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Coordinate Geometry Proofs Guided Notes

To Prove:	Formula you should use:
lines are congruent, show the lengths are equal = length, distance	$D=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
segments bisect each other, show $\boxed{\text{midpoints}}$ are the same	$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
lines are parallel show slopes are = ≅ same	$m=\frac{y_2-y_1}{x_2-x_1}$ $m_1=m_2$
lines are perpendicular, show slopes are negative reciprocal $2 \cdot -\frac{1}{2}$	$m_1 \cdot m_2=-1$

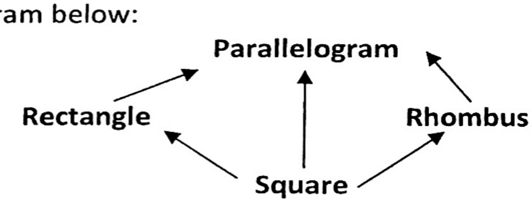
$m_1 = -\frac{1}{m_2}$

When you are completing a coordinate geometry proof:

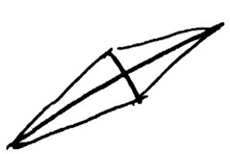
1. draw + label graph
2. State the formulas
3. Show all work
4. write a concluding statement, showing what was proven and why.

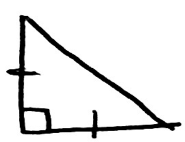
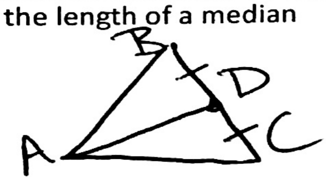
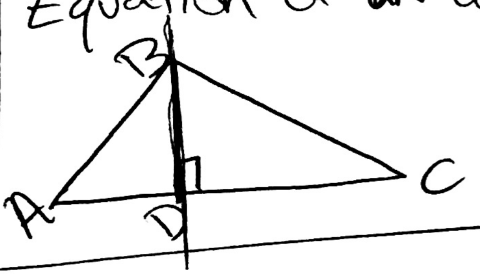
BE NEAT! If I can't follow your work, you will lose points.

Remember the diagram below:



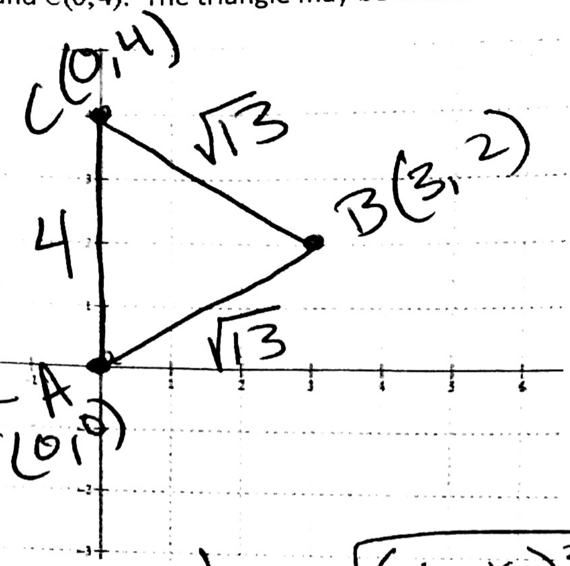
The table gives methods that can be used to prove a quad belongs to a specific category.

To prove a figure is a...	Methods:
1. Parallelogram ****	Show *one* of the following: 1. 2 pairs opp. $\parallel$ sides (4 slope) or 2. 2 pairs opp $\cong$ sides (4 distance) or 3. Diagonals bisect eachother (2 mid pt) or 4. One pair sides $\parallel$ and $\cong$ (2 slope 2 distance)
2. Rectangle	Show it is a parallelogram (see #1) and one of the following: 1. 1 rt $\angle$, show sides $\perp$ (2 slope) or 2. Diagonals are $\cong$ (2 distance)
3. Rhombus	Show it is a parallelogram (see #1) and one of the following: 1. 2 adjacent sides $\cong$ (2 distance) or 2. Diagonals are $\perp$ (2 slope)
4. Square	Show it is a *rectangle* (see #2) AND 1. 2 adjacent sides $\cong$ (2 distance) OR Show it is a *rhombus* (see # 3) AND 2. 1 rt $\angle$ (2 slopes)
5. Trapezoid	Show it has only one pair of parallel sides (2 slopes = 2 slopes $\neq$) Note: you do have to find the slope of *all 4 sides*
6. Isosceles trapezoid 	Show it is a trapezoid (see #5) and *one* of the following: 1. Show non $\parallel$ sides $\cong$ (2 distance) or 2. Diagonals are $\cong$ (2 distance)

Triangle is a right triangle	1. 1 $90°\angle$ 2 lines are $\perp$ (2 slope) OR 2. Satisfies Pythagorean thm $a^2+b^2=c^2$ (3 distance)
Triangle is isosceles	Show 2 $\cong$ sides (2 distance)
Triangle is scalene	No sides $\cong$ (3 distance)
Triangle is equilateral	3 $\cong$ sides (3 distance)
Triangle is an isosceles right triangle 	$\perp$ lines + 2 $\cong$ sides 2 sides $\cong$ + $a^2+b^2=c^2$ (3 distance)
To find the length of a median 	- Midpoint BC - Distance between A + D
Equation of an altitude 	Point + Slope $\uparrow$ B $\uparrow$ $\perp$ AC $y-y_1=m(x-x_1)$

1. Triangle *ABC* has vertices $A(0,0)$, $B(3,2)$, and $C(0,4)$. The triangle may be classified as

a. equilateral
b. isosceles
c. right
d. scalene



AC = 4

$d_{AB}=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d_{AB}=\sqrt{(0-3)^2+(0-2)^2}$

$=\sqrt{(-3)^2+(-2)^2}$

$=\sqrt{9+4}$ $=\sqrt{13}$

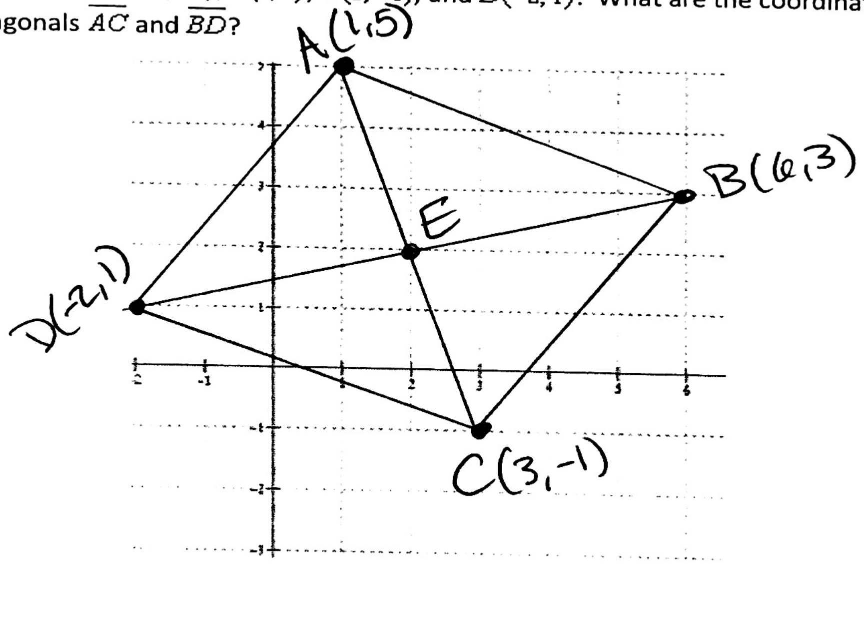
$d_{CB}=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d_{CB}=\sqrt{(3-0)^2+(2-4)^2}$

$=\sqrt{\underset{9}{3^2}+\underset{4}{(-2)^2}}$ $=\sqrt{13}$

2. Parallelogram *ABCD* has coordinates $A(1,5)$, $B(6,3)$, $C(3,-1)$, and $D(-2,1)$. What are the coordinates of *E*, the intersection of diagonals $\overline{AC}$ and $\overline{BD}$?

a. (2,2)
b. (4.5, 1)
c. (3.5, 2)
d. (-1, 3)



Midpt AC

$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

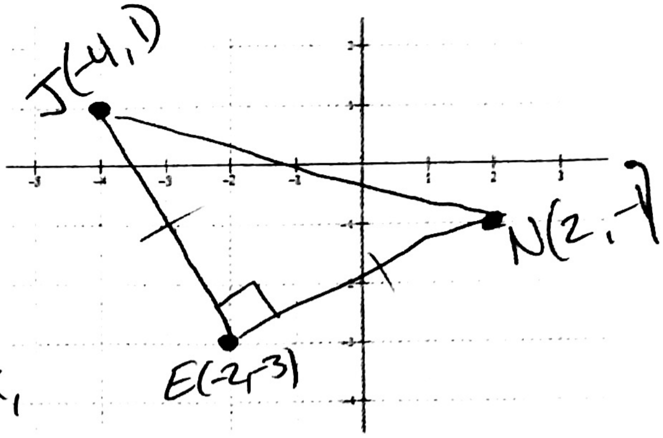
$\left(\frac{1+3}{2}, \quad \right)$

Midpt BD

3. Given: J(-4,1), E(-2,-3), N(2,-1)
Prove: triangle JEN is an isosceles right triangle.

2 ≅ sides

1 rt ∠



$M_{JE} = \frac{Y_2 - Y_1}{X_2 - X_1}$

$M_{EN} = \frac{Y_2 - Y_1}{X_2 - X_1}$

$\boxed{M_{JE} = -2}$

$\boxed{M_{EN} = \frac{1}{2}}$

$JE \perp EN$

∠E is a rt ∠

$d_{JE} = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

$= 2.82 = \sqrt{20}$

$\sqrt{4 \cdot 5}$

$2\sqrt{5}$

$d_{EN} = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

$= \sqrt{20} = 2.82$

$2\sqrt{5}$

∠E is a rt ∠.
Ad $\overline{JE} \cong \overline{NE}$

∴ therefore JEN is an isosceles rt △.