CLASSIFYING QUADRILATERALS

Section 4.2
Quadrilateral

• Any shape with 4 sides and 4 angles
• A quadrilateral is classified by how many pairs of parallel sides it has.

• Note: Any quadrilaterals that do not fit any of these 7 types are just considered, quadrilaterals.
2 Pairs of Parallel Sides

- **Parallelogram:**
  - A quadrilateral that has 2 pairs of parallel sides and opposite angles congruent.
2 Pairs of Parallel Sides

- **Rectangle:**
  - A parallelogram with 4 right angles.
2 Pairs of Parallel Sides

• **Rhombus**
  • A parallelogram that has 4 equal sides
2 Pairs of Parallel Sides

**Square**
- A parallelogram that has 4 right angles and 4 equal sides
1 Pair of Parallel Sides

- **Trapezoid**
  - A quadrilateral with exactly 1 pair of parallel sides
1 Pair of Parallel Sides

- **Isosceles Trapezoid**
  - A trapezoid with the non-parallel sides that are congruent
NO Pairs of Parallel Sides

- **Kite**
  - A quadrilateral with 2 pairs of adjacent sides congruent and no opposite sides congruent
Classifying Quadrilaterals

- Example: Classify the quadrilateral in as many ways as possible.

Square
Rhombus
Rectangle
Parallelogram

Most precisely: Square
Classifying Quadrilaterals

• Example: Determine the most precise name for the quadrilateral

[Diagram showing a quadrilateral with labeled vertices W, X, Y, Z and the word "rhombus" written next to it.]
Using Properties of Quadrilaterals

- Example: Find the values of the variables. Then find the length of the sides.

Isosceles Trapezoid

\[ AD \cong BC \]

\[ 3x - 4 = 2x - 1 \]

\[ x = 3 \]

\[ AD = BC = 2(3) - 1 = 5 \]

\[ AB = 2 \]

\[ DC = 5 \]
Using Properties of Quadrilaterals

Example: Find the values of the variables. Then find the length of the sides.

Rhombus

\[ AD = AB = BC = DC = 10 \]

\[ 5x + 9x + 26 = 180 \]

\[ 14x + 26 = 180 \]

\[ 14x = 154 \]

\[ x = 11 \]

\[ y = 3y - 20 \]

\[ -2y = 20 \]

\[ y = 10 \]

\[ 3r + 1 = 10 \]

\[ 3r = 9 \]

\[ r = 3 \]
Review

• How do we find the length of a line between 2 points on a graph?

   Distance formula: \( d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \)

• How do we find slope of lines?

   \[ m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2} \]
Graphing and Classifying Quadrilaterals

• We will be graphing coordinates of a quadrilateral and use the properties of quadrilaterals to classify each.

• We will be using the distances of lines to find congruent sides and the slopes of the lines to find parallel sides.

To determine rectangle or square:

Look for perpendicular slopes:

\[
\left( \frac{2}{3} \right) \perp - \frac{3}{2}
\]
Example: Graph and label each quadrilateral with the given vertices. Then determine and justify the most precise name for each quadrilateral.

Q(1, 2)  R(3, 3)  S(5, 2)  T(3, 1)

QR = RS = ST = QT
\[ m_{QR} = \frac{1}{2} \quad m_{RS} = \frac{1}{2} \]
\[ m_{RS} = -\frac{1}{2} \quad m_{QT} = -\frac{1}{2} \]

\[ d_{QR} = \sqrt{\left(\frac{1-3}{2}\right)^2 + (2-3)^2} = \sqrt{4+1} = \sqrt{5} \]
\[ d_{RS} = \sqrt{2^2 + 1^2} = \sqrt{5} \]
\[ d_{ST} = \sqrt{2^2 + 1^2} = \sqrt{5} \]
\[ d_{QT} = \sqrt{2^2 + 1^2} = \sqrt{5} \]

Rhombus