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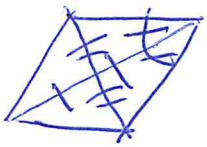
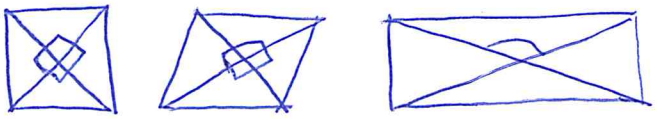
Date _____
Geometry

Quadrilateral Properties Review Sheet

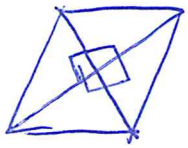
1. Which quadrilateral has diagonals that always bisect its angles and also bisect each other?
1) rhombus
2) rectangle
3) parallelogram
4) isosceles trapezoid



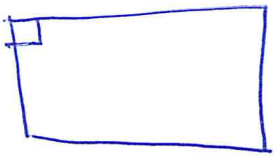
2. Given three distinct quadrilaterals, a square, a rectangle, and a rhombus, which quadrilaterals must have perpendicular diagonals?
1) the rhombus, only
2) the rectangle and the square
3) the rhombus and the square
4) the rectangle, the rhombus, and the square



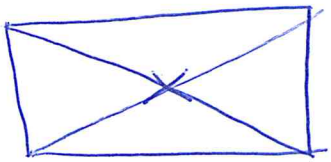
3. A parallelogram must be a rhombus when its
1) Diagonals are congruent.
2) Opposite sides are parallel.
3) Diagonals are perpendicular.
4) Opposite angles are congruent.



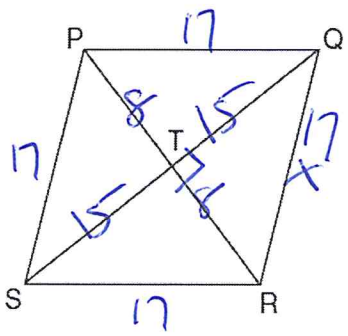
4. A parallelogram must be a rectangle when its
1) consecutive sides are congruent
2) opposite angles are congruent
3) consecutive sides are perpendicular
4) opposite sides are parallel



5. A parallelogram must be a rectangle when its
1) diagonals are perpendicular
2) diagonals are congruent
3) opposite sides are parallel
4) opposite sides are congruent



6. In the diagram of rhombus $PQRS$ below, the diagonals $\overline{PR}$ and $\overline{QS}$ intersect at point T, $PR = 16$, and $QS = 30$. Determine and state the perimeter of $PQRS$.

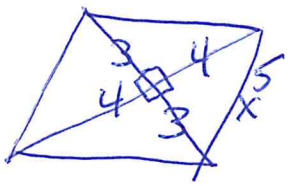


$a^2+b^2=c^2$
$8^2+15^2=x^2$
$64+225=x^2$
$\sqrt{289}=\sqrt{x^2}$
$17=x$

17(4)
68

- cut the diagonals in half since they bisect each other
- there are right angles since the diagonals are perpendicular
- all sides of the rhombus are congruent.

7. A rhombus has diagonals that measure 6 and 8. Find the perimeter of the rhombus.

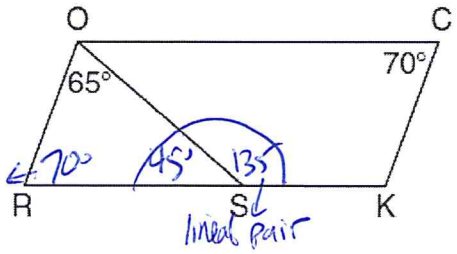


$a^2+b^2=c^2$
$3^2+4^2=x^2$
$9+16=x^2$
$\sqrt{25}=\sqrt{x^2}$
$5=x$

5(4)=20

8. In the diagram below of parallelogram $ROCK$, $m\angle C$ is 70° and $m\angle ROS$ is 65°. What is $m\angle KSO$?

1) 45°
2) 110°
3) 115°
4) 135°

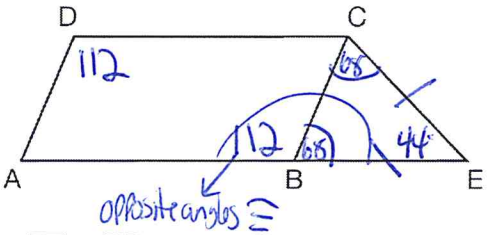


opposite angles ≅

linear pair

ΔROS
$70+65+x=180$
$135+x=180$
$-135 \quad -135$
$x=45$

9. In the diagram below, $ABCD$ is a parallelogram, $\overline{AB}$ is extended through B to E, and $\overline{CE}$ is drawn.



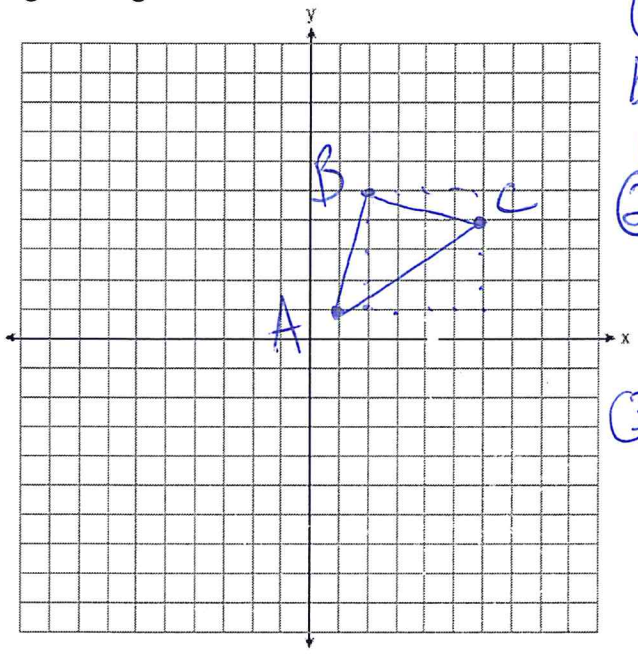
opposite angles ≅

ΔBCE
$68+68+x=180$
$136+x=180$
$-136 \quad -136$
$x=44$

If $\overline{CE} \cong \overline{BE}$ and $m\angle D = 112°$, what is $m\angle E$?

$d = \sqrt{\Delta x^2 + \Delta y^2}$ $\quad m = \frac{\Delta y}{\Delta x}$

10. Triangle ABC has vertices A(1,1), B(2,5), and C(6,4). Prove that triangle ABC is an isosceles right triangle.



① $\triangle ABC$ is an isosceles right triangle because it has two congruent sides and its sides fit into Pythagorean Theorem.

② $d\overline{AB} = \sqrt{1^2+4^2} = \sqrt{1+16} = \sqrt{17}$

$d\overline{BC} = \sqrt{4^2+1^2} = \sqrt{16+1} = \sqrt{17}$

$d\overline{AC} = \sqrt{5^2+3^2} = \sqrt{25+9} = \sqrt{34}$

③ $\overline{AB} \cong \overline{BC}$ because they have the same distance.

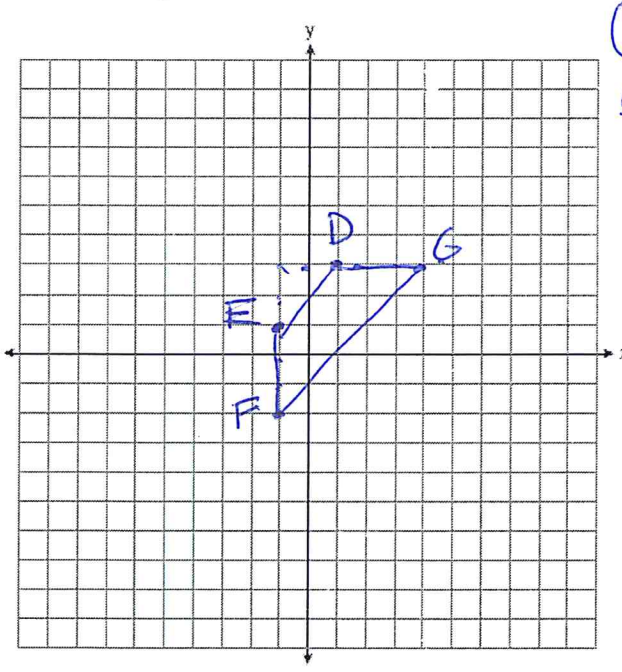
$a^2+b^2=c^2$

$\sqrt{17}^2+\sqrt{17}^2=\sqrt{34}^2$

$17+17=34$

$34=34$ ✓

11. Quadrilateral DEFG has vertices D(1,3) E(-1,1) F(-1,-2) G(4,3). Prove that DEFG is an isosceles trapezoid.



① DEFG is an isosceles trapezoid because it has 1 pair of opposite sides $\parallel$, 1 pair of opposite sides $\not\parallel$, and congruent legs.

② slope $\overline{ED} = \frac{2}{2} = 1$

slope $\overline{FG} = \frac{5}{5} = 1$

slope $\overline{EF} = \frac{3}{0} =$ No slope

slope $\overline{DG} = \frac{0}{3} = 0$

$d\overline{EF} = 3$

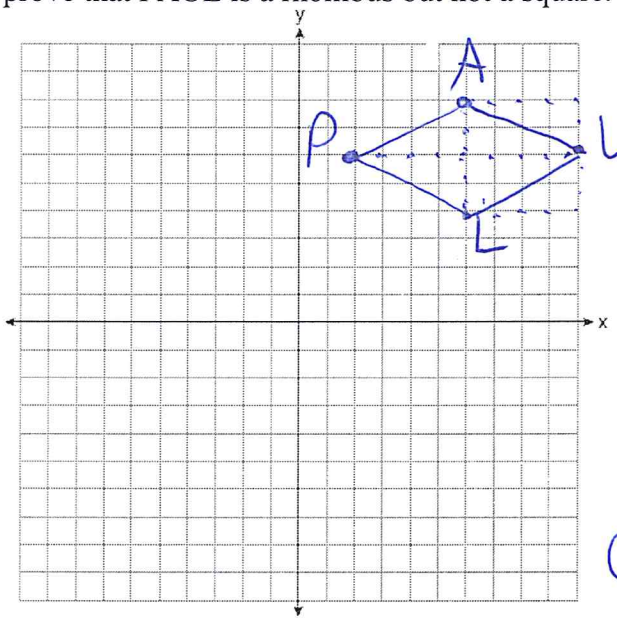
$d\overline{DG} = 3$

③ $\overline{ED} \parallel \overline{FG}$ because they have the same slope.

$\overline{EF} \not\parallel \overline{DG}$ because they don't have the same slope.

$\overline{EF} \cong \overline{DG}$ because they have the same distance

12. Rhombus PAUL has vertices P(2,6) A(6,8), U(10,6), and L(6,4). Using coordinate geometry, prove that PAUL is a rhombus but not a square.

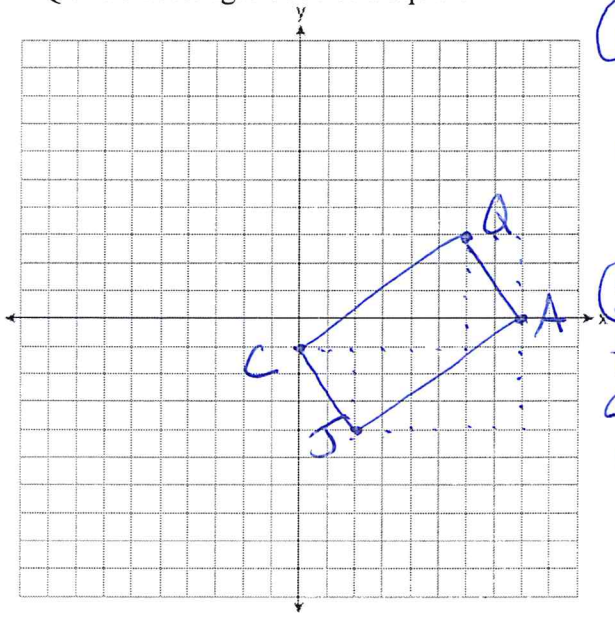


① PAUL is a rhombus because it has all sides congruent. It is not a square because the diagonals are not congruent.

② $d\overline{PA} = \sqrt{4^2+2^2}$
$d\overline{AU} = \sqrt{4^2+2^2}$
$d\overline{UL} = \sqrt{4^2+2^2}$
$d\overline{LP} = \sqrt{4^2+2^2}$
$d\overline{PU} = 8$
$d\overline{AL} = 4$

③ $\overline{PA} \cong \overline{AU} \cong \overline{UL} \cong \overline{LP}$ because they have the same distance.
$\overline{PU} \ncong \overline{AL}$ because they don't have the same distance.

13. Quadrilateral JAQC has vertices J(2,-4), A(8,0), C(0,-1), and Q(6,3). Prove that quadrilateral JAQC is a rectangle but not a square.



① JAQC is a rectangle because it has 2 pairs of opposite sides congruent and diagonals congruent. It is not a square because not all sides are congruent.

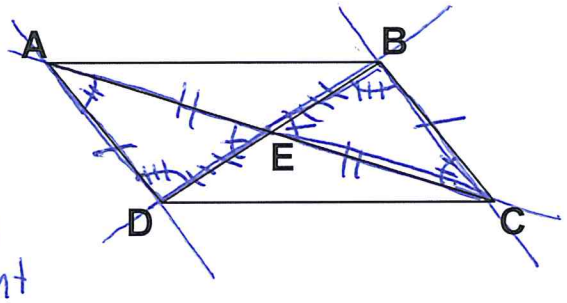
② ~~$\overline{CQ} \cong \overline{JA}, \overline{CJ} \cong \overline{QA}$ because they~~ for

$d\overline{CQ} = \sqrt{6^2+4^2} = \sqrt{36+16} = \sqrt{52}$
$d\overline{JA} = \sqrt{6^2+4^2} = \sqrt{36+16} = \sqrt{52}$
$d\overline{CJ} = \sqrt{2^2+3^2} = \sqrt{4+9} = \sqrt{13}$
$d\overline{QA} = \sqrt{2^2+3^2} = \sqrt{4+9} = \sqrt{13}$
$d\overline{CA} = \sqrt{8^2+1^2} = \sqrt{64+1} = \sqrt{65}$
$d\overline{QJ} = \sqrt{4^2+7^2} = \sqrt{16+49} = \sqrt{65}$

③ $\overline{CQ} \cong \overline{JA}, \overline{CJ} \cong \overline{QA}, \overline{CA} \cong \overline{JQ}$ because they have the same distance.
$\overline{CJ} \ncong \overline{JA}$ because they don't have the same distance.

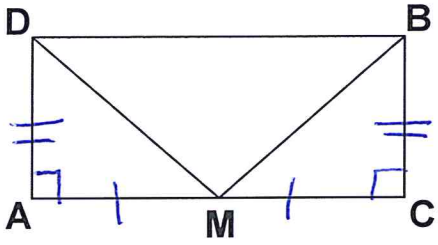
You only need to prove 3 things but I will prove all six!

14. Given: ABCD is a parallelogram
Prove: $\Delta AED \cong \Delta CEB$



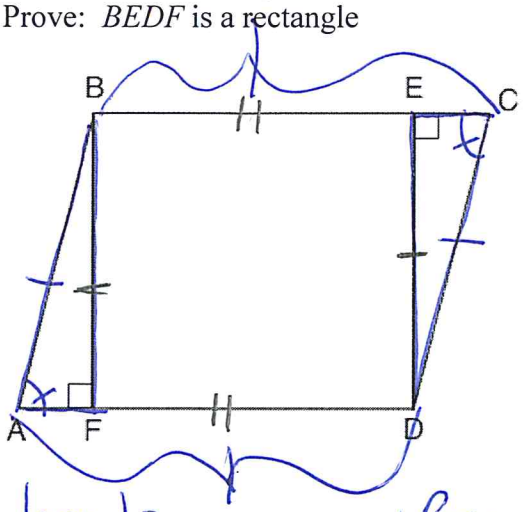
Statements	Reasons
(1) ABCD is a Parallelogram	(1) given
(2) $\overline{AD} \cong \overline{BC}$	(2) A parallelogram has opposite sides congruent
(3) $\overline{AE} \cong \overline{EC}$, $\overline{DE} \cong \overline{EB}$	(3) A parallelogram has diagonals that bisect each other
(4) $\angle DAE \cong \angle BCE$, $\angle ADE \cong \angle EBC$	(4) A parallelogram has parallel lines cut by a transversal creating congruent alternate interior angles.
(5) $\angle AED \cong \angle BEC$	(5) Vertical angles are congruent
(6) $\Delta AED \cong \Delta CEB$	(6) SAS, ASA, AAS, SSS

15. Given: ABCD is a rectangle, M is the midpoint of $\overline{AC}$
Prove: $\overline{DM} \cong \overline{BM}$



Statements	Reasons
(1) ABCD is a rectangle	(1) given
(2) $\angle DAM \cong \angle BCM$	(2) A rectangle has congruent right angles
(3) $\overline{DA} \cong \overline{BC}$	(3) A rectangle has opposite sides congruent
(4) M is midpoint of $\overline{AC}$	(4) given
(5) $\overline{AM} \cong \overline{MC}$	(5) A midpoint creates two congruent segments.
(6) $\Delta DAM \cong \Delta BCM$	(6) SAS
(7) $\overline{DM} \cong \overline{BM}$	(7) CPCTC

16. Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$
Prove: $BEDF$ is a rectangle



Always prove triangles congruent

Statements	Reasons
(1) Parallelogram ABCD	(1) Given
(2) $\overline{AB} \cong \overline{CD}$	(2) A parallelogram has opposite sides congruent
(3) $\angle BAF \cong \angle DCE$	(3) A parallelogram has opposite angles congruent
(4) $\overline{BF} \perp \overline{AFD}$, $\overline{DE} \perp \overline{BEC}$	(4) given
(5) $\angle BFA \cong \angle DEC$	(5) Perpendicular lines form congruent right angles
(6) $\triangle BFA \cong \triangle DEC$	(6) AAS
(7) $\overline{BF} \cong \overline{ED}$	(7) CPCTC
(8) $\overline{BC} \cong \overline{AD}$	(8) A parallelogram has opposite sides congruent
(9) $\overline{EC} \cong \overline{AF}$	(9) CPCTC
(10) $\overline{BE} \cong \overline{FD}$	(10) Subtraction Property
(11) BEDF is a parallelogram	(11) A parallelogram has 2 pairs of opposite sides congruent
(12) $\angle BFD$ is a right angle	(12) ~~A rectangle is a parallelogram~~ Perpendicular lines form right angles.
(13) BEDF is a rectangle	(13) A rectangle is a parallelogram with a right angle.