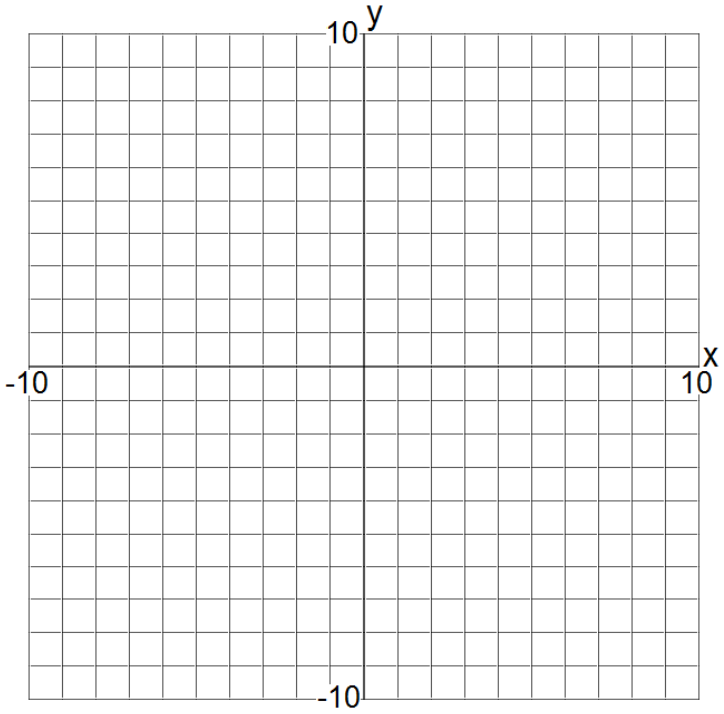
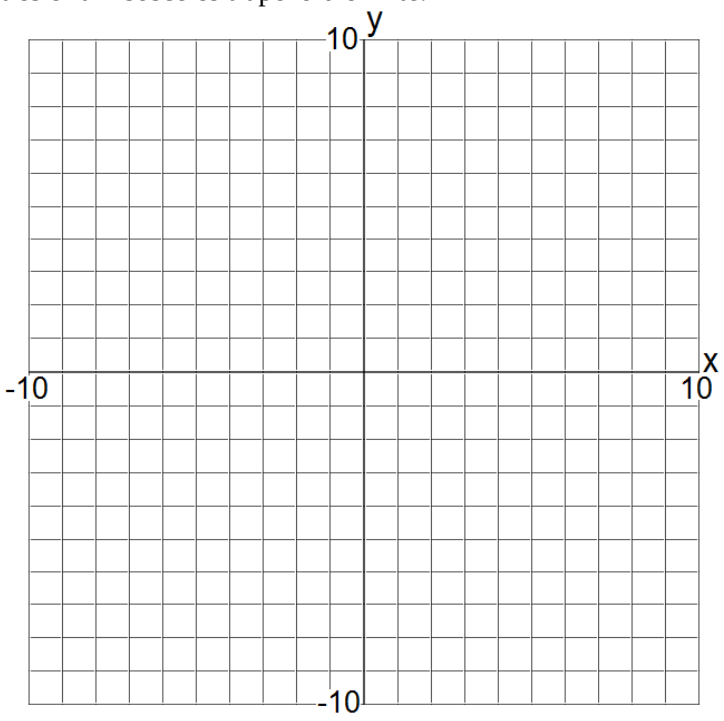
Geometry 6.6 Special Quadrilaterals Activity Name(s): _____ ____/ 10
(Earn a 5/5 on 6.6 Exit Ticket if one problem is also done with a group of 2-4 on "LARGE" graph paper)

$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $x_m = \frac{x_2 + x_1}{2}, y_m = \frac{y_2 + y_1}{2}$

#1) Rhombus + Rectangle = Square: Create a square and plot it on a coordinate grid. Clearly label the vertices ABCD and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has the properties of a square.



#2) Isosceles Trapezoid or Kite: Create an isosceles trapezoid or kite and plot it on a coordinate grid. Clearly label the vertices QRST and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has the properties of an isosceles trapezoid or kite.



CCSS Assessed: G.CO.11 **Learning Targets Assessed:** Students will identify and classify quadrilaterals supporting their reasoning by using properties of that type of quadrilateral.

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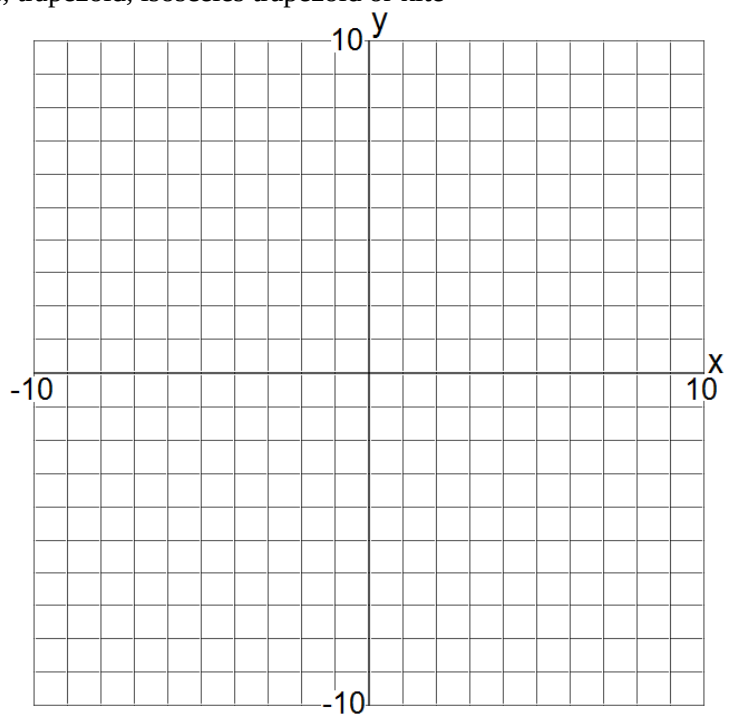
$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $x_m = \frac{x_2 + x_1}{2}, y_m = \frac{y_2 + y_1}{2}$

#3) Quadrilateral: Create a quadrilateral that is neither a parallelogram, rhombus, rectangle, square, trapezoid, isosceles trapezoid or kite and plot it on a coordinate grid. Clearly label the vertices WXYZ and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has none of the properties of a parallelogram, rhombus, rectangle, square, trapezoid, isosceles trapezoid or kite



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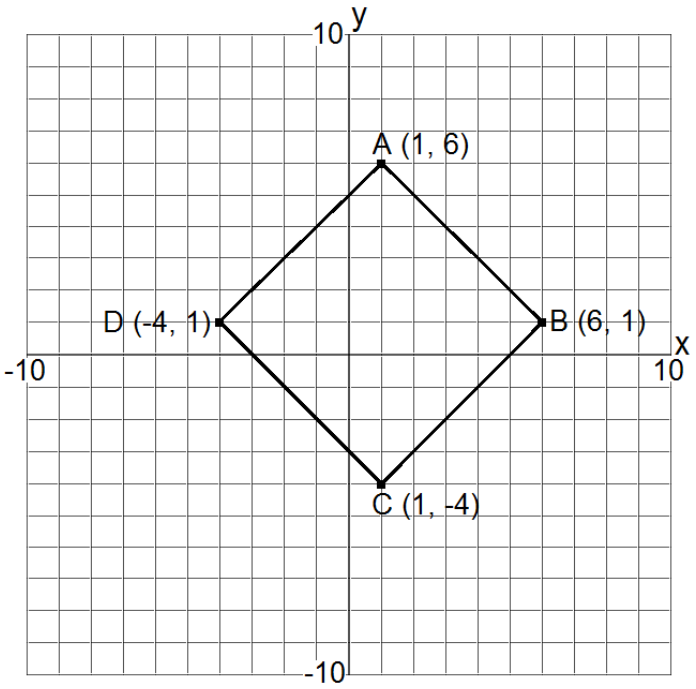
$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $x_m = \frac{x_2 + x_1}{2}, y_m = \frac{y_2 + y_1}{2}$

#1) Rhombus + Rectangle = Square: Create a square and plot it on a coordinate grid. Clearly label the vertices ABCD and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has the properties of a square.



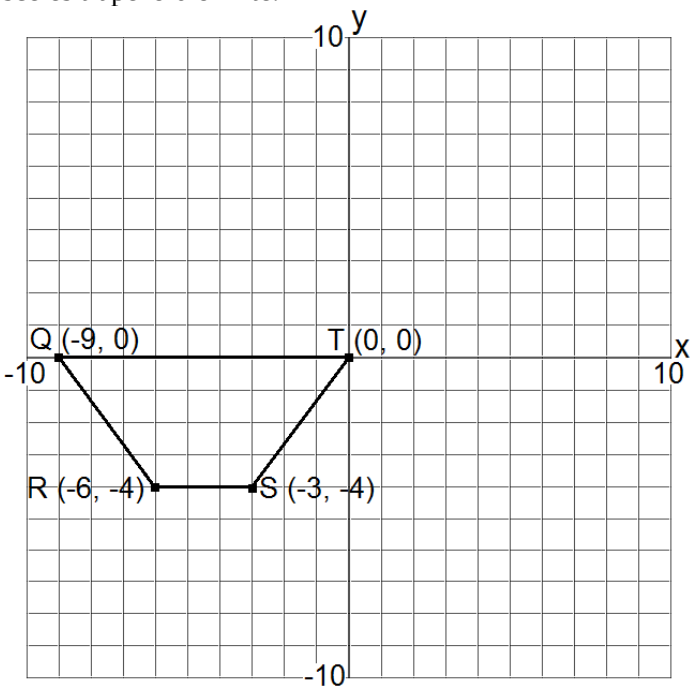
Diagonals Distance:
$AC = \sqrt{(1-1)^2 + (-4-6)^2} = \sqrt{100} = 10$
$BD = \sqrt{(-4-6)^2 + (1-1)^2} = \sqrt{100} = 10$
So quadrilateral *ABCD* is a rectangle with each 4 right angles because the diagonals are congruent (Rectangle Corollary).

Side Length Distances:
$AB = \sqrt{(6-1)^2 + (1-6)^2} = \sqrt{50} \approx 7.07$
$BC = \sqrt{(1-6)^2 + (-4-1)^2} = \sqrt{50} \approx 7.07$
$CD = \sqrt{(-4-1)^2 + (1-(-4))^2} = \sqrt{50} \approx 7.07$
$DA = \sqrt{(1-(-4))^2 + (6-1)^2} = \sqrt{50} \approx 7.07$
So quadrilateral *ABCD* is a rhombus with 4 equal side lengths (*Rhombus Corollary*).

Diagonals Slopes: $AC = \frac{6-(-4)}{1-1} = \frac{10}{0} = Undefined$
$BD = \frac{1-1}{6-(-4)} = \frac{0}{10} = 0$
So quadrilateral *ABCD* is a rhombus because the slopes of the diagonals are opposite reciprocals which means they are perpendicular (*Theorem 6.11*).

Quadrilateral *ABCD* is a square because it is both a rectangles and rhombus (*Square Corollary).*

#2) Isosceles Trapezoid: Create an isosceles trapezoid or kite and plot it on a coordinate grid. Clearly label the vertices QRST and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has the properties of an isosceles trapezoid or kite.



Side Slopes:
$QR = \frac{-4-0}{-6-(-9)} = \frac{-4}{3}$ $RS = \frac{-4-(-4)}{-6-(-3)} = \frac{0}{3} = 0$
$ST = \frac{0-(-4)}{0-(-3)} = \frac{4}{3}$ $TQ = \frac{0-0}{-9-0} = \frac{0}{-9} = 0$
So exactly one pair of sides or bases *RS* and *TQ* are parallel.

Diagonal Distances:
$QS = \sqrt{(-3-(-9))^2 + (-4-0)^2} = \sqrt{52} \approx 7.21$
$RT = \sqrt{(0-(-6))^2 + (0-(-4))^2} = \sqrt{52} \approx 7.21$
So the diagonals are congruent which makes legs *QR* and *ST* congruent (*Theorem 6.16*).

Quadrilateral *QRST* is an isosceles trapezoid with exactly 1 pair of parallel bases (*Definition)* and 1 pair of congruent legs.

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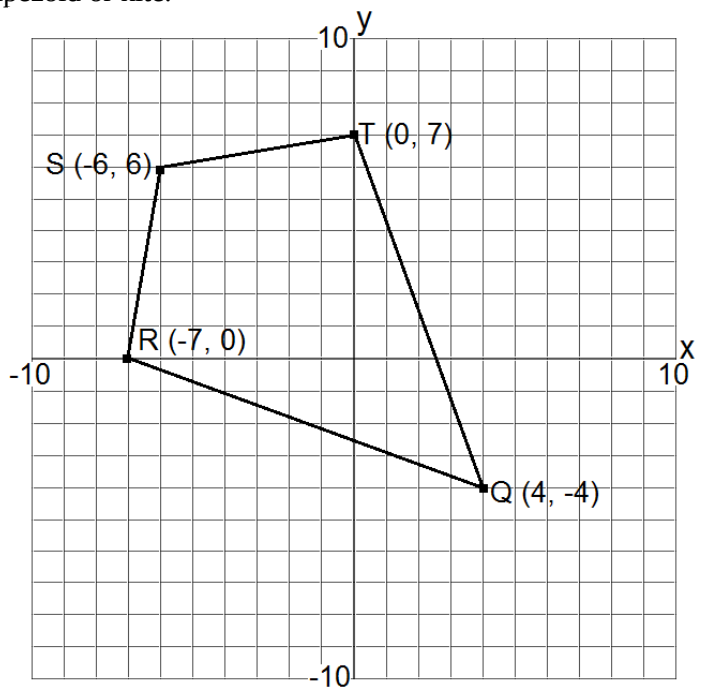
$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $x_m = \frac{x_2 + x_1}{2}, y_m = \frac{y_2 + y_1}{2}$

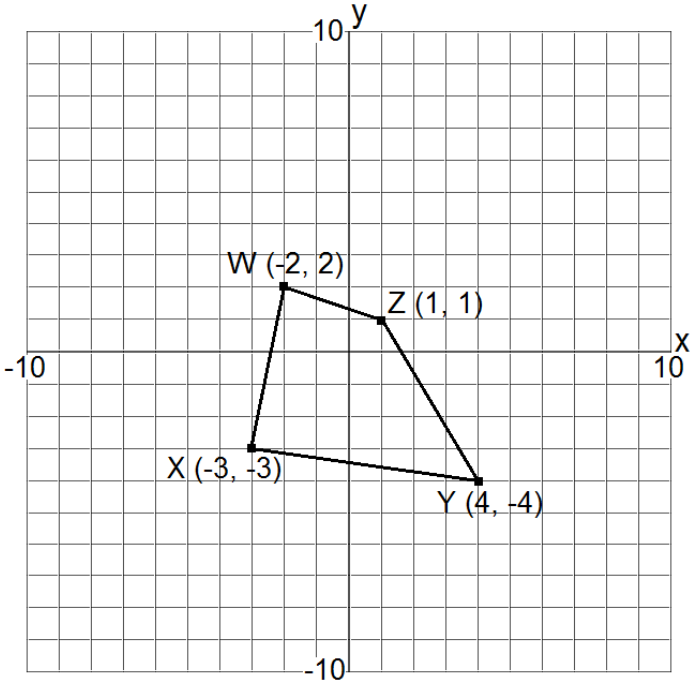
#2) Kite: Create an isosceles trapezoid or kite and plot it on a coordinate grid. Clearly label the vertices QRST and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has the properties of an isosceles trapezoid or kite.



Side Slopes:
$QR = \frac{-4-0}{4-(-7)} = \frac{-4}{11}$ $RS = \frac{6-0}{-6-(-7)} = \frac{6}{1} = 6$
$ST = \frac{7-6}{0-(-6)} = \frac{1}{6}$ $TQ = \frac{-4-7}{4-0} = \frac{-11}{4}$
No sides are parallel so quadrilateral *QRST* is not a parallelogram.

Side Distances:
$QR = \sqrt{(4-(-7))^2 + (-4-0)^2} = \sqrt{137} \approx 11.70$
$RS = \sqrt{(-6-(-7))^2 + (6-0)^2} = \sqrt{37} \approx 6.08$
$ST = \sqrt{(0-(-6))^2 + (7-6)^2} = \sqrt{37} \approx 6.08$
$TQ = \sqrt{(4-0)^2 + (-4-7)^2} = \sqrt{137} \approx 11.70$
Opposite sides are not congruent, but *RS*≅*ST* and *QR*≅*TQ* so 2 pairs of consecutive sides are congruent (*Definition*).

#3) Quadrilateral: Create a quadrilateral that is neither a parallelogram, rhombus, rectangle, square, trapezoid, isosceles trapezoid or kite and plot it on a coordinate grid. Clearly label the vertices WXYZ and identify the coordinates of each vertex. Finally, use coordinate methods such as slope, distance formula or midpoint formula to confirm that it has none of the properties of a parallelogram, rhombus, rectangle, square, trapezoid, isosceles trapezoid or kite.



Diagonal Midpoints:
WY: $\frac{-2+4}{2} = 1, \frac{2+(-4)}{2} = -1$ midpoint is (1, -1)
XZ: $\frac{1+(-3)}{2} = -1, \frac{1+(-3)}{2} = -1$ midpoint is (-1, -1)
The diagonals do not have the same midpoint so the diagonals don't bisect and quadrilateral *WXYZ* is not a parallelogram or isosceles trapezoid.

Side Slopes: $WX = \frac{-3-(-2)}{-3-2} = \frac{-1}{-5} = \frac{1}{5}$ $XY = \frac{-4-(-3)}{4-(-3)} = \frac{-1}{7}$
$YZ = \frac{1-(-4)}{1-4} = \frac{5}{-3}$ $ZW = \frac{1-2}{1-(-2)} = \frac{-1}{3}$
No sides are parallel so quadrilateral *WXYZ* is not a parallelogram or trapezoid.

Side Distances:
$WX = \sqrt{(-3-(-2))^2 + (2-(-3))^2} = \sqrt{26} \approx 5.1$
$XY = \sqrt{(4-(-3))^2 + (-4-(-3))^2} = \sqrt{50} \approx 7.07$
$YZ = \sqrt{(1-4)^2 + (1-(-4))^2} = \sqrt{34} \approx 5.83$
$ZW = \sqrt{(-2-1)^2 + (1-2)^2} = \sqrt{10} \approx 3.33$
No sides are congruent so quadrilateral *WXYZ* is not a kite, rhombus or isosceles trapezoid.

Quadrilateral *WXYZ* is not a parallelogram so it also is not a square or a rectangle.

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