

You can use Theorem 6.7 to determine the coordinates of the intersection of the diagonals of a parallelogram on a coordinate plane given the coordinates of the vertices.

Example 3 Parallelograms and Coordinate Geometry

COORDINATE GEOMETRY Determine the coordinates of the intersection of the diagonals of $\square FGHI$ with vertices $F(-2, 4)$, $G(3, 5)$, $H(2, -3)$, and $I(-3, -4)$.

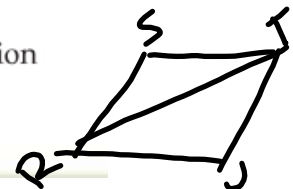
$$FH \left(\frac{-2+2}{2}, \frac{4+(-3)}{2} \right) \left(0, \frac{1}{2} \right)$$

$$GI \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right)$$

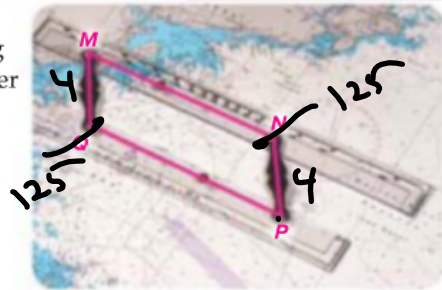
3. **COORDINATE GEOMETRY** Determine the coordinates of the intersection of the diagonals of $\square RSTU$ with vertices $R(-8, -2)$, $S(-6, 7)$, $T(6, 7)$, and $U(4, -2)$.

$$RT \left(\frac{-8+6}{2}, \frac{-2+7}{2} \right)$$

$$\left(-1, \frac{5}{2} \right)$$

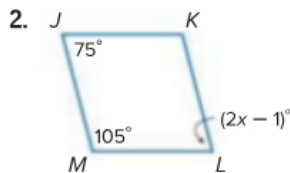


1. **NAVIGATION** To chart a course, sailors use a *parallel ruler*. One edge of the ruler is placed along the line representing the direction of the course to be taken. Then the other ruler is moved until its edge reaches the compass rose printed on the chart. Reading the compass determines which direction to travel. The rulers and the crossbars of the tool form $\square MNPQ$.



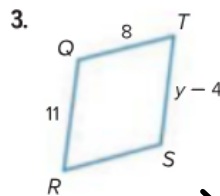
- a. If $m\angle NMQ = 32$, find $m\angle MNP$.
- b. If $m\angle MQP = 125$, find $m\angle MNP$.
- c. If $MQ = 4$, what is NP ?

ALGEBRA Find the value of each variable in each parallelogram.



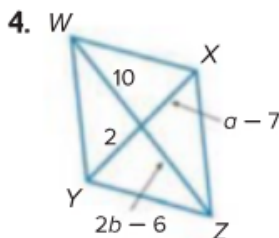
$$2x - 1 = 75$$

$$x = 38$$



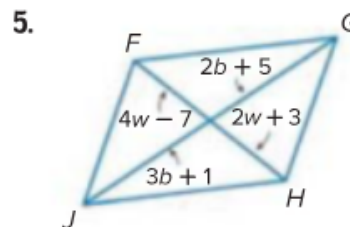
$$y - 4 = 11$$

$$y = 15$$



$$2b - 6 = 10 \quad b = 8$$

$$2 = a - 7 \quad a = 9$$



$$4w - 7 = 2w + 3$$

$$w = 5$$

$$3b + 1 = 2b + 5$$

$$b = 4$$

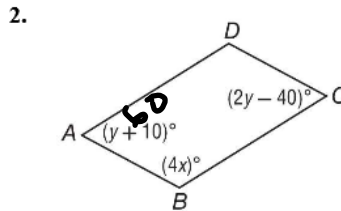
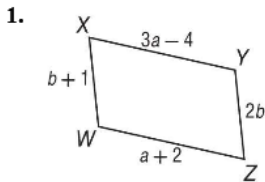
6. **COORDINATE GEOMETRY** Determine the coordinates of the intersection of the diagonals of $\square ABCD$ with vertices $A(-4, 6)$, $B(5, 6)$, $C(4, -2)$, and $D(-5, -2)$.

$$AC = \left(\frac{-4+4}{2}, \frac{6+(-2)}{2} \right) = (0, 2)$$

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6-2 Practice Parallelograms

ALGEBRA Find the value of each variable in the following parallelograms.



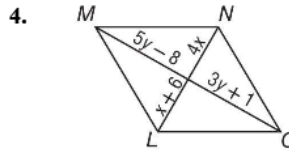
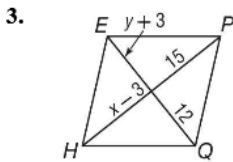
$$y + 10 = 2y - 40$$

$$50 = y$$

$$60 + 4x = 180$$

$$4x = 120$$

$$x = 30$$



$$5y - 8 = 3y + 1$$

$$2y = 9$$

$$y = 9/2$$

$$180$$

$$- 55$$

$$\hline 125$$

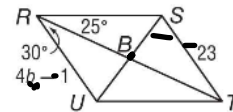
ALGEBRA Use $\square RSTU$ to find each measure or value.

5. $m\angle RST = 125$

6. $m\angle STU = 55$

7. $m\angle TUR = 125$

8. $b = 6$



COORDINATE GEOMETRY Find the coordinates of the intersection of the diagonals of $\square PRYZ$ with the given vertices.

9. $P(2, 5), R(3, 3), Y(-2, -3), Z(-3, -1)$

10. $P(2, 3), R(1, -2), Y(-5, -7), Z(-4, -2)$

Py $(\frac{2+(-2)}{2}, \frac{5+(-3)}{2}) = (0, 1)$ Py $(\frac{2+(-5)}{2}, \frac{3+(-7)}{2}) = (-\frac{3}{2}, -2)$

$$4b - 1 = 23$$

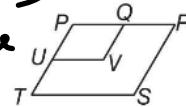
$$b = 6$$

11. PROOF Write a paragraph proof of the following.

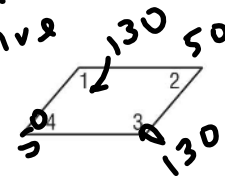
Given: $\square PRST$ and $\square PQVU$

Prove: $\angle V \cong \angle S$

$\angle P \cong \angle P$ reflective
 $\angle P \cong \angle S$ opp $\angle \cong$
 $\angle P \cong \angle V$ " " "
 $\angle V \cong \angle S$ Transitive



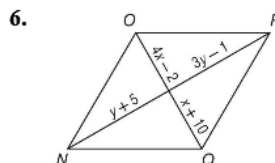
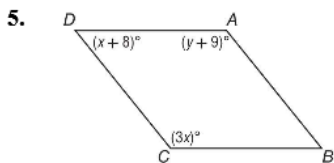
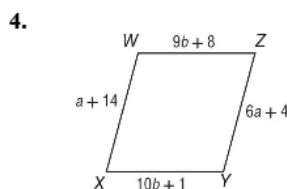
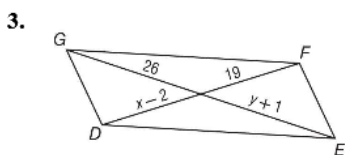
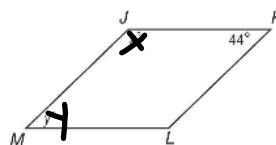
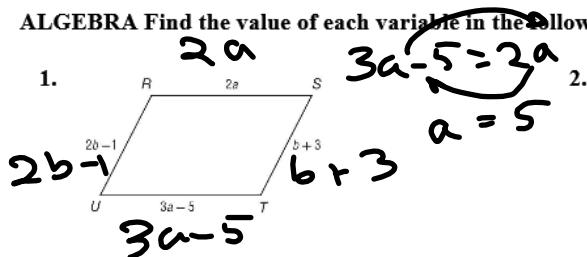
12. CONSTRUCTION Mr. Rodriguez used the parallelogram at the right to design a herringbone pattern for a paving stone. He will use the paving stone for a sidewalk. If $m\angle 1$ is 130, find $m\angle 2, m\angle 3,$ and $m\angle 4$.



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6-2 Skills Practice Parallelograms

ALGEBRA Find the value of each variable in the following parallelograms.



COORDINATE GEOMETRY Find the coordinates of the intersection of the diagonals of $\square HJKL$ with the given vertices.

7. $H(1, 1), J(2, 3), K(6, 3), L(5, 1)$

8. $H(-1, 4), J(3, 3), K(3, -2), L(-1, -1)$