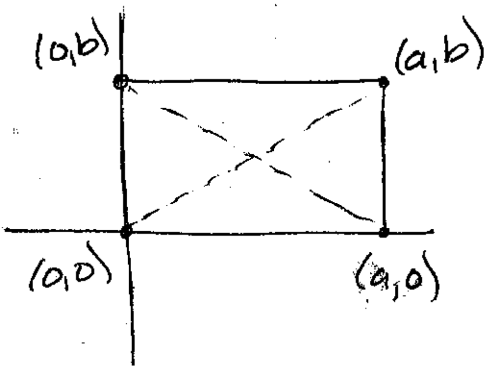
Advanced Geometry Partner Problems Name *Key*

COORDINATE PROOFS Date ___________ Block __________

Use coordinate geometry to prove each statement. Draw a figure and choose convenient axes and coordinates!!

1. The diagonals for a rectangle are congruent.

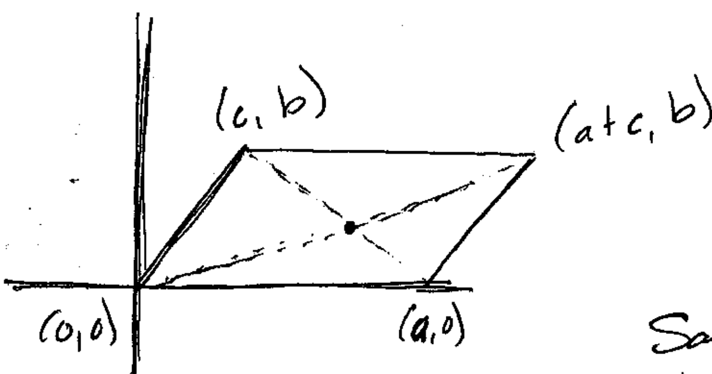


$$d = \sqrt{(a-0)^2 + (b-0)^2} = \sqrt{a^2 + b^2}$$

$$d = \sqrt{(a-0)^2 + (0-b)^2} = \sqrt{a^2 + b^2}$$

distances are $\cong$.

2. The diagonals of a parallelogram bisect each other.

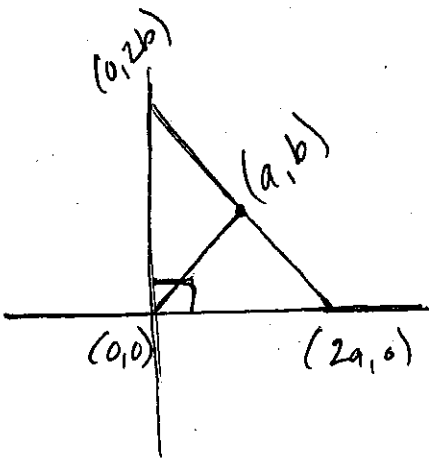


$$\text{Midpt} = \left(\frac{a+c+0}{2}, \frac{b+0}{2}\right) = \left(\frac{a+c}{2}, \frac{b}{2}\right)$$

$$\text{Midpt} = \left(\frac{a+c}{2}, \frac{b+0}{2}\right) = \left(\frac{a+c}{2}, \frac{b}{2}\right)$$

Same midpt which means they bisect each other

3. The length of the median to the hypotenuse of a right triangle is half the length of the hypotenuse.



$$d = \sqrt{(a-0)^2 + (b-0)^2} = \sqrt{a^2 + b^2}$$

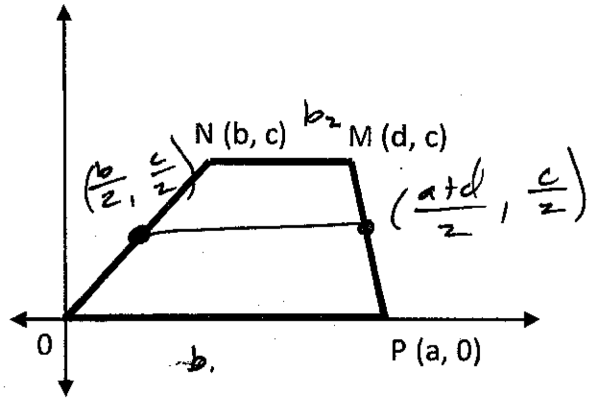
$$d = \sqrt{(2a-0)^2 + (0-2b)^2}$$

$$\sqrt{4a^2 + 4b^2}$$

$$\sqrt{4(a^2 + b^2)}$$

$$= 2\sqrt{a^2 + b^2}$$

For problems 4 and 5, refer to trapezoid *MNOP*.



4. Prove that the median of a trapezoid is parallel to the bases. (The *median* of a trapezoid connects the *midpoints* of the two *non-parallel* sides)

$$m b_1 = \frac{0-0}{a-0} = \frac{0}{a} = 0$$

All slopes = 0

$$m b_2 = \frac{c-c}{d-b} = \frac{0}{d-b} = 0$$

$$m = \frac{\frac{c}{2} - \frac{c}{2}}{\frac{a+d}{2} - \frac{b}{2}} = \frac{0}{\frac{a+d-b}{2}} = 0$$

5. Prove that the median of a trapezoid has a length equal to the *average* of the base lengths.

$$d = \sqrt{\left(\frac{c}{2} - \frac{c}{2}\right)^2 + \left(\frac{a+d}{2} - \frac{b}{2}\right)^2}$$

$$= \sqrt{\left(\frac{a+d-b}{2}\right)^2} = \sqrt{\frac{(a+d-b)^2}{4}} = \frac{1}{2}\sqrt{(a+d-b)^2}$$

$$= \tfrac{1}{2}(a+d-b)$$

$$d = \sqrt{(c-c)^2 + (d-b)^2} = \sqrt{(d-b)^2} = d-b$$

$$d = \sqrt{(a-0)^2 + (0-0)^2} = \sqrt{a^2} = a$$

$$\text{average} = \frac{a+d-b}{2} = \tfrac{1}{2}(a+d-b)$$