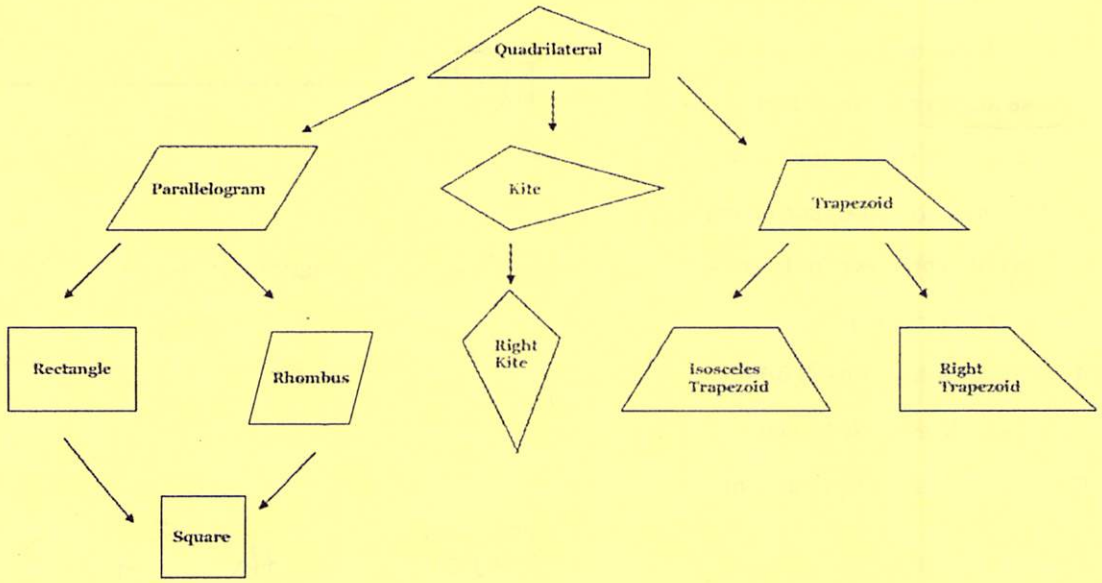
Exploring Properties of Quadrilaterals

e the Geometer's Sketchpad document to explore the properties of the quadrilaterals. If you are unsure how to measure the angles, segments etc. refer to the glossary at the end of the packet. Check off each property that is true for the indicated quadrilateral. Then mark the picture.

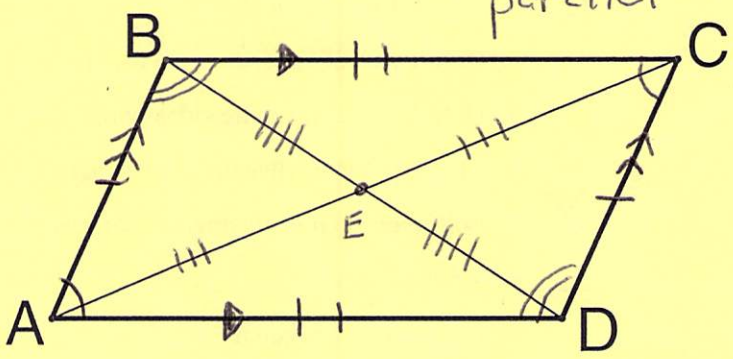
Keep the following in mind:

> For a quadrilateral to have a specific property, the property must be true for every configuration of that quadrilateral.



Parallelogram

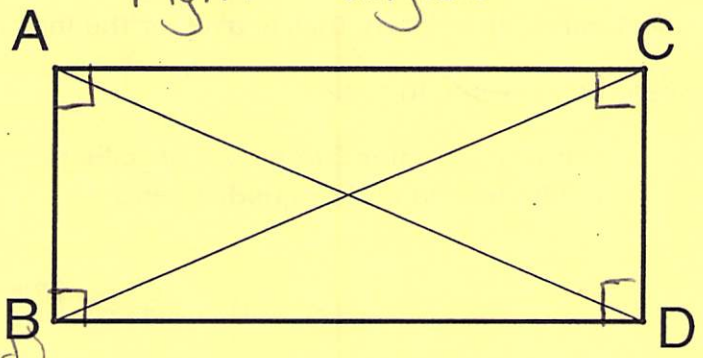
A Quad with both pair of opposite sides parallel



- X 1. Both pair of opposite sides congruent
- X 2. Both pair of opposite sides parallel
- _____ 3. All 4 sides congruent
- _____ 4. Only 1 pair of opposite sides congruent
- _____ 5. Only 1 pair of opposite sides parallel
- _____ 6. Only 2 pairs of adjacent sides congruent
- X 7. Both pair of opposite angles congruent
- _____ 8. 4 right angles
- _____ 9. Base angles are congruent
- X 10. All pairs of consecutive angles supplementary
- _____ 11. Diagonals bisect opposite angles
- X 12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles
- _____ 13. Diagonals are congruent
- X 14. Diagonals bisect each other
- _____ 15. Only 1 diagonal is bisected
- _____ 16. Diagonals are perpendicular

Rectangle

Quad with 4 right angles



P X 1. Both pair of opposite sides congruent

P X 2. Both pair of opposite sides parallel

_____ 3. All 4 sides congruent

_____ 4. Only 1 pair of opposite sides congruent

_____ 5. Only 1 pair of opposite sides parallel

_____ 6. Only 2 pairs of adjacent sides congruent

P X 7. Both pair of opposite angles congruent

X 8. 4 right angles

_____ 9. Base angles are congruent (Trapezoid)

P X 10. All pairs of consecutive angles supplementary

_____ 11. Diagonals bisect opposite angles

P X 12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles

X 13. Diagonals are congruent

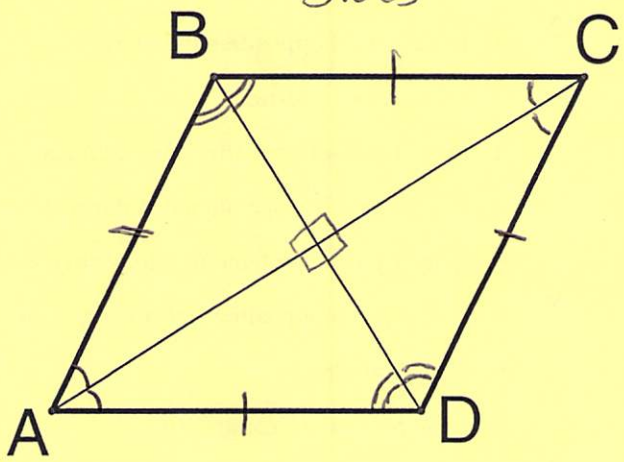
P X 14. Diagonals bisect each other

_____ 15. Only 1 diagonal is bisected

_____ 16. Diagonals are perpendicular

Rhombus

Quad with 4 $\cong$ Sides



P X 1. Both pair of opposite sides congruent ✓

P X 2. Both pair of opposite sides parallel ✓

X 3. All 4 sides congruent ✓

_____ 4. Only 1 pair of opposite sides congruent

_____ 5. Only 1 pair of opposite sides parallel

_____ 6. Only 2 pairs of adjacent sides congruent

P X 7. Both pair of opposite angles congruent ✓

_____ 8. 4 right angles

_____ 9. Base angles are congruent

P X 10. All pairs of consecutive angles supplementary

X 11. Diagonals bisect opposite angles

P X 12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles ✓

_____ 13. Diagonals are congruent

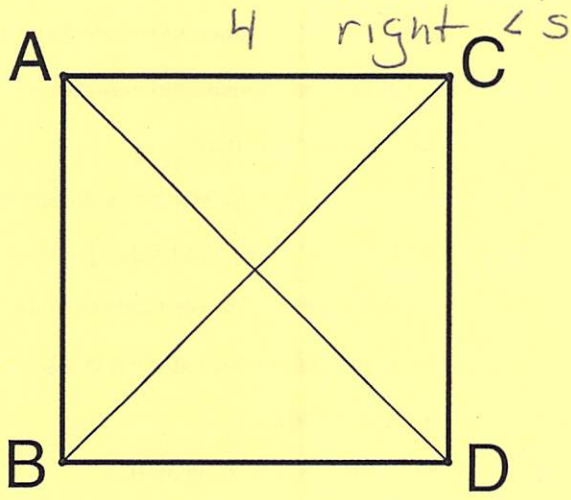
P X 14. Diagonals bisect each other ✓

_____ 15. Only 1 diagonal is bisected

X 16. Diagonals are perpendicular *

Square

Quad 4 ≅ sides and 4 right ∠'s



P X 1. Both pair of opposite sides congruent

P X 2. Both pair of opposite sides parallel

Rh X 3. All 4 sides congruent

_____ 4. Only 1 pair of opposite sides congruent

_____ 5. Only 1 pair of opposite sides parallel

_____ 6. Only 2 pairs of adjacent sides congruent

P X 7. Both pair of opposite angles congruent

Re X 8. 4 right angles

_____ 9. Base angles are congruent (Trapezoid)

P X 10. All pairs of consecutive angles supplementary

Rh X 11. Diagonals bisect opposite angles

P X 12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles

Re X 13. Diagonals are congruent

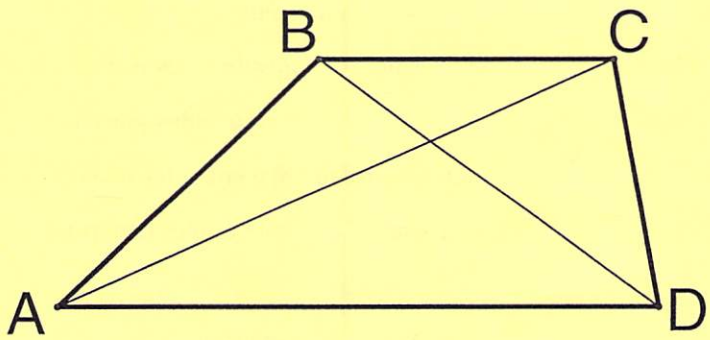
P X 14. Diagonals bisect each other

_____ 15. Only 1 diagonal is bisected

Rh X 16. Diagonals are perpendicular

Trapezoid

Quad w/ exactly 1 Pair of Parallel Sides



_____ 1. Both pair of opposite sides congruent

_____ 2. Both pair of opposite sides parallel

_____ 3. All 4 sides congruent

_____ 4. Only 1 pair of opposite sides congruent

X 5. Only 1 pair of opposite sides parallel

_____ 6. Only 2 pairs of adjacent sides congruent

_____ 7. Both pair of opposite angles congruent

_____ 8. 4 right angles

_____ 9. Base angles are congruent

_____ 10. All pairs of consecutive angles supplementary

_____ 11. Diagonals bisect opposite angles

_____ 12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles

_____ 13. Diagonals are congruent

_____ 14. Diagonals bisect each other

_____ 15. Only 1 diagonal is bisected

_____ 16. Diagonals are perpendicular

Isosceles Trapezoid

Trapezoid whose non-|| opp. sides are ≅

_____1. Both pair of opposite sides congruent

_____2. Both pair of opposite sides parallel

_____3. All 4 sides congruent

X 4. Only 1 pair of opposite sides congruent (Non-Parallel)

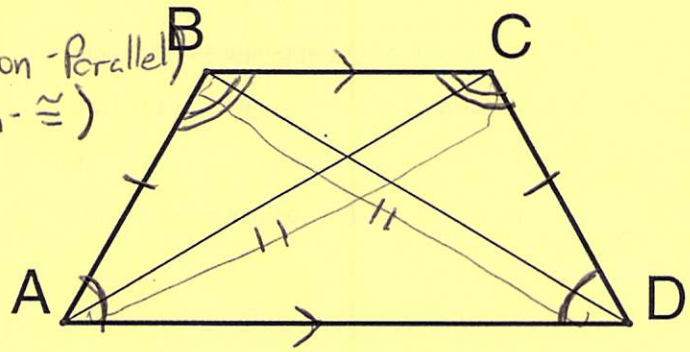
X 5. Only 1 pair of opposite sides parallel (Non-≅)

_____6. Only 2 pairs of adjacent sides congruent

_____7. Both pair of opposite angles congruent

_____8. 4 right angles

X 9. Base angles are congruent



_____10. All pairs of consecutive angles supplementary

_____11. Diagonals bisect opposite angles

_____12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles

X 13. Diagonals are congruent

_____14. Diagonals bisect each other

_____15. Only 1 diagonal is bisected

_____16. Diagonals are perpendicular

Kite

_____1. Both pair of opposite sides congruent

_____2. Both pair of opposite sides parallel

_____3. All 4 sides congruent

_____4. Only 1 pair of opposite sides congruent

_____5. Only 1 pair of opposite sides parallel

X 6. Only 2 pairs of adjacent sides congruent

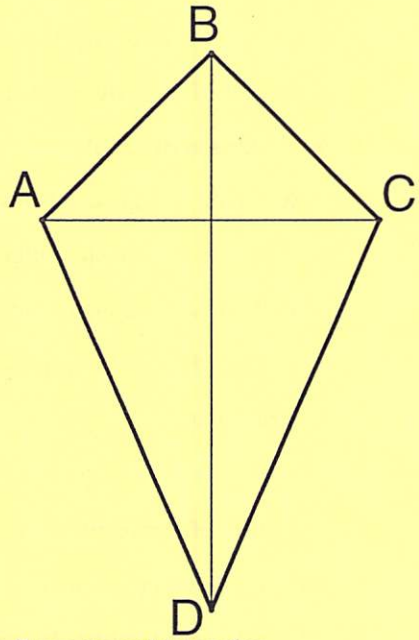
_____7. Both pair of opposite angles congruent

_____8. 4 right angles

_____9. Base angles are congruent

_____10. All pairs of consecutive angles supplementary

_____11. Diagonals bisect opposite angles



_____12. Each diagonal (when drawn separately) divides quad into 2 congruent triangles

_____13. Diagonals are congruent

_____14. Diagonals bisect each other

X 15. Only 1 diagonal is bisected

X 16. Diagonals are perpendicular

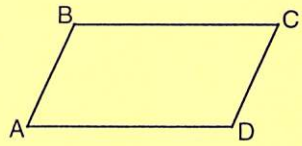
Quad w/ 2 pair of adjacent sides ≅ but no pair of opp. sides ≅

Glossary of Geometers Sketchpad How To...

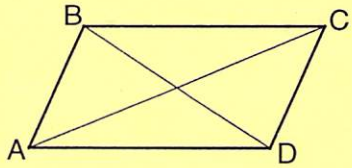
1. Calculate the length of a segment:
   - Click and Highlight just the segment
   - From the **Measure** menu select **Length**

2. Calculate the slope of a segment:
   - Click and Highlight just the segment
   - From the **Measure** menu select **Slope**

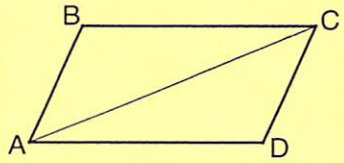
3. Measure an angle (ex. $\angle BAD$):
   - Click and Highlight in order B, then A, then D, making sure the middle point is the vertex of the angle
   - From the **Measure** menu select **Angle**



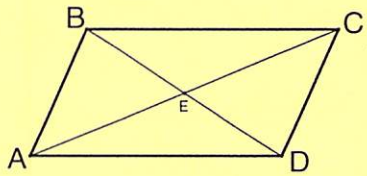
4. Determine if Diagonals Bisect Opposite Angles:
   - Draw in diagonals $\overline{AC}$ and $\overline{BD}$
   - Determine if $\angle BAC \cong \angle DAC$
   - Repeat for other 3 pairs of angles.



5. Determine if Diagonals divide Quad into 2 Congruent Triangles:
   - Draw in diagonal $\overline{AC}$
   - Measure segments/angles of ΔABC and ΔADC to determine if triangles are congruent by one of the following: SSS, SAS, AAS, ASA, or HL
   - Repeat with triangles formed by drawing diagonal $\overline{BD}$



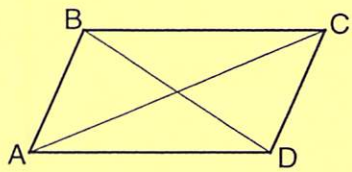
6. Determine if Diagonals Bisect Each other:
   - Draw in diagonals $\overline{AC}$ and $\overline{BD}$ with intersection point E
   - Determine if $\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$



OR

   - Draw in diagonal $\overline{AC}$
   - Click and Highlight $\overline{AC}$. From the **Construct** menu, select **Midpoint**
   - Click and Highlight just Midpoint. From **Measure** menu, select **Coordinates**
   - Repeat with diagonal $\overline{BD}$ to see if both diagonals have the same midpoint

7. Determine if Diagonals are Perpendicular
   - Draw in diagonals $\overline{AC}$ and $\overline{BD}$
   - Calculate slope of each diagonal
   - From the **Measure** menu select **Calculate**
   - Click to Calculate (slope $\overline{AC}$) • (slope $\overline{BD}$)
     If the product is equal to -1, the diagonals are perpendicular



Summary

ıce a checkmark in the box if the quadrilateral has that numbered property

Properties:

1. Both pair of opposite sides congruent
2. Both pair of opposite sides parallel
3. All 4 sides congruent
4. Only 1 pair of opposite sides congruent
5. Only 1 pair of opposite sides parallel
6. Only 2 pairs of adjacent sides congruent
7. Both pair of opposite angles congruent
8. 4 right angles
9. Base angles are congruent
10. All pairs of consecutive angles supplementary
11. Diagonals bisect opposite angles
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15. Only 1 diagonal is bisected
16. Diagonals are perpendicular

Quadrilateral	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Parallelogram	X	X					X			X		X		X		
Rectangle	X	X					X	X		X		X	X	X		
Rhombus	X	X	X				X			X	X	X		X		X
Square	X	X	X				X	X		X	X	X	X	X		X
Trapezoid					X											
Isosceles Trapezoid				X	X				X				X			
te						X									X	X