You're always calculating distance except trapezoid in which case you're calculating slope!

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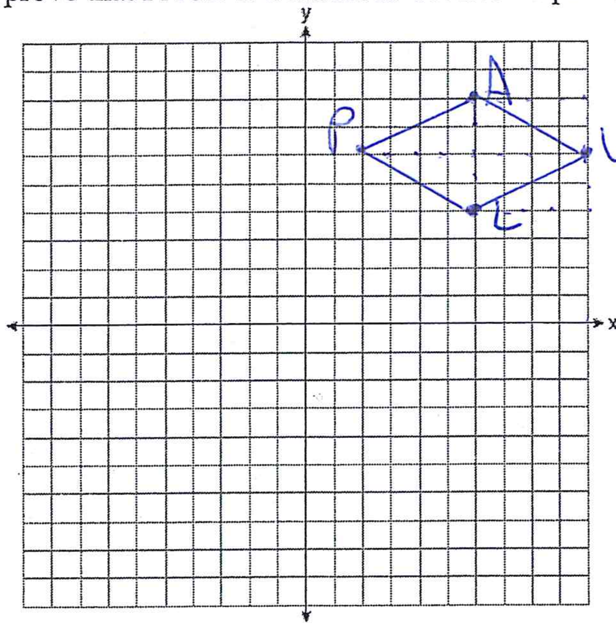
Geometry

Coordinate Geometry Proofs Practice

1. Rhombus PAUL has vertices P(2,6) A(6,8), U(10,6), and L(6,4). Using coordinate geometry, prove that PAUL is a rhombus but not a square.

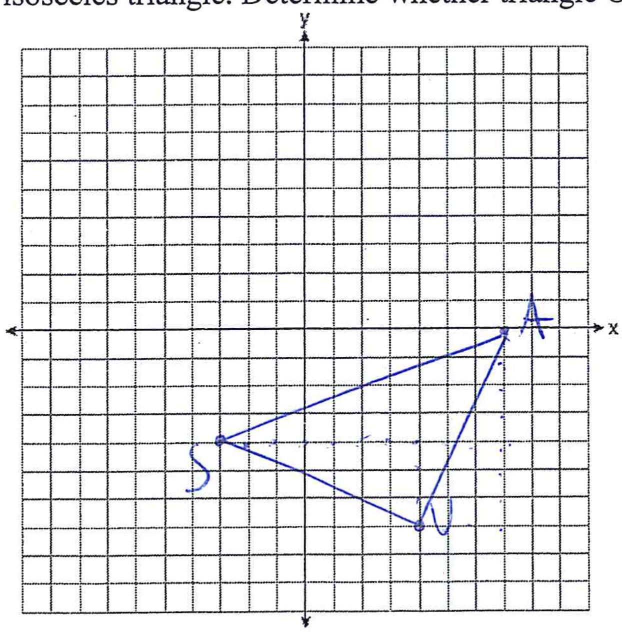


1) PAUL is a rhombus because all sides are congruent. It is not a square because diagonals are not congruent.

2) $d\overline{PA} = \sqrt{4^2+2^2} = \sqrt{16+4} = \sqrt{20}$
$d\overline{AU} = \sqrt{4^2+2^2} = \sqrt{16+4} = \sqrt{20}$
$d\overline{UL} = \sqrt{4^2+2^2} = \sqrt{16+4} = \sqrt{20}$
$d\overline{LP} = \sqrt{4^2+2^2} = \sqrt{16+4} = \sqrt{20}$
$d\,PU = 8$
$d\,AL = 4$

3) $\overline{PA} \cong \overline{AU} \cong \overline{UL} \cong \overline{LP}$ because they have the same distance
$\overline{PU} \ncong \overline{AL}$ because they don't have the same distance

2. Triangle USA has vertices U(4,-7), S(-3,-4), and A(7,0). Prove that triangle USA is an isosceles triangle. Determine whether triangle USA is a right triangle.



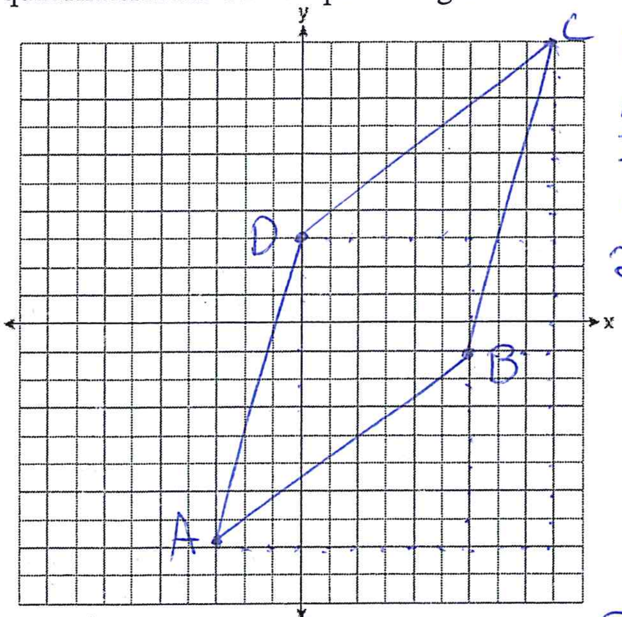
1) USA is an isosceles triangle because it has 2 congruent sides. It is a right triangle because its sides fit into Pythagorean Theorem.

2) $d\overline{US} = \sqrt{7^2+3^2} = \sqrt{49+9} = \sqrt{58}$
$d\overline{SA} = \sqrt{10^2+4^2} = \sqrt{100+16} = \sqrt{116}$
$d\overline{AU} = \sqrt{3^2+7^2} = \sqrt{9+49} = \sqrt{58}$

3) $\overline{US} \cong \overline{AU}$ because they have the same distance.

$a^2+b^2=c^2$
$\sqrt{58}^2 + \sqrt{58}^2 = \sqrt{116}^2$
$58+58=116$
$116=116$

3. The coordinates of quadrilateral ABCD are A(-3,-8), B(6,-1), C(9,10), and D(0,3). Prove that quadrilateral ABCD is a parallelogram but *not* a rectangle.



1) ABCD is a Parallelogram because it has 2 pairs of opposite sides congruent. It is not a rectangle because it ~~has~~ does not have congruent diagonals.

2) $d\overline{AD} = \sqrt{3^2+11^2} = \sqrt{9+121} = \sqrt{130}$

$d\overline{BC} = \sqrt{3^2+11^2} = \sqrt{9+121} = \sqrt{130}$

$d\overline{DC} = \sqrt{9^2+7^2} = \sqrt{81+49} = \sqrt{130}$

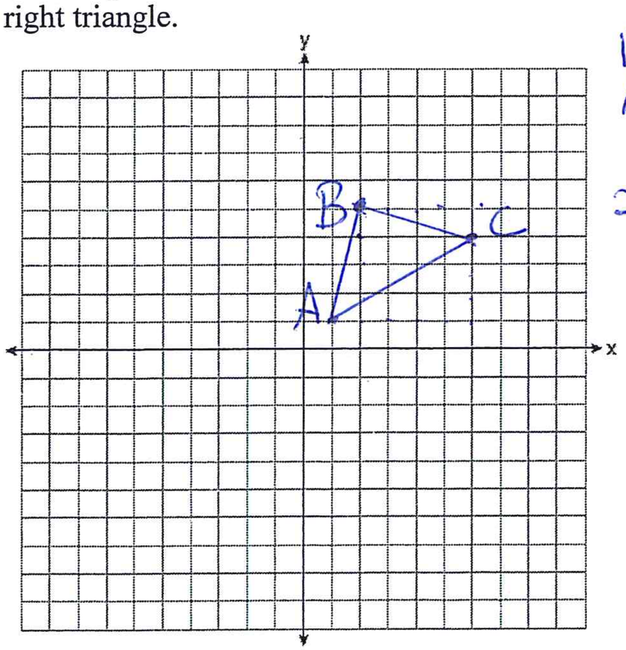
$d\overline{AB} = \sqrt{9^2+7^2} = \sqrt{81+49} = \sqrt{130}$

$d\overline{AC} = \sqrt{12^2+18^2} = \sqrt{144+324} = \sqrt{468}$

$d\overline{DB} = \sqrt{6^2+4^2} = \sqrt{36+16} = \sqrt{52}$

3) $\overline{AD} \cong \overline{BC}$, $\overline{AB} \cong \overline{DC}$ because they have the same distance. $\overline{AC} \ncong \overline{DB}$ because they don't have the same distance.

4. Triangle ABC has vertices A(1,1), B(2,5), and C(6,4). Prove that triangle ABC is an isosceles right triangle.



1) ABC is an isosceles right triangle because it has two congruent sides and its sides fit into Pythagorean Theorem.

2) $d\overline{AB} = \sqrt{1^2+4^2} = \sqrt{1+16} = \sqrt{17}$

$d\overline{BC} = \sqrt{4^2+1^2} = \sqrt{16+1} = \sqrt{17}$

$d\overline{CA} = \sqrt{5^2+3^2} = \sqrt{25+9} = \sqrt{34}$

3) $\overline{AB} \cong \overline{BC}$ because they have the same distance.

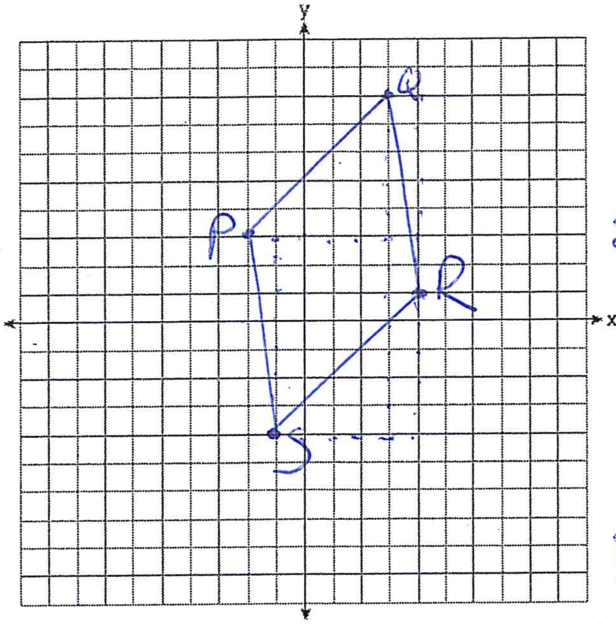
$a^2+b^2=c^2$

$\cancel{\sqrt{17}}^2 + \cancel{\sqrt{17}}^2 = \cancel{\sqrt{34}}^2$

$17+17 = 34$

$34=34$

5. Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$. Prove that $PQRS$ is a rhombus. Prove that $PQRS$ is *not* a square.



1) PQRS is a rhombus because all sides are congruent. It is not a square because diagonals are not congruent.

2) $d\overline{PQ} = \sqrt{5^2+5^2} = \sqrt{25+25} = \sqrt{50}$

$d\overline{QR} = \sqrt{1^2+7^2} = \sqrt{1+49} = \sqrt{50}$

$d\overline{RS} = \sqrt{5^2+5^2} = \sqrt{25+25} = \sqrt{50}$

$d\overline{SP} = \sqrt{1^2+7^2} = \sqrt{1+49} = \sqrt{50}$

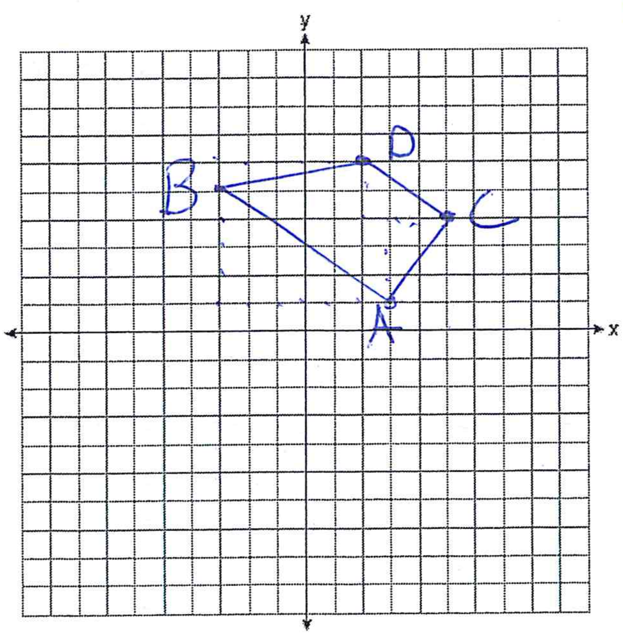
$d\overline{PR} = \sqrt{6^2+2^2} = \sqrt{36+4} = \sqrt{40}$

$d\overline{QS} = \sqrt{4^2+12^2} = \sqrt{16+144} = \sqrt{160}$

3) $\overline{PQ} \cong \overline{QR} \cong \overline{RS} \cong \overline{SP}$ because they have the same distance.

$\overline{PR} \ncong \overline{QS}$ because they don't have the same distance

6. Quadrilateral ABCD has vertices A(3,1) B(-3,5) C(5,4) and D(2,6). Prove quadrilateral ABCD is a trapezoid but *not* an isosceles trapezoid.



1) ABCD is a trapezoid because it has 1 pair of opposite sides $\parallel$ and 1 pair of opposite sides $\nparallel$. It is not a trapezoid because its legs are $\ncong$.

2) $m\overline{DC} = -\frac{2}{3}$

$m\overline{BA} = -\frac{4}{6} = -\frac{2}{3}$

$m\overline{BD} = \frac{1}{5}$

$m\overline{CA} = \frac{3}{2}$

$d\overline{BD} = \sqrt{5^2+1^2} = \sqrt{25+1} = \sqrt{26}$

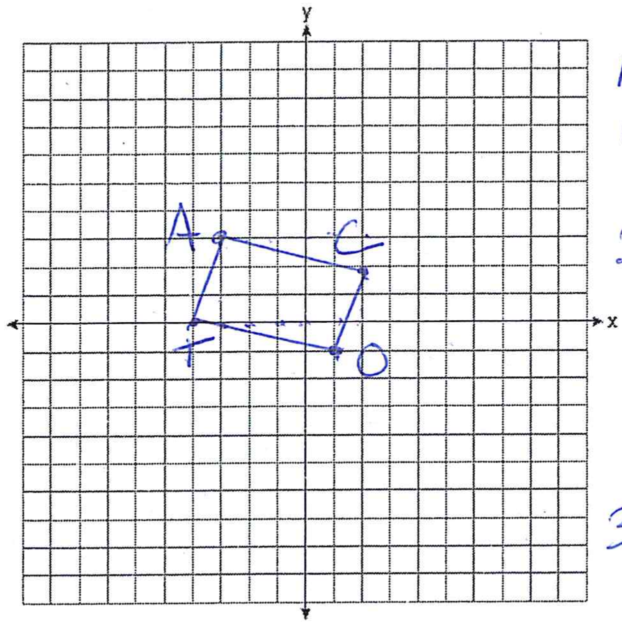
$d\overline{CA} = \sqrt{3^2+2^2} = \sqrt{9+4} = \sqrt{13}$

3) $\overline{DC} \parallel \overline{BA}$ because they have the same slope

$\overline{BD} \nparallel \overline{AC}$ because they don't have the same slope

$\overline{BD} \ncong \overline{CA}$ because they don't have the same distance

7. The coordinate of quadrilateral TACO are T(-4,0), A(-3,3), C(2,2), and O(1,-1). Prove that TACO is a parallelogram but not a rhombus.



1) TACO is a parallelogram because it has 2 pairs of opposite sides congruent. It is not a rhombus because all sides are not congruent.

2) $d\overline{TA} = \sqrt{1^2+3^2} = \sqrt{1+9} = \sqrt{10}$

$d\overline{CO} = \sqrt{1^2+3^2} = \sqrt{1+9} = \sqrt{10}$

$d\overline{AC} = \sqrt{5^2+1^2} = \sqrt{25+1} = \sqrt{26}$

$d\overline{TO} = \sqrt{5^2+1^2} = \sqrt{25+1} = \sqrt{26}$

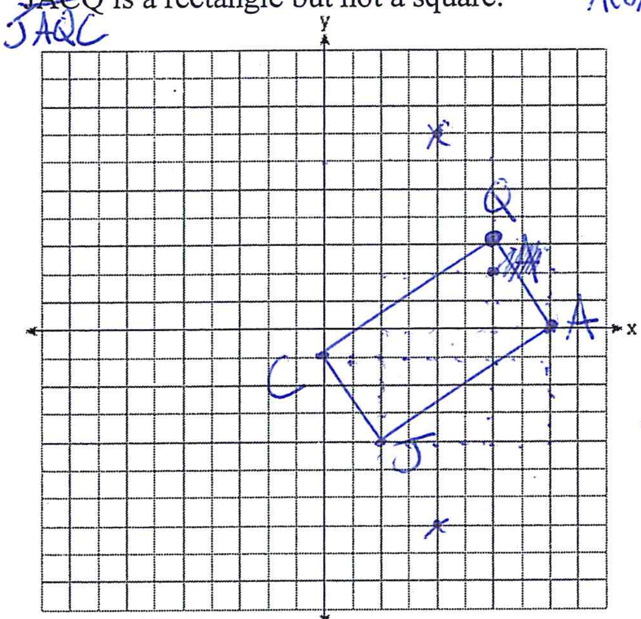
3) $\overline{TA} \cong \overline{CO}$ and $\overline{AC} \cong \overline{TO}$ because they have the same distance.

$\overline{TA} \not\cong \overline{AC}$ because they don't have the same distance.

JAQC

8. Quadrilateral ~~JACQ~~ has vertices J(2,-4), ~~A(6,2)~~, C(0,-1), and ~~Q(4,-7)~~. Prove that quadrilateral ~~JACQ~~ JAQC is a rectangle but not a square.

A(8,0) Q(6,3)



1) JAQC is a rectangle because it has 2 pairs of opposite sides congruent and diagonals congruent. It is not a square because not all sides are congruent.

2) $d\overline{JC} = \sqrt{2^2+3^2} = \sqrt{4+9} = \sqrt{13}$

$d\overline{AQ} = \sqrt{2^2+3^2} = \sqrt{4+9} = \sqrt{13}$

$d\overline{CQ} = \sqrt{6^2+4^2} = \sqrt{36+16} = \sqrt{52}$

$d\overline{JA} = \sqrt{6^2+4^2} = \sqrt{36+16} = \sqrt{52}$

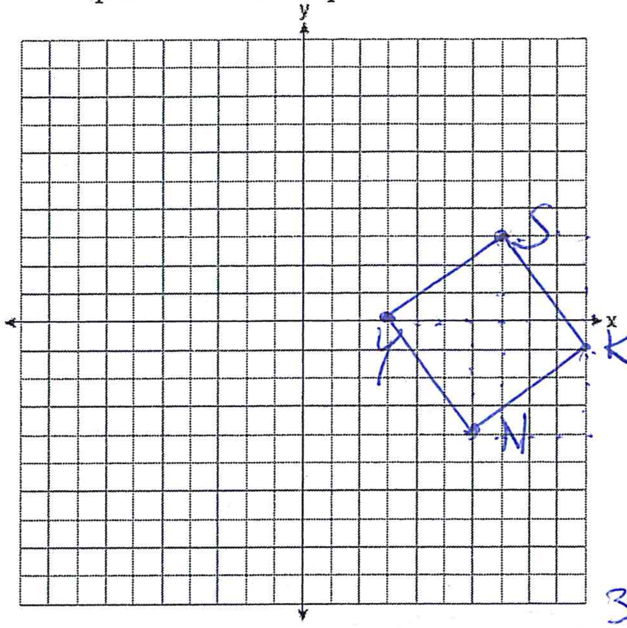
$d\overline{CA} = \sqrt{8^2+1^2} = \sqrt{64+1} = \sqrt{65}$

$d\overline{JQ} = \sqrt{4^2+7^2} = \sqrt{16+49} = \sqrt{65}$

3) $\overline{JC} \cong \overline{AQ}$, $\overline{CQ} \cong \overline{JA}$, $\overline{CA} \cong \overline{JQ}$ because they have the same distance

$\overline{CQ} \not\cong \overline{QA}$ because they don't have the same distance.

9. Quad YNKS has vertices Y(3,0) N(6,-4) K(10,-1) S(7,3).
Prove quad YNKS is a square



1) YNKS is a square because it has all sides congruent and diagonals congruent

2) $d\overline{YS} = \sqrt{4^2+3^2} = \sqrt{16+9} = \sqrt{25}$

$d\overline{SK} = \sqrt{3^2+4^2} = \sqrt{9+16} = \sqrt{25}$

$d\overline{KN} = \sqrt{4^2+3^2} = \sqrt{16+9} = \sqrt{25}$

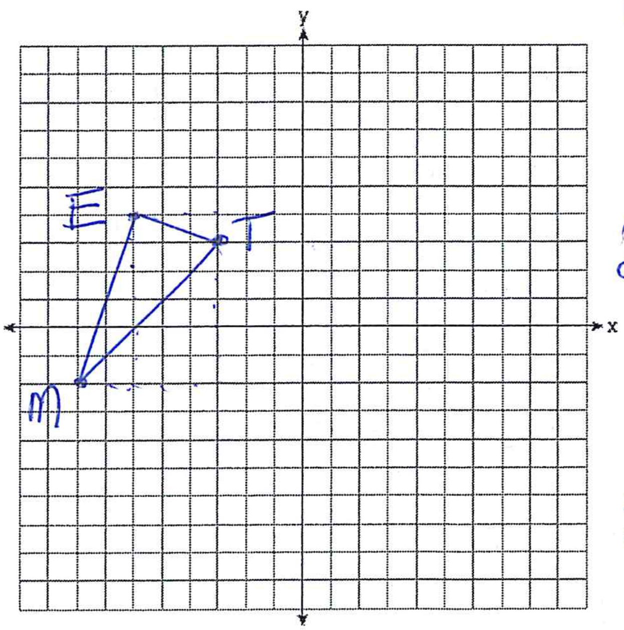
$d\overline{NY} = \sqrt{3^2+4^2} = \sqrt{9+16} = \sqrt{25}$

$d\overline{YK} = \sqrt{7^2+1^2} = \sqrt{49+1} = \sqrt{50}$

$d\overline{SN} = \sqrt{1^2+7^2} = \sqrt{1+49} = \sqrt{50}$

3) $\overline{YS} \cong \overline{SK} \cong \overline{KN} \cong \overline{NY}$ because they have the same distance.
and $\overline{YK} \cong \overline{SN}$

10. Triangle MET has vertices M(-8,-2), E(-6,4), and T(-3,3). Prove that triangle MET is a right triangle.



1) MET is a right triangle because its sides fit into Pythagolean theolem.

2) $d\overline{ME} = \sqrt{2^2+6^2} = \sqrt{4+36} = \sqrt{40}$

$d\overline{ET} = \sqrt{3^2+1^2} = \sqrt{9+1} = \sqrt{10}$

$d\overline{TM} = \sqrt{5^2+5^2} = \sqrt{25+25} = \sqrt{50}$

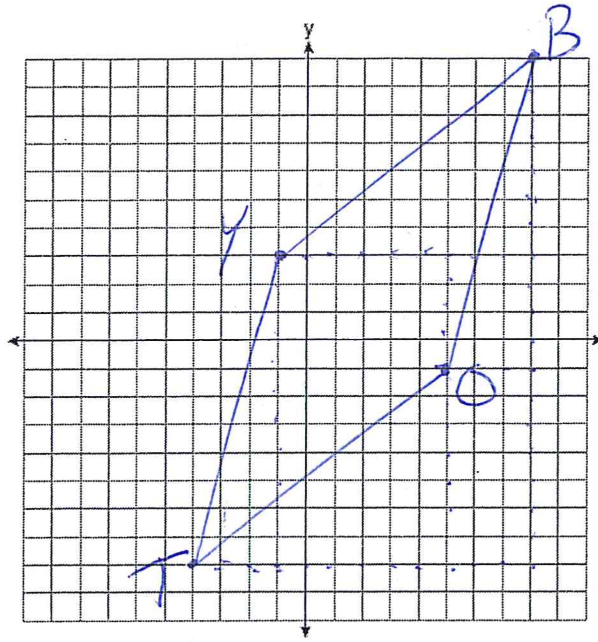
3) $a^2+b^2=c^2$

$\sqrt{40}^2+\sqrt{10}^2=\sqrt{50}^2$

$40+10=50$

$50=50$

11. Quadrilateral TOBY has vertices T(-4, -8), O(5,-1), B(8,10) and Y(-1,3). Using coordinate geometry, prove that quadrilateral TOBY is a rhombus but not a square.



1) TOBY is a rhombus because all sides are congruent. It is not a square because diagonals are not congruent.

2) $d\overline{TY} = \sqrt{3^2+11^2} = \sqrt{9+121} = \sqrt{130}$

$d\overline{YB} = \sqrt{9^2+7^2} = \sqrt{81+49} = \sqrt{130}$

$d\overline{BO} = \sqrt{3^2+11^2} = \sqrt{9+121} = \sqrt{130}$

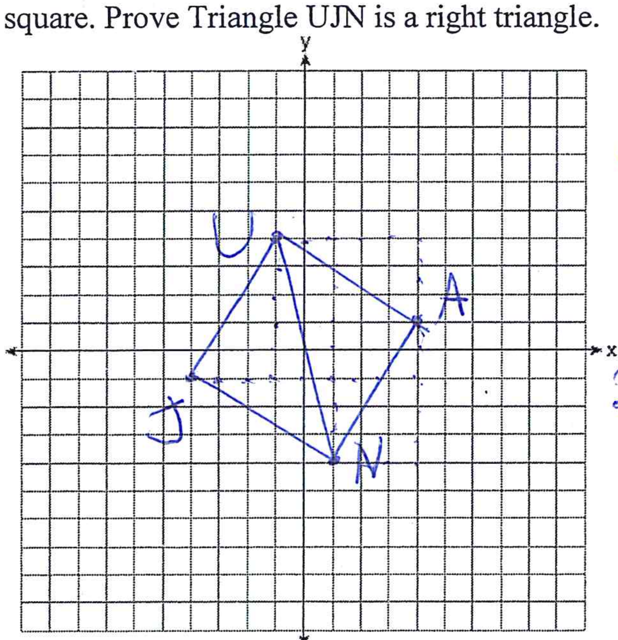
$d\overline{OT} = \sqrt{9^2+7^2} = \sqrt{81+49} = \sqrt{130}$

$d\overline{YO} = \sqrt{6^2+4^2} = \sqrt{36+16} = \sqrt{52}$

$d\overline{TB} = \sqrt{12^2+18^2} = \sqrt{144+324} = \sqrt{468}$

3) $\overline{TY} \cong \overline{YB} \cong \overline{BO} \cong \overline{OT}$ because they have the same distance.
$\overline{TB} \ncong \overline{YO}$ because they don't have the same distance.

12. Quadrilateral JUAN has vertices J(-4,-1), U(-1,4), A(4,1), and N(1,-4). Prove JUAN is a square. Prove Triangle UJN is a right triangle.



1) JUAN is a square because all sides are congruent and diagonals are congruent. Triangle UJN is a right triangle because its sides fit into Pythagorean theorem.

2) $*d\overline{JU} = \sqrt{3^2+5^2} = \sqrt{9+25} = \sqrt{34}$

$d\overline{UA} = \sqrt{5^2+3^2} = \sqrt{25+9} = \sqrt{34}$

$d\overline{AN} = \sqrt{3^2+5^2} = \sqrt{9+25} = \sqrt{34}$

$*d\overline{NJ} = \sqrt{5^2+3^2} = \sqrt{25+9} = \sqrt{34}$

$*d\overline{UN} = \sqrt{2^2+8^2} = \sqrt{4+64} = \sqrt{68}$

$d\overline{JA} = \sqrt{8^2+2^2} = \sqrt{64+4} = \sqrt{68}$

3) $\overline{JU} \cong \overline{UA} \cong \overline{AN} \cong \overline{NJ}$ ~~bec~~ and $\overline{UN} \cong \overline{JA}$ because they have the same distance.

$a^2+b^2=c^2$

$\sqrt{34}^2 + \sqrt{34}^2 = \sqrt{68}^2$

$34+34=68$

$68=68$