$$\boxed{\angle 4 = 48°}$$

Since △ABD is Iscosceles

$\angle 4 \cong \angle 5 = 48°$

Thm 6-9:

$\angle 5 \cong \angle 2 = 48°$

In △ABD: $\angle 1 + \angle 5 + \angle 4 = 180°$
$\angle 1 + 48° + 48° = 180°$

$\boxed{\angle 1 = 84°}$ ⟹ ∠1 & ∠3 are opp ∠s in all-gram so they are ≅

$$\boxed{\angle 3 = 84°}$$
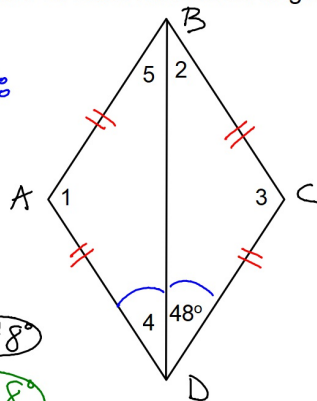
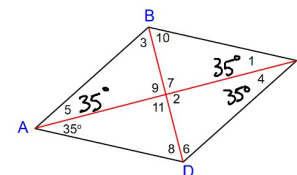**Find the measure of each numbered angle in this Rhombus.**
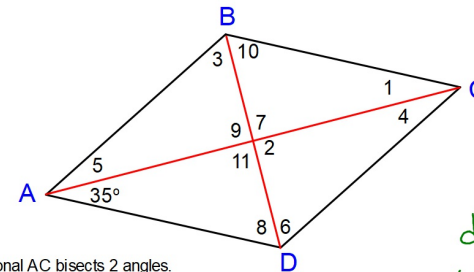
diagonal AC bisects 2 angles.

$\angle 5 \cong \angle 1 \cong \angle 4 = 35°$

diagonals are ⊥

$\angle 9 \cong \angle 7 \cong \angle 2 \cong \angle 11 = 90°$

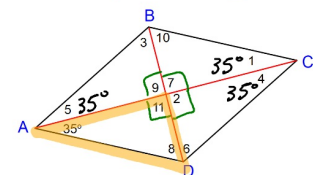$\angle 3 \cong \angle 10 \cong \angle 6 \cong \angle 8 = 55°$

In the highlighted △

$\angle 8 + 90° + 35° = 180°$
$\angle 8 = 55°$

Find the lengths of the sides of this Rhombus.

DB = 10

AC = 24

Since diagonals bisect each other:

DB = 10 means
DX = BX = 5
AC = 24 means
AX = CX = 12

A

D

5 x 12

5

12 B

C
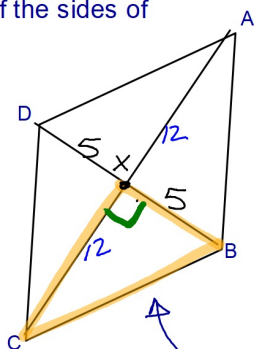
DIAGONALS are ⊥

use this △ to find BC

$5^2 + 12^2 = (BC)^2$

$25 + 144 = (BC)^2$

$\sqrt{169} = \sqrt{(BC)^2}$

$BC = 13$ ∴ ALL 4 sides = 13

Find the length of diagonal $\overline{BD}$ of Rhombus ABCD

AC = 16   The perimeter of ABCD is 68

DIAGONALS
BISECT each
other

AX = CX = 8

B

17   17

A   C

8   x   8

17   17

D

perimeter = 68

each side = $\frac{68}{4}$

= 17

Diagonals are ⊥

use this △

$17^2 = 8^2 + (BX)^2$

$289 = 64 + (BX)^2$

$-64 \quad -64$

$\sqrt{225} = \sqrt{(BX)^2}$

$BX = 15$ ⟹ IF BX = 15, then DX = 15
Therefore BD = 15 + 15 = 30