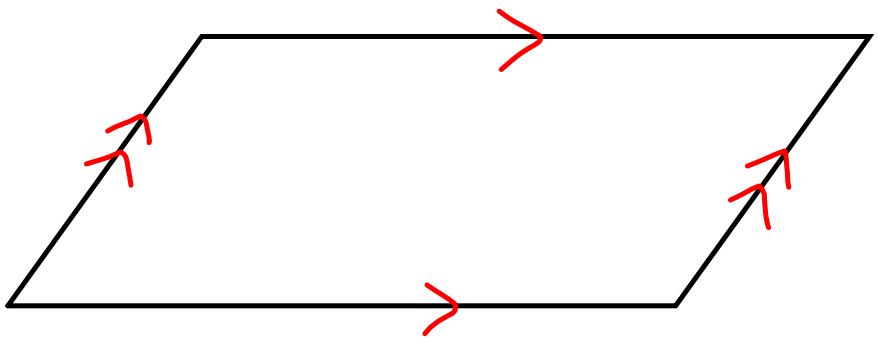
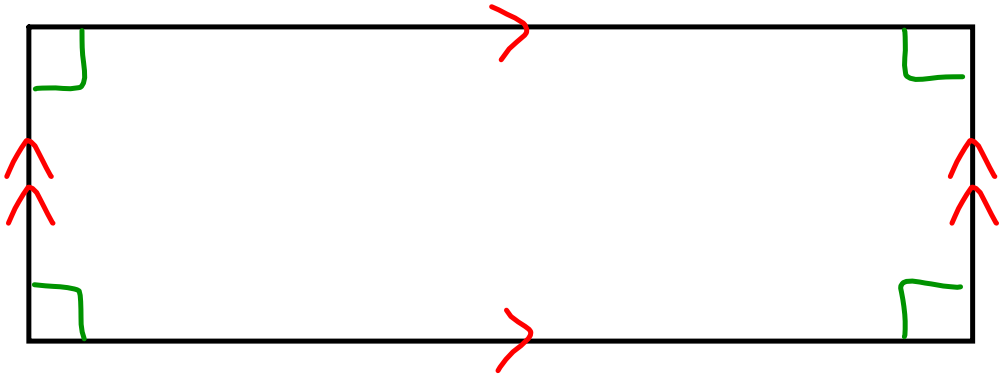
<u>Parallelogram</u>

Quadrilateral with both pairs of opposite sides parallel



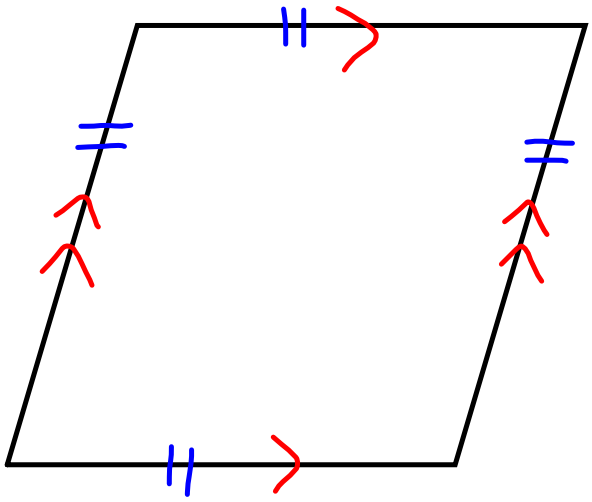
Rectangle

Parallelogram with four right angles



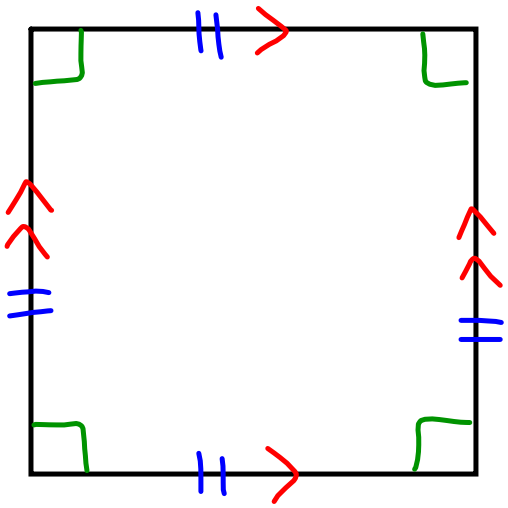
Rhombus

Parallelogram with four congruent sides



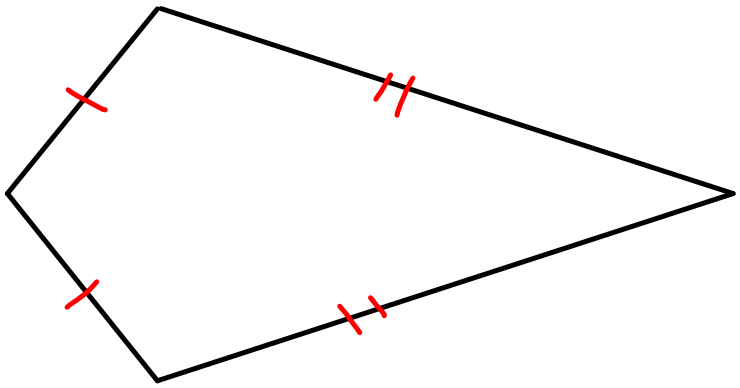
<u>Square</u>

Parallelogram with four congruent sides and four right angles



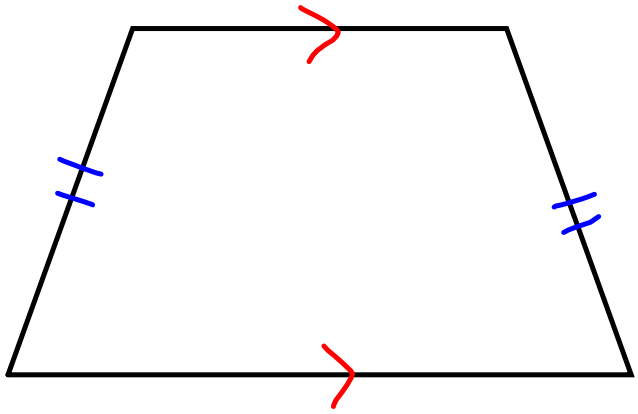
<u>Kite</u>

Quadrilateral two pairs of consecutive congruent sides



<u>Isosceles Trapezoid</u>

Quadrilateral with only one pair of opposite sides parallel, and non-parallel sides are congruent



Given the coordinates of four points, it is possible to determine which quadrilateral is being graphed:

Parallelogram

1 - slopes of both pairs of opp sides are equal

Rectangle

1 - slopes of both pairs of opp sides are equal

2 - slopes of consecutive sides are negative reciprocals

Rhombus

1 - slopes of both pairs of opp sides are equal

2 - all four sides have same length

<u>Square</u>

1 - slopes of both pairs of opp sides are equal

2 - all four sides have same length

3 - slopes of consecutive sides are negative reciprocals

<u>Kite</u>

1 - slopes of both pairs of opp sides are not equal

2 - two pairs of consecutive sides have same length (but not all four the same)

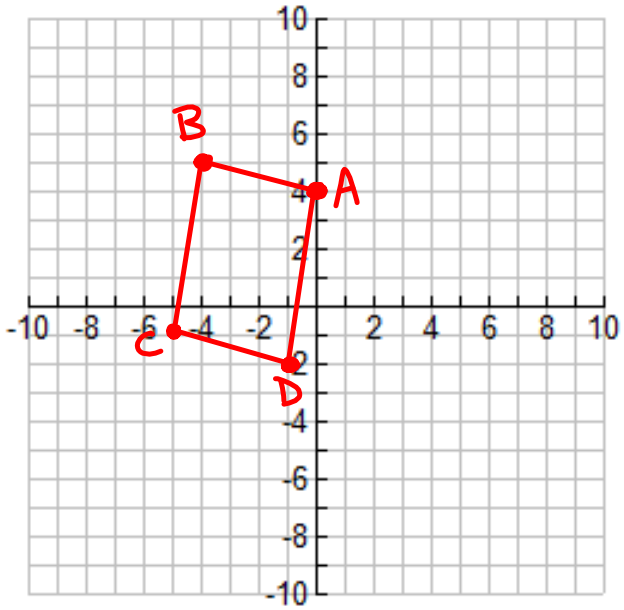
<u>Isosceles Trapezoid</u>

1 - slopes of only one pairs of opp sides is equal

2 - other two sides are same length

Graph the Quadrilateral:

A(0, 4) *B*(-4, 5) *C*(-5, -1) *D*(-1, -2)



Which quadrilateral does it appear to be?

RECTANGLE?

Prove it:

$m\overline{AB} = \frac{4-5}{0+4} = -1/4$ $\quad$ $m\overline{BC} = \frac{5+1}{-4+5} = 6$

$m\overline{CD} = \frac{-1+2}{-5+1} = -1/4$ $\quad$ $m\overline{DA} = \frac{4+2}{0+1} = 6$

$$\left.\begin{array}{l} m\overline{AB} = m\overline{CD} \\ m\overline{BC} = m\overline{DA} \end{array}\right\} \therefore \text{//-OGRAM}$$

$$\left.\begin{array}{l} \overline{AB} \not\perp \overline{BC} \\ \overline{BC} \not\perp \overline{CD} \\ \overline{CD} \not\perp \overline{DA} \\ \overline{DA} \not\perp \overline{AB} \end{array}\right\} \therefore \text{NOT SQUARE OR RECTANGLE}$$

$AB = \sqrt{(0+4)^2+(4-5)^2} = \sqrt{16+1} = \sqrt{17}$

$BC = \sqrt{(-4+5)^2+(5+1)^2} = \sqrt{1+36} = \sqrt{37}$

$CD = \sqrt{(-5+1)^2+(-1+2)^2} = \sqrt{16+1} = \sqrt{17}$

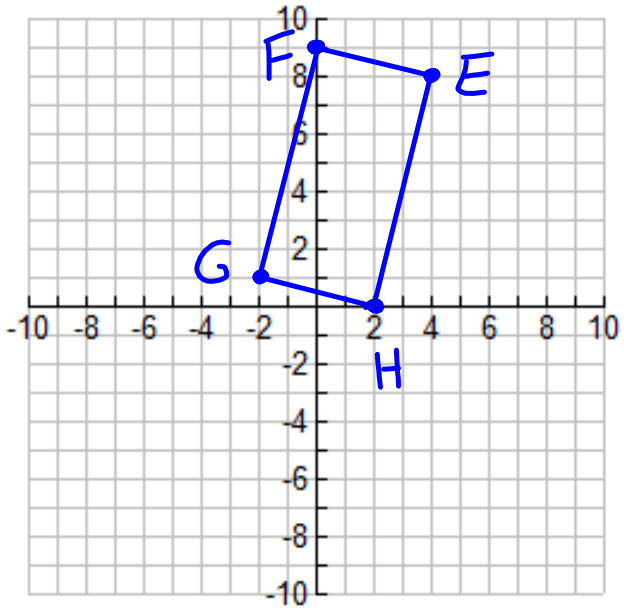
$DA = \sqrt{(0+1)^2+(4+2)^2} = \sqrt{1+36} = \sqrt{37}$

$$\left.\begin{array}{l} AB = CD \\ BC = DA \\ AB \neq BC \end{array}\right\} \therefore \text{NOT RHOMBUS}$$

ABCD IS A PARALLELOGRAM

Graph the Quadrilateral:

E(4, 8) *F*(0, 9) *G*(-2, 1) *H*(2, 0)



Which quadrilateral does it appear to be?

RECTANGLE ?

Prove it:

$m\overline{EF} = \frac{8-9}{4-0} = -1/4$ $\quad$ $m\overline{FG} = \frac{9-1}{0+2} = 4$

$m\overline{GH} = \frac{1-0}{-2-2} = -1/4$ $\quad$ $m\overline{HE} = \frac{8-0}{4-2} = 4$

$$\left.\begin{array}{l} m\overline{EF} = m\overline{GH} \\ m\overline{FG} = m\overline{HE} \end{array}\right\} \therefore \text{ //-OGRAM}$$

$$\left.\begin{array}{l} \overline{EF} \perp \overline{FG} \\ \overline{FG} \perp \overline{GH} \\ \overline{GH} \perp \overline{HE} \\ \overline{HE} \perp \overline{EF} \end{array}\right\} \therefore \text{ SQUARE OR RECTANGLE}$$

$EF = \sqrt{(4-0)^2+(8-9)^2} = \sqrt{16+1} = \sqrt{17}$

$FG = \sqrt{(0+2)^2+(9-1)^2} = \sqrt{4+64} = \sqrt{68}$
$= 2\sqrt{17}$

$GH = \sqrt{(-2-2)^2+(1-0)^2} = \sqrt{16+1} = \sqrt{17}$

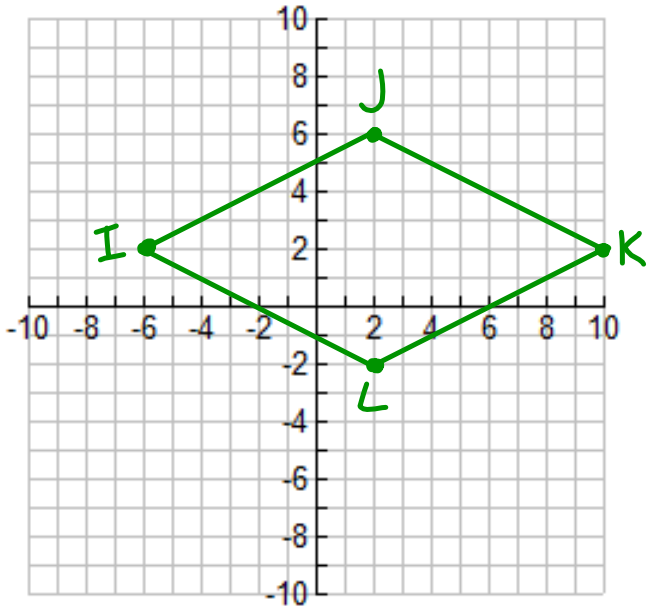
$HE = \sqrt{(2-4)^2+(0-8)^2} = \sqrt{4+64} = \sqrt{68}$
$= 2\sqrt{17}$

$$\left.\begin{array}{l} EF = GH \\ FG = HE \\ EF \neq FG \end{array}\right\} \therefore \text{ NOT SQUARE}$$

EFGH IS A RECT$\angle$

Graph the Quadrilateral:

I(-6, 2) *J*(2, 6) *K*(10, 2) *L*(2, -2)



Which quadrilateral does it appear to be?

KITE?

RHOMBUS?

Prove it:

$m\overline{IJ} = \frac{2-6}{-6-2} = \frac{-4}{-8} = \frac{1}{2}$ $\quad m\overline{JK} = \frac{6-2}{2-10} = \frac{4}{-8} = -\frac{1}{2}$

$m\overline{KL} = \frac{2+2}{10-2} = \frac{4}{8} = \frac{1}{2}$ $\quad m\overline{LI} = \frac{2+2}{-6-2} = \frac{4}{-8} = -\frac{1}{2}$

$$\left.\begin{array}{l} m\overline{IJ} = m\overline{KL} \\ m\overline{JK} = m\overline{IL} \end{array}\right\} \therefore \text{ //-OGRAM}$$

$$\left.\begin{array}{l} \overline{IJ} \not\perp \overline{JK} \\ \overline{JK} \not\perp \overline{KL} \\ \overline{KL} \not\perp \overline{LI} \\ \overline{LI} \not\perp \overline{IJ} \end{array}\right\} \therefore \text{ NOT SQUARE OR RECTANGLE (MUST BE //-OGRAM OR RHOMBUS)}$$

$IJ = \sqrt{(-6-2)^2+(2-6)^2} = \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$

$JK = \sqrt{(2-10)^2+(6-2)^2} = \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$

$KL = \sqrt{(10-2)^2+(2+2)^2} = \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$

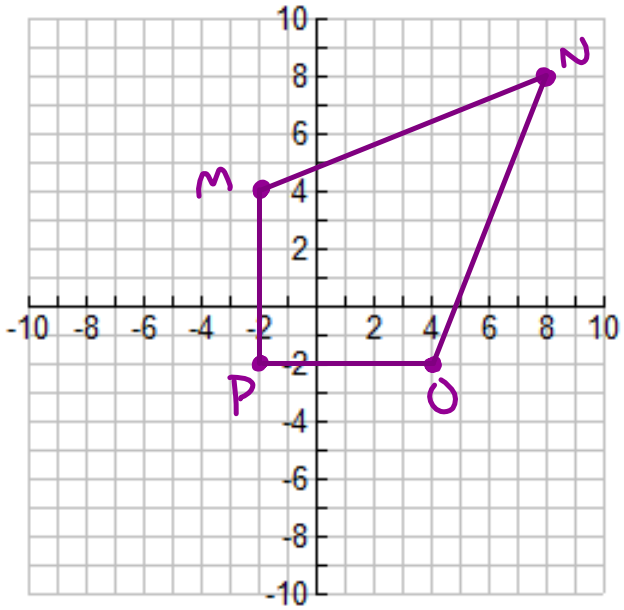
$LI = \sqrt{(2+6)^2+(-2-2)^2} = \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$

$IJ = JK = KL = LI$

$\therefore$ IJKL IS A RHOMBUS

Graph the Quadrilateral:

M(-2, 4) *N*(8, 8) *O*(4, -2) *P*(-2, -2)



Which quadrilateral does it appear to be?

KITE ?

Prove it:

$m\overline{MN} = \frac{4-8}{-2-8} = \frac{-4}{-10} = 2/5$ $\quad$ $m\overline{NO} = \frac{8+2}{8-4} = \frac{10}{4} = 5/2$

$m\overline{OP} = \frac{-2+2}{4+2} = \frac{0}{6} = 0$ $\quad$ $m\overline{PM} = \frac{-2-4}{-2+2} = \frac{-6}{0}$

UNDEFINED

$m\overline{MN} \neq m\overline{OP}$
$m\overline{NO} \neq m\overline{PM}$ } NOT A //-OGRAM
NOT AN ISOSCELES TRAPEZOID

$MN = \sqrt{(-2-8)^2+(4-8)^2} = \sqrt{100+16} = \sqrt{116} = 2\sqrt{29}$

$NO = \sqrt{(8-4)^2+(8+2)^2} = \sqrt{16+100} = \sqrt{116} = 2\sqrt{29}$

$OP = \sqrt{(4+2)^2+(-2+2)^2} = \sqrt{36+0} = \sqrt{36} = 6$

$PM = \sqrt{(-2+2)^2+(-2-4)^2} = \sqrt{0+36} = \sqrt{36} = 6$

$MN = NO$

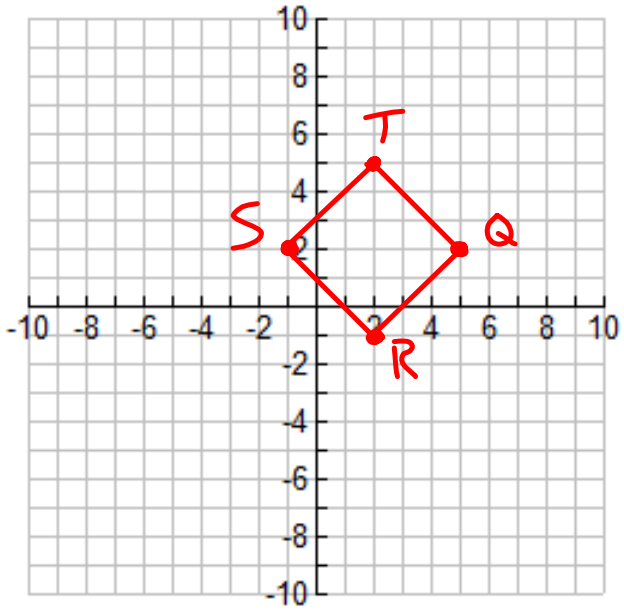
$OP = PM$

$MN \neq OP$

$\therefore$ MNOP IS A KITE

Graph the Quadrilateral:

Q(5, 2) *R*(2, -1) *S*(-1, 2) *T*(2, 5)



Which quadrilateral does it appear to be?

SQUARE?

Prove it:

$m\overline{QR} = \frac{2+1}{5-2} = \frac{3}{3} = 1$ $\quad m\overline{RS} = \frac{-1-2}{2+1} = \frac{-3}{3} = -1$

$m\overline{ST} = \frac{2-5}{-1-2} = \frac{-3}{-3} = 1$ $\quad m\overline{TQ} = \frac{5-2}{2-5} = \frac{3}{-3} = -1$

$$\left.\begin{array}{l} m\overline{QR} = m\overline{ST} \\ m\overline{RS} = m\overline{TQ} \end{array}\right\} \therefore \text{ //-OGRAM}$$

$$\left.\begin{array}{l} \overline{QR} \perp \overline{RS} \\ \overline{RS} \perp \overline{ST} \\ \overline{ST} \perp \overline{TQ} \\ \overline{TQ} \perp \overline{QR} \end{array}\right\} \text{RECTANGLE OR SQUARE}$$

$QR = \sqrt{(5-2)^2+(2+1)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$

$RS = \sqrt{(2+1)^2+(-1-2)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$

$ST = \sqrt{(-1-2)^2+(2-5)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$

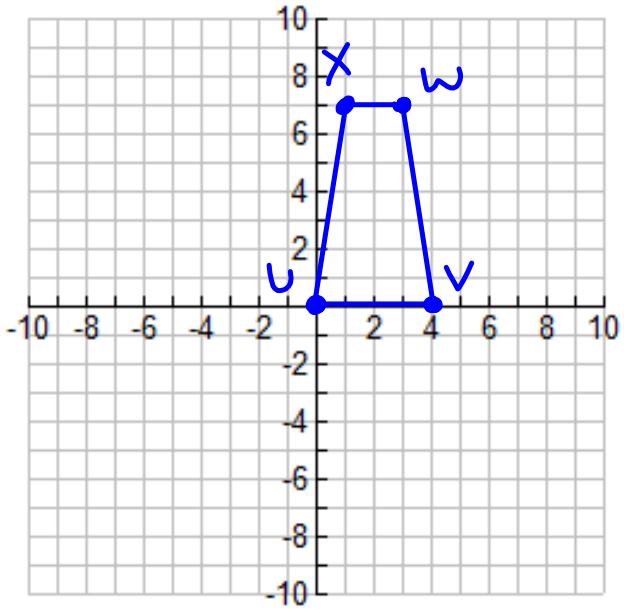
$TQ = \sqrt{(5-2)^2+(2-5)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$

$QR = RS = ST = TQ$

$\therefore$ QRST IS A SQUARE

Graph the Quadrilateral:

$U(0, 0)$ $V(4, 0)$ $W(3, 7)$ $X(1, 7)$



Which quadrilateral does it appear to be?

ISOSCELES TRAPEZOID ?

Prove it:

$m\overline{UV} = \frac{0-0}{0-4} = \frac{0}{-4} = 0$ $\quad$ $m\overline{VW} = \frac{0-7}{4-3} = \frac{-7}{1} = -7$

$m\overline{WX} = \frac{7-7}{3-1} = \frac{0}{2} = 0$ $\quad$ $m\overline{XU} = \frac{7-0}{1-0} = \frac{7}{1} = 7$

$$\left.\begin{array}{l} m\overline{UV} = m\overline{WX} \\ m\overline{VW} \neq m\overline{XU} \end{array}\right\} \text{NOT A //-OGRAM}$$

$UV = \sqrt{(0-4)^2 + (0-0)^2} = \sqrt{16+0} = \sqrt{16} = 4$

$VW = \sqrt{(4-3)^2 + (0-7)^2} = \sqrt{1+49} = \sqrt{50} = 5\sqrt{2}$

$WX = \sqrt{(3-1)^2 + (7-7)^2} = \sqrt{4+0} = \sqrt{4} = 2$

$XU = \sqrt{(1-0)^2 + (7-0)^2} = \sqrt{1+49} = \sqrt{50} = 5\sqrt{2}$

$\overline{UV} \parallel \overline{WX}$

$VW = UX$

$\therefore$ UVWX IS AN ISOSCELES TRAPEZOID