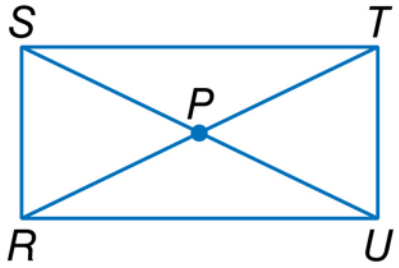
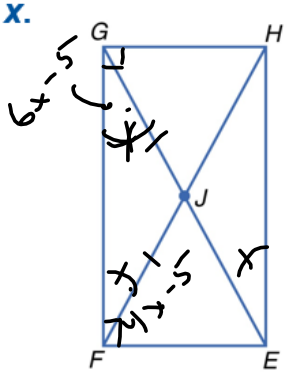
Quadrilateral *RSTU* is a rectangle. If $m\angle RTU = 8x + 4$ and $m\angle SUR = 3x - 2$, find x.



Quadrilateral *EFGH* is a rectangle. If $m\angle FGE = 6x - 5$ and $m\angle HFE = 4x - 5$, find x.



$6x - 5 + 4x - 5 = 90$

$10x - 10 = 90$

$10x = 100$

$x = 10$

2 Prove that Parallelograms are Rectangles

The converse of Theorem 6.13 is also true.

Theorem 6.14 Diagonals of a Rectangle

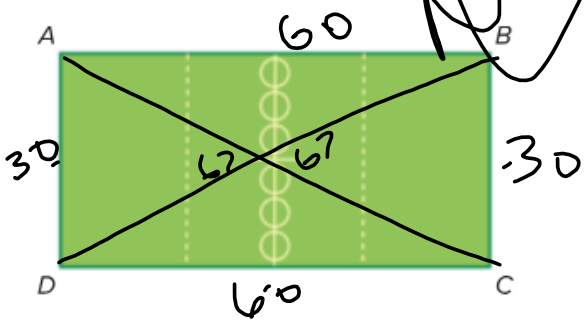
If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.

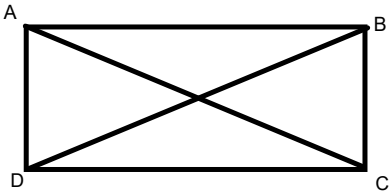
Abbreviation *If diag. of a ▱ are ≅, then ▱ is a rectangle.*

Example If $\overline{WY} \cong \overline{XZ}$ in ▱$WXYZ$, then ▱$WXYZ$ is a rectangle.

Real-World Example 3 Proving Rectangle Relationships

DODGEBALL A community recreation center has created an outdoor dodgeball playing field. To be sure that it meets the ideal playing field requirements, they measure the sides of the field and its diagonals. If $AB = 60$ feet, $BC = 30$ feet, $CD = 60$ feet, $AD = 30$ feet, $AC = 67$ feet, and $BD = 67$ feet, explain how the recreation center can be sure that the playing field is rectangular.





$2x+4 = 6x-5$

$9 = 4x$

$\frac{9}{4} = x$

$2\left(\frac{9}{4}\right)+4 = \frac{9}{2}+\frac{8}{2} = \frac{17}{2}$

Find the length of the rectangles diagonals.

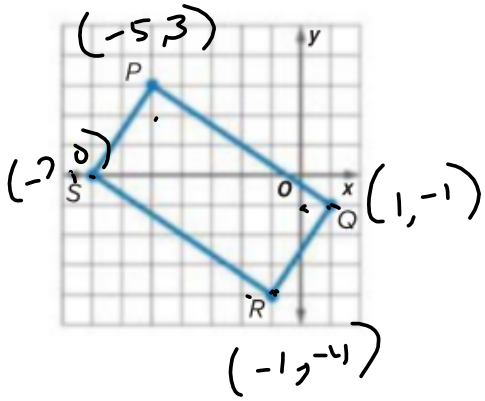
AC = 2x + 4 and BD = 6x - 5

Find the length of AC

Example 4 Rectangles and Coordinate Geometry

COORDINATE GEOMETRY Quadrilateral $PQRS$ has vertices $P(-5, 3)$, $Q(1, -1)$, $R(-1, -4)$, and $S(-7, 0)$. Determine whether $PQRS$ is a rectangle by using the Distance Formula.

1. Prove that it is a parallelogram.



Slope

$PS = \frac{3-0}{-5-(-7)} = \frac{3}{2}$

$QR = \frac{3}{2}$

$PQ = \frac{-4}{6}$

$SR = \frac{-4}{6}$

2. Prove the diagonals are congruent. $PR = \sqrt{(-5+1)^2+(3+4)^2}$

$\sqrt{65}$

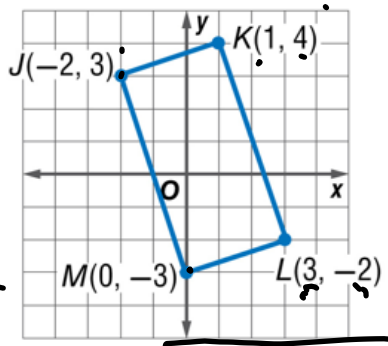
$SQ = \sqrt{(-7+1)^2+(0+1)^2}$

$\sqrt{65}$

Quadrilateral *JKLM* has vertices *J*(–2, 3), *K*(1, 4), *L*(3, –2), and *M*(0, –3). Determine whether *JKLM* is a rectangle using the Distance Formula.

$JK = \frac{1}{3}$ $LM = \frac{1}{3}$

$JM = \frac{-6}{2}$ $KL = \frac{-6}{2}$



$JL = \sqrt{(-2-3)^2 + (3--2)^2}$

$25 + 25$

$\sqrt{50}$

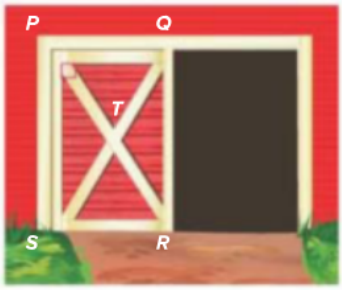
$KL = \sqrt{(1-0)^2 + (4--3)^2}$

$1 + 49$

$\sqrt{50}$

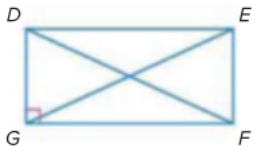
4.4

Example 1 **FARMING** An X-brace on a rectangular barn door is both decorative and functional. It helps to prevent the door from warping over time. If $ST = 3\frac{13}{16}$ feet, $PS = 7$ feet, and $m\angle PTQ = 67$, find each measure.



1. QR
2. SQ
3. $m\angle TQR$
4. $m\angle TSR$

Example 2 **ALGEBRA** Quadrilateral $DEFG$ is a rectangle.



5. If $FD = 3x - 7$ and $EG = x + 5$, find EG.
6. If $m\angle EFD = 2x - 3$ and $m\angle DFG = x + 12$, find $m\angle EFD$.