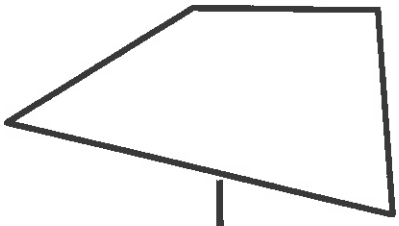
Geometry R – Mr. Bo
Unit 7 – Day 3 Notes

Name Notes
Date

Proving Parallelograms

Quadrilateral – Polygon with 4 sides



main property - try to use this property first

Parallelogram – Quad with opp sides parallel

- Quad with opposite sides ≅
- Quad with opposite angles ≅
- Quad with diagonals that bisect each other
- Quad with 1 pairs sides // and ≅

other options if the main property doesn't work

use First

Rectangle – Quad with 4 ≅ (or right) angles

other options

- **//-ogram** with 1 right angle
- **//-ogram** with ≅ diagonals

use First

Rhombus – Quad with 4 ≅ sides

- **//-ogram** with ⊥ diagonals
- **//-ogram** with diagonals that bisect the angles

other options

use First

Square – Quad with 4 ≅ sides and 4 ≅ (or right) angles

- **Rhombus** with ≅ diagonals
- **Rectangle** with ⊥ diagonals
- **Rectangle** with diagonals that bisect the angles

other options

1-2-1 Proof Activity

Complete 1 proof with your group, 2 with your partner, and 1 alone.

2-column/Flow/Paragraph Proofs:

1. Given: $\overline{AB} \parallel \overline{CD}$

E is the midpoint of $\overline{BD}$

Prove: ABCD is a Parallelogram

ASA

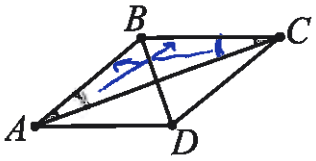
(AAS also works)

S	R
① $\overline{AB} \parallel \overline{CD}$	① Given
② E midpt of $\overline{BD}$	② midpt ÷ seg. into 2 ≅ segs.
③ $\overline{BE} \cong \overline{DE}$	③ ∥ lines cut by trans make alt. int. ∠'s ≅
④ $\angle ABE \cong \angle CDE$	④ vert. ∠'s are ≅
⑤ $\angle BAE \cong \angle DCE$	⑤ ASA.
⑥ $\overline{BA} \cong \overline{DC}$	⑥ CPCTC
⑦ ABCD is a ∥-ogram	⑦ A Quad. w/ 1 pair sides ≅ + ∥ is a ∥-ogram.

2. Given: Parallelogram ABCD

$\angle BAC \cong \angle BCA$

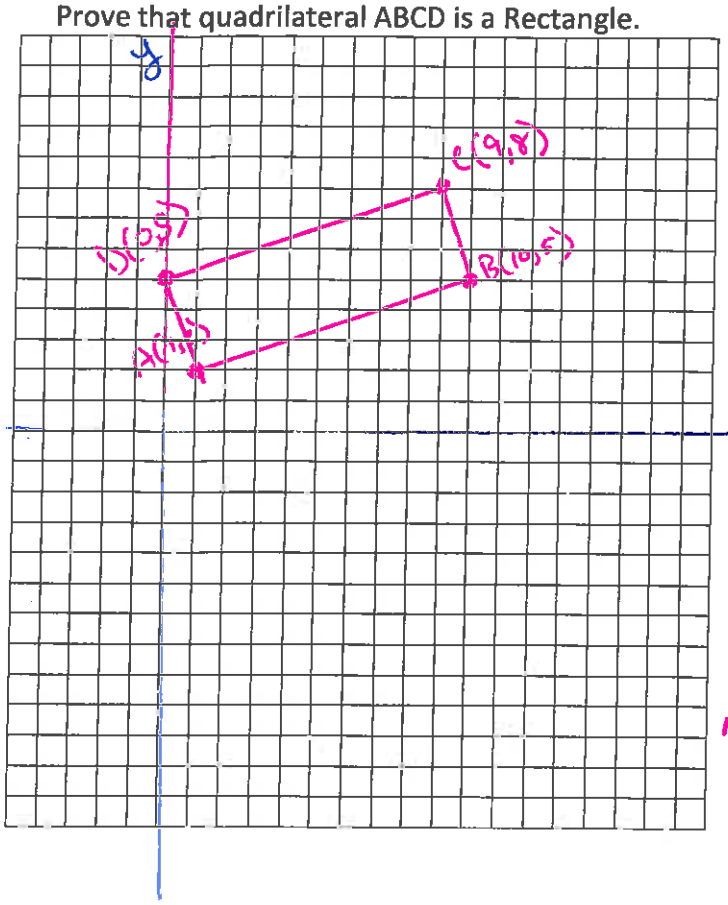
Prove: ABCD is a Rhombus



S	R
① ∥-ogram ABCD $\angle BAC \cong \angle BCA$	① Given
② $\overline{AB} \cong \overline{CB}$	② in a △, sides opp. ≅ ∠'s are ≅.
③ $\overline{AB} \cong \overline{CD}$ $\overline{BC} \cong \overline{AD}$	③ in a ∥-ogram the opp. sides are ≅.
④ $\overline{CB} \cong \overline{CD}$ $\overline{AB} \cong \overline{AD}$ ($\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{DA}$)	④ transitive
⑤ Rhombus ABCD	⑤ A Quad w/ 4 ≅ sides is a Rhombus

Coordinate Geometry Proofs (Use Distance, Midpoint, & Slope formulas):

3. The vertices of quadrilateral ABCD are A(1,2), B(10,5), C(9,8) and D(0,5).
Prove that quadrilateral ABCD is a Rectangle.



Slope $\overline{AD} = \frac{5-2}{0-1} = \frac{3}{-1}$

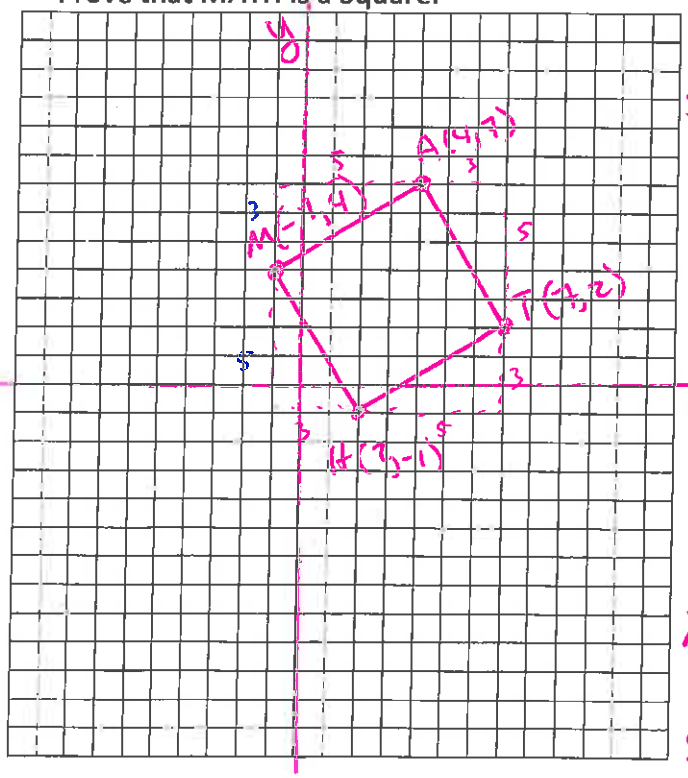
Slope $\overline{DC} = \frac{8-5}{9-0} = \frac{3}{9} = \frac{1}{3}$

Slope $\overline{CB} = \frac{8-5}{9-10} = \frac{3}{-1}$

Slope $\overline{AB} = \frac{5-2}{10-1} = \frac{3}{9} = \frac{1}{3}$

$\overline{AD} \perp \overline{DC}$, $\overline{DC} \perp \overline{BC}$, $\overline{BC} \perp \overline{AB}$ and $\overline{AB} \perp \overline{AD}$ because the slopes are negative reciprocals.
So, $\angle A, \angle B, \angle C, \angle D$ are all Rt $\angle$'s
Because $\perp$ lines make Rt $\angle$'s.
ABCD is a rectangle because it is a Quad w/ 4 Rt $\angle$'s.

4. Quadrilateral MATH has vertices M(-1,4), A(4,7), T(7,2), and H(2,-1).
Prove that MATH is a Square.



Slope $\overline{MA} = \frac{7-4}{4--1} = \frac{3}{5}$

Slope $\overline{AT} = \frac{7-2}{4-7} = \frac{5}{-3}$

Slope $\overline{TH} = \frac{2--1}{7-2} = \frac{3}{5}$

Slope $\overline{MH} = \frac{4--1}{-1-2} = \frac{5}{-3}$

$MA = \sqrt{3^2+5^2} = \sqrt{24}$

$AT = \sqrt{3^2+5^2} = \sqrt{24}$

$TH = \sqrt{3^2+5^2} = \sqrt{24}$

$MH = \sqrt{3^2+5^2} = \sqrt{24}$

$\overline{MA} \perp \overline{AT}$, $\overline{AT} \perp \overline{TH}$, $\overline{TH} \perp \overline{MH}$, $\overline{MH} \perp \overline{MA}$ because neg. recip. Slopes.
So, $\angle M, \angle A, \angle T, \angle H$ are all Rt.
$\overline{MA} \cong \overline{AT} \cong \overline{TH} \cong \overline{MH}$ because their length are all $\sqrt{24}$.
So, MATH is a Square because it has 4 $\cong$ sides and 4 Rt $\angle$'s.