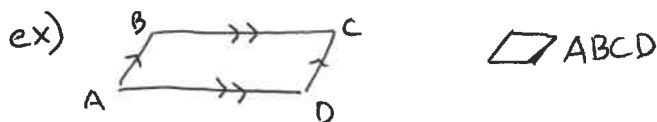


**Parallelogram:** a quadrilateral w/ both pairs of opposite sides parallel



Properties of Parallelograms:

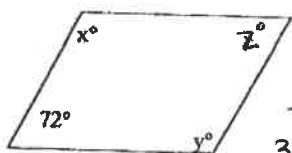
1. opposite sides parallel
2. opposite sides congruent
3. opposite angles congruent
4. consecutive angles are supplementary
5. Diagonals bisect each other  
splits into 2  $\cong$  pieces

Diagonals



1. The figures below are parallelograms. Solve for the variable below:

a.



Method 1

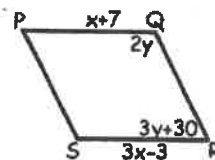
$$\begin{aligned} 360 &= 72 + x + z + y \\ 360 &= 72 + 72 + 2x \\ 360 &= 144 + 2x \\ 216 &= 2x \\ 108 &= x \end{aligned}$$

Method 2

$$\begin{aligned} 72 + x &= 180 \\ x &= 108^\circ \end{aligned}$$

$$\begin{aligned} z &= 72^\circ \\ x &= 108^\circ \\ y &= 108^\circ \end{aligned}$$

b.



$$3x - 3 = x + 7$$

$$2x - 3 = 7$$

$$2x = 10$$

$x = 5$

$$(3y + 30) + 2y = 180$$

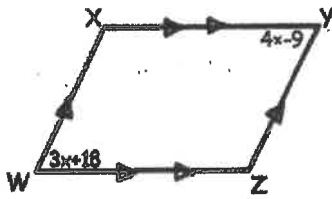
$$5y + 30 = 180$$

$$5y = 150$$

$y = 30^\circ$

Geometry CC  
Parallelograms

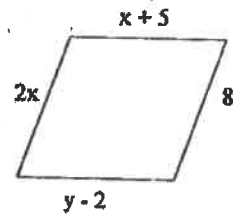
c.



$$3x + 18 = 4x - 9$$

$$\boxed{27 = x}$$

d.



opp sides  $\cong$

$$2x = 8$$

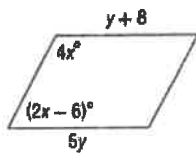
$$x + 5 = y - 2$$

$$\boxed{x = 4}$$

$$4 + 5 = y - 2$$

$$\boxed{11 = y}$$

e.



$$4x + (2x - 6) = 180 \quad \text{* consecutive angles supp}$$

$$6x - 6 = 180$$

$$6x = 186$$

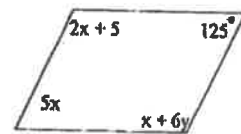
$$\boxed{x = 31^\circ}$$

$$y + 8 = 5y \quad \text{* opp sides } \cong$$

$$8 = 4y$$

$$\boxed{2 = y}$$

f.



opp angles  $\cong$

$$2x + 5 = x + 6y$$

$$5x = 125$$

$$\boxed{x = 25^\circ}$$

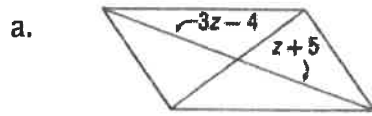
$$2(25) + 5 = 25 + 6y$$

$$55 = 25 + 6y$$

$$30 = 6y$$

$$\boxed{5 = y}$$

2. The figures below are parallelograms. Determine the value of the variables.



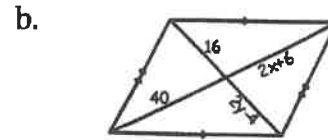
$$3z - 4 = z + 5$$

$$3z = z + 9$$

$$2z = 9$$

$$z = 4.5$$

\* diagonals  
bisect  
each other



$$40 = 2x + 6$$

$$34 = 2x$$

$$17 = x$$

$$2y - 4 = 16$$

$$2y = 20$$

$$y = 10$$

3. Use the diagram to find the measures.  $m\angle ZVX = 80^\circ$ ,  $VZ = 7$ ,  $VX = 10$ ,  $VT = 5$

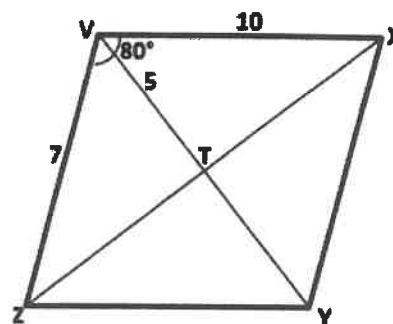
$$m\angle VZY = 100^\circ$$

$$m\angle XYZ = 80^\circ$$

$$TY = 5$$

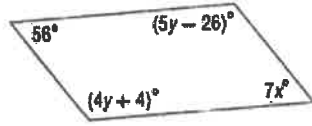
$$ZY = 10$$

$$XY = 7$$



4. Find the variables in the diagrams below so that each quadrilateral is a parallelogram.

a.



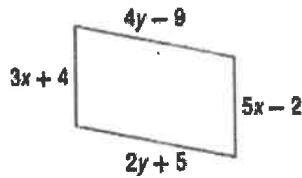
$$56 = 7x$$

$$\boxed{8 = x}$$

$$4y + 4 = 5y - 26$$

$$\boxed{30 = y}$$

b.



$$4y - 9 = 2y + 5$$

$$2y = 14$$

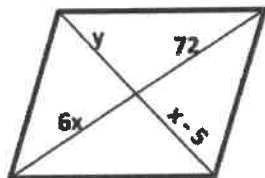
$$\boxed{y = 7}$$

$$3x + 4 = 5x - 2$$

$$6 = 2x$$

$$\boxed{3 = x}$$

c.



$$6x = 72$$

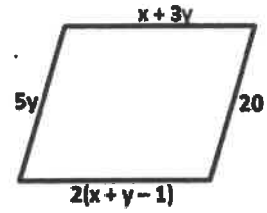
$$\boxed{x = 12}$$

$$y = x - 5$$

$$y = 12 - 5$$

$$\boxed{y = 7}$$

d.



$$5y = 20$$

$$\boxed{y = 4}$$

$$x + 3y = 2(x + y - 1)$$

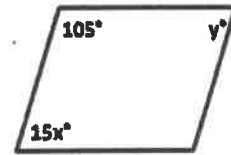
$$x + 3y = 2x + 2y - 2$$

$$x + 3(4) = 2x + 2(4) - 2$$

$$x + 12 = 2x + 6$$

$$\boxed{6 = x}$$

e.



$$15x = y$$

$$15x + 105 = 180$$

$$15x = 75$$

$$\boxed{x = 5}$$

$$15(5) = y$$

$$\boxed{75 = y}$$