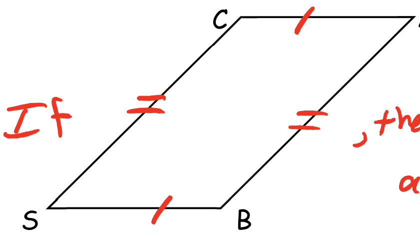
# Quadrilaterals – Tests for Parallelograms

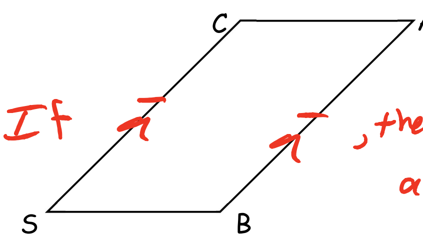
Notes Section 6.3 Name________________

<u>Theorem 6-7</u>:
If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.



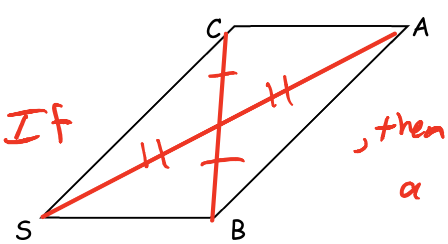

If $\cong$ $\cong$, then SCAB is a parallelogram

<u>Theorem 6-8</u>:
If one pair of opposite sides of a quadrilateral is both parallel and congruent, then the quadrilateral is a parallelogram.



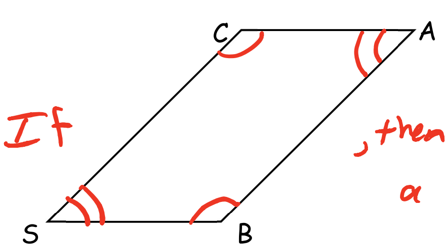

If $\cong$ $\cong$, then SCAB is a parallelogram

<u>Theorem 6-9</u>:
If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.




If, then SCAB is a parallelogram

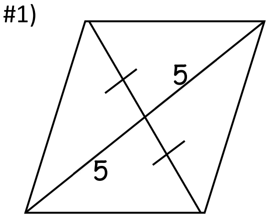
<u>Theorem 6-10</u>:
If both pairs of opposite angles in a quadrilateral are congruent, then the quadrilateral is a parallelogram.




If, then SCAB is a parallelogram

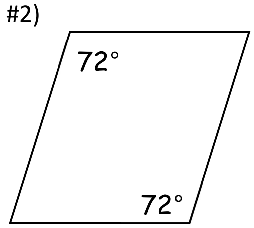
Determine if each quadrilateral must be a parallelogram. Justify your answer.

#1)



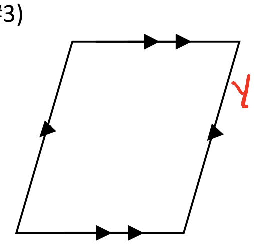

Yes, the diagonals bisect each other.

#2)




NO.

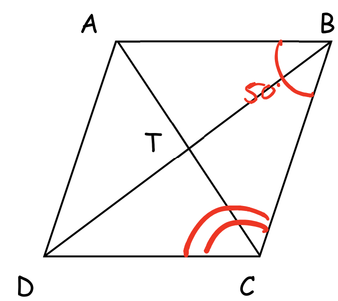
#3)



Yes, Def'n of parallelogram

Use parallelogram ABCD and the given information to find each value.

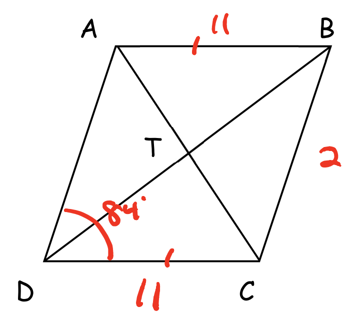
#4) m∠ABC = 50°. Find m∠BCD




$50 + m\angle BCD = 180$

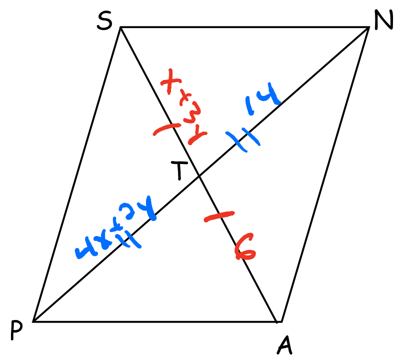
$m\angle BCD = 130°$

#5) AB = 11, BC = 2, m∠ADC = 84°. Find DC.




DC = 11

#6) What values must x and y have in order for the quadrilateral to be a parallelogram? ST = x + 3y, TA = 6, PT = 4x + 2y and TN = 14




$$\boxed{\begin{aligned} x+3y&=6 \\ 4x+2y&=14 \end{aligned}}$$

$2x+y=7$

$2(6-3y)+y=7$

$12-6y+y=7$

$12-5y=7$

$-5y=-5$

$y=1$

$x=6-3y$

$x=6-3(1)$

$x=6-3$

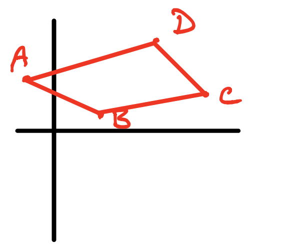
$x=3$

$(3,1)$

#7) The coordinates of the vertices of quadrilateral ABCD are A(-1, 3), B(2, 1), C(9, 2), and D(6, 4). Determine if the quadrilateral ABCD is a parallelogram.

| |
|---|
| **Option 1**: Use the distance formula to find the length of all four sides.<br>*If opposite lengths are the same, then the quad is a parallelogram. |
| **Option 2**: Use the slope formula to find the slope of all four sides.<br>*If opposite slopes are the same, then the quad is a parallelogram. |
| **Option 3**: Find the slopes and lengths of one pair of opposite sides.<br>*If the pair of opposite sides have the same slope and length, then the quad is a parallelogram. |
| **Option 4**: Find the midpoints of the diagonals.<br>*If the midpoints of the diagonals are the same, then the quad is a parallelogram. |

A(-1, 3), B(2, 1), C(9, 2), and D(6, 4).




OPTION 4

$$M_{\overline{BD}} = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right) = \left(\frac{(2)+(6)}{2}, \frac{(1)+(4)}{2}\right) = \left(\frac{8}{2}, \frac{5}{2}\right)$$

$$M_{\overline{BD}} = \left(4, \frac{5}{2}\right)$$

$$M_{\overline{AC}} = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right) = \left(\frac{(-1)+(9)}{2}, \frac{(3)+(2)}{2}\right) = \left(\frac{8}{2}, \frac{5}{2}\right)$$

$$M_{\overline{AC}} = \left(4, \frac{5}{2}\right)$$

ABCD is a parallelogram because the diagonals bisect each other.