



- I can use properties to identify parallelograms.
- I can use coordinate geometry to identify parallelograms.

You can use the following conditions to determine whether a quadrilateral is a parallelogram.

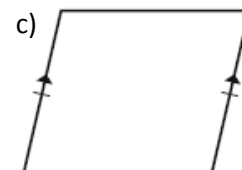
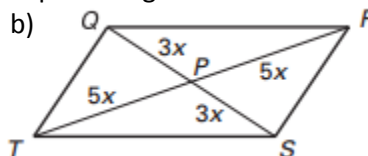
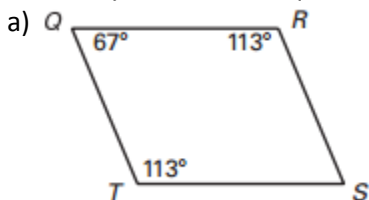
### Conditions for Parallelograms

A quadrilateral is a parallelogram if....

- Both pairs of opposite sides are parallel (definition)
- Both pairs of opposite sides are congruent.
- Both pairs of opposite angles are congruent.
- The diagonals bisect each other.
- One pair of opposite sides is congruent and parallel.

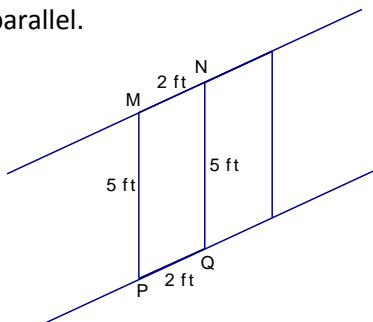
#### Example 1: Identify parallelograms

Explain how you know that quadrilateral  $QRST$  is a parallelogram.



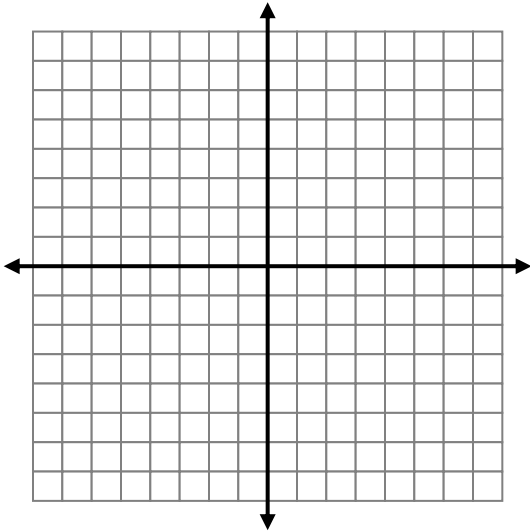
#### Example 2: Solve a real world problem

The figure shows part of a stair railing. Explain how you know that the support bars  $\overline{MP}$  and  $\overline{QN}$  are parallel.

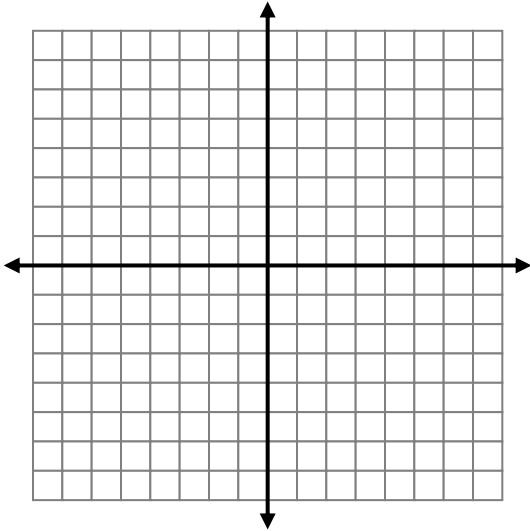


**Example 3: Use coordinate Geometry to identify parallelograms**

- a) The vertices of  $ABCD$  are  $A(-3, 1)$ ,  $B(-1,0)$ ,  $C(4, 5)$ , and  $D(2, 6)$ . Show that  $ABCD$  is a parallelogram using the definition of parallelograms.



- b) The vertices of  $LMNO$  are  $L(-4, 2)$ ,  $M(-5, -2)$ ,  $N(-1, -4)$  and  $O(0, 0)$ . Show that  $LMNO$  is a parallelogram using the diagonals.



- c) Use the  $LMNO$  from example b, prove that  $LMNO$  is a parallelogram using sides  $\overline{LM}$  and  $\overline{NO}$  only.

- d) Could we prove a quadrilateral is a parallelogram using only side lengths?