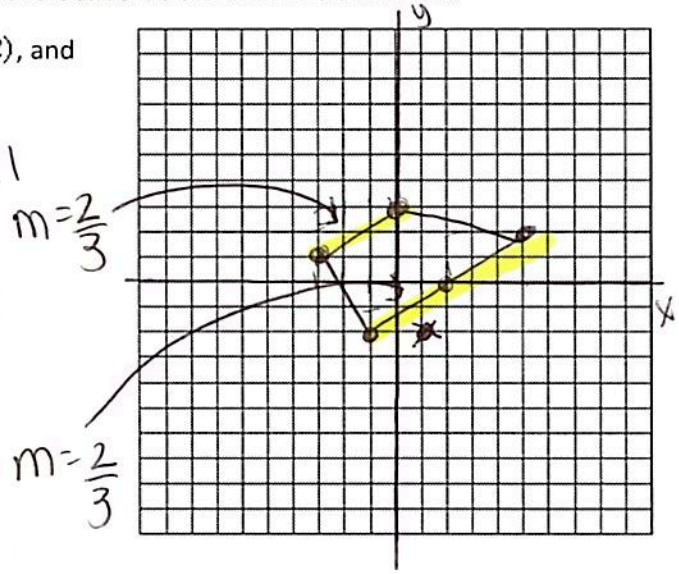
Name: Key Date: _____

UNIT 7 **LESSON 11**

AIM: HOW DO PROVE TRAPEZOIDS AND ISOSCELES TRAPEZOIDS USING COORDINATE GEOMETRY?

Do Now: A quadrilateral has vertices with coordinates $(-3, 1)$, $(0, 3)$, $(5, 2)$, and $(-1, -2)$. Which type of quadrilateral is this?

1) rhombus } opp sides not ≅
2) rectangle } both pairs opp sides not ||
3) square
4) trapezoid → one pair opp. sides are ||



NOTES:

- Trapezoids have one pair of opposite sides parallel
- To prove a quadrilateral is a trapezoid, we use the slope formula 4 times to show one pair of opposite sides are parallel.
- In an isosceles trapezoid, the non-parallel sides are congruent.

- To prove a quadrilateral is an isosceles triangle, we use the slope formula 4 times to show one pair of opposite sides are parallel then the distance formula 2 times to show the non-parallel sides are congruent

1) Given: $A(1, 6)$, $B(7, 9)$, $C(13, 6)$, and $D(3, 1)$

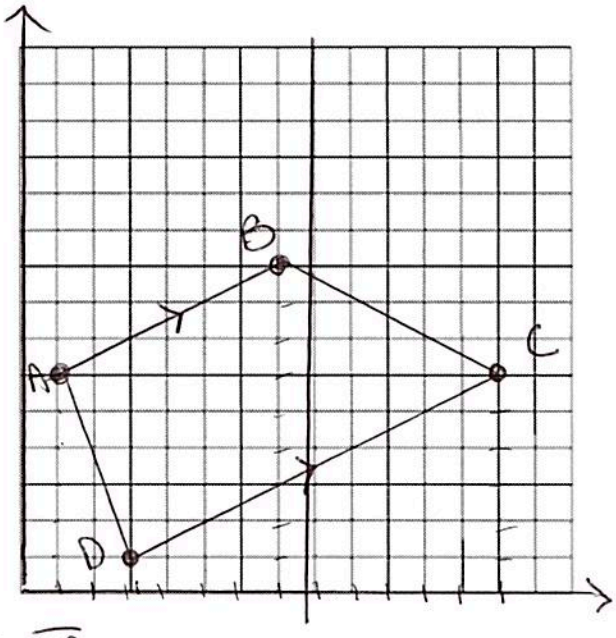
Prove: *ABCD* is a trapezoid. [*The use of the accompanying grid is optional.*]

$m_{\overline{AB}} = \frac{9-6}{7-1} = \frac{3}{6} = \frac{1}{2}$

$m_{\overline{BC}} = \frac{6-9}{13-7} = \frac{-3}{6} = -\frac{1}{2}$

$m_{\overline{CD}} = \frac{1-6}{3-13} = \frac{-5}{-10} = \frac{1}{2}$

$m_{\overline{AD}} = \frac{1-6}{3-1} = \frac{-5}{2}$



CONCLUSION: ABCD is a trapezoid b/c $\overline{AB} \parallel \overline{CD}$

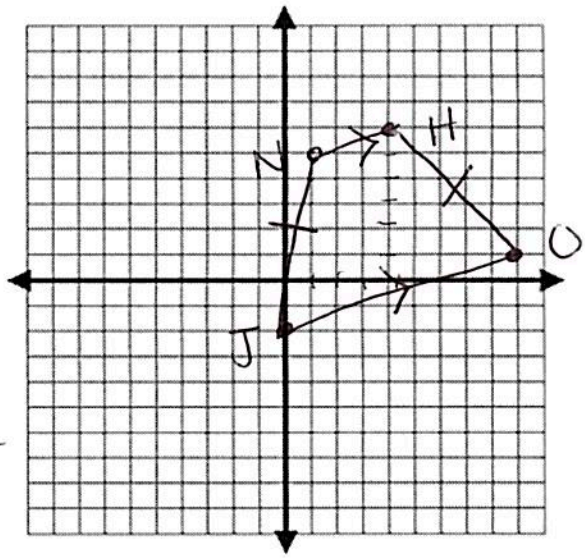
2) Given the coordinates of Quadrilateral $JOHN$ are $J(0,-2)$, $O(9,1)$, $H(4,6)$, $N(1,5)$.
Prove that Quadrilateral $JOHN$ is an Isosceles Trapezoid.

$m_{\overline{JO}} = \frac{1--2}{9-0} = \frac{3}{9} = \frac{1}{3}$

$m_{\overline{OH}} = \frac{6-1}{4-9} = \frac{5}{-5} = -1$

$m_{\overline{HN}} = \frac{5-6}{1-4} = \frac{-1}{-3} = \frac{1}{3}$

$m_{\overline{JN}} = \frac{5--2}{1-0} = \frac{7}{1} = 7$



$\overline{JN} = \sqrt{(1-0)^2+(5--2)^2} = \sqrt{50}$

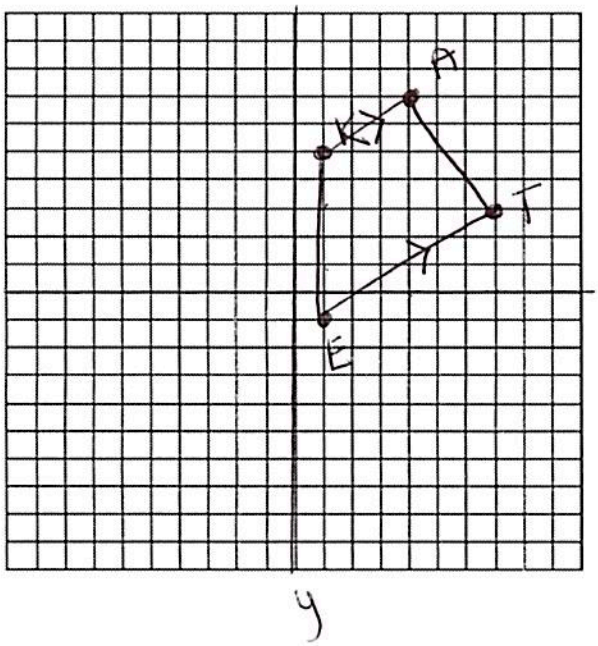
$\overline{OH} = \sqrt{(4-9)^2+(6-1)^2} = \sqrt{50}$

CONCLUSION: JOHN is an isosceles trapezoid b/c $\overline{JO} \parallel \overline{HN}$ and $\overline{JN} \cong \overline{OH}$

3. Quadrilateral *KATE* has vertices $K(1,5)$, $A(4,7)$, $T(7,3)$, and $E(1,-1)$.

a) Prove that *KATE* is a trapezoid. [The use of the grid is optional.]

b) Prove that *KATE* is *not* an isosceles trapezoid.



$m_{\overline{KA}} = \frac{7-5}{4-1} = \frac{2}{3}$

$m_{\overline{AT}} = \frac{3-7}{7-4} = -\frac{4}{3}$

$m_{\overline{TE}} = \frac{-1-3}{1-7} = \frac{2}{3}$

$m_{\overline{KE}} = \frac{-1-5}{1-1} =$ undefined

$\overline{KE}$ $\sqrt{(1-1)^2+(-1-5)^2} = \sqrt{36} = 6$

$\overline{AT} = \sqrt{(3-7)^2+(7-4)^2} = \sqrt{10}$

CONCLUSION: KATE is a trapezoid b/c $\overline{KA} \parallel \overline{TE}$ but not isosceles b/c $\overline{KE} \not\cong \overline{AT}$

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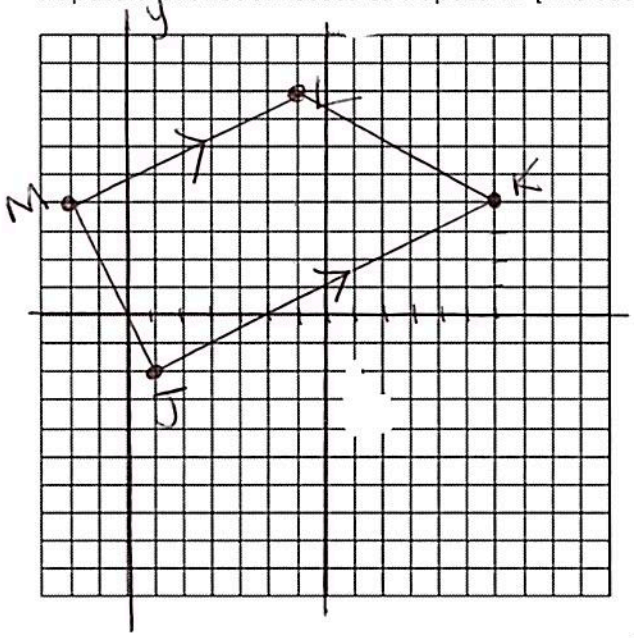
UNIT 7 **LESSON 11 HOMEWORK**

) The coordinates of quadrilateral *JKLM* are $J(1,-2)$, $K(13,4)$, $L(6,8)$, and $M(-2,4)$. Prove that quadrilateral *JKLM* is a trapezoid but *not* an isosceles trapezoid. [The use of the grid is optional.]



$m_{\overline{JK}} = \frac{4--2}{13-1} = \frac{1}{2}$

$m_{\overline{KL}} = \frac{8-4}{6-13} = -\frac{4}{7}$

$m_{\overline{LM}} = \frac{4-8}{-2-6} = \frac{1}{2}$

$m_{\overline{JM}} = \frac{4--2}{-2-1} = -2$

$\overline{MJ} = \sqrt{(-2-1)^2+(4-2)^2} = \sqrt{45}$

$\overline{LK} = \sqrt{(6-13)^2+(8-4)^2} = \sqrt{65}$

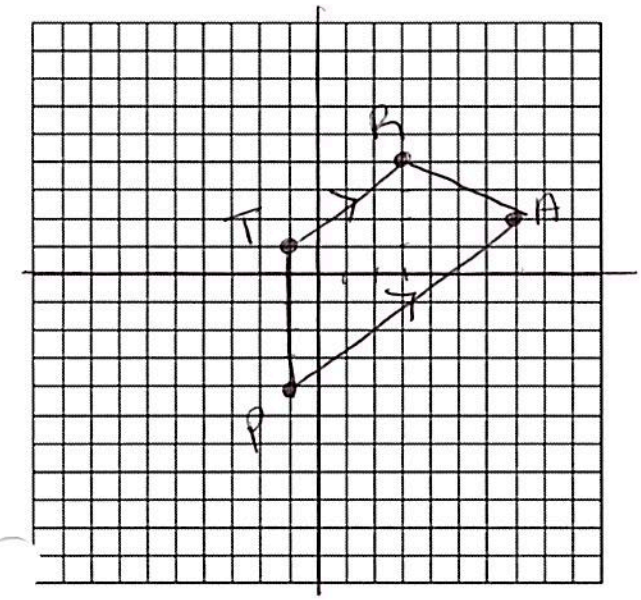
CONCLUSION: JKLM is a trapezoid b/c $\overline{JK} \parallel \overline{LM}$ but not isosceles b/c $\overline{MJ} \not\parallel \overline{LK}$

?) Given: $T(-1,1)$, $R(3,4)$, $A(7,2)$, and $P(-1,-4)$

Prove: *TRAP* is a trapezoid.

TRAP is not an isosceles trapezoid.

[The use of the grid is optional.]



$m_{\overline{TR}} = \frac{4-1}{3--1} = \frac{3}{4}$

$m_{\overline{RA}} = \frac{2-4}{7-3} = -\frac{1}{2}$

$m_{\overline{AP}} = \frac{-4-2}{-1-7} = \frac{3}{4}$

$m_{\overline{TP}} = \frac{-4--1}{-1--1} = \text{undefined}$

$\overline{TP} = \sqrt{(-1--1)^2+(-4-1)^2} = \sqrt{25} = 5$ (or count boxes!)

$\overline{RA} = \sqrt{(7-3)^2+(2-4)^2} = \sqrt{20}$

CONCLUSION: TRAP is a trapezoid b/c $\overline{TR} \parallel \overline{AP}$ but not isosceles b/c $\overline{TP} \not\parallel \overline{RA}$