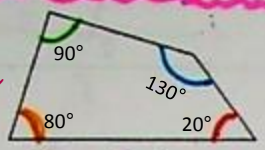
5.4 Notes: Four-Sided Polygons

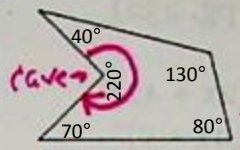
In a *convex polygon*, each interior angle is less than 180°. If a polygon is not convex, it is Concave

Classify each polygon:

4 – Sides "QUAD"



Convex



Concave

5 – Sides "PENTA-gon"

Definitions:

Quadrilateral: Polygon with 4 sides

Parallelogram: A Quad with both prs opp sides ≅ & ∥

Rectangle: A parallelogram with 4 Rt ∠'s

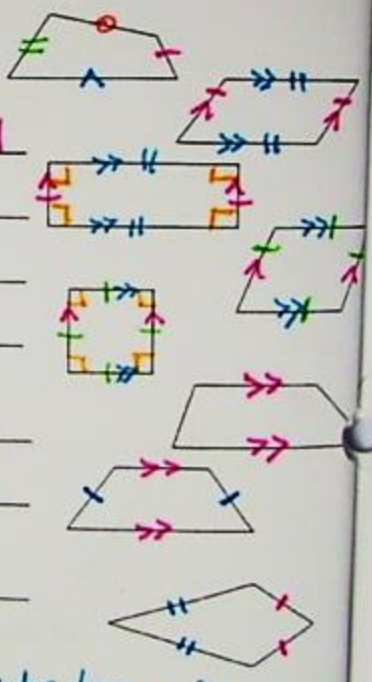
Rhombus: A parallelogram with all sides ≅

Square: Both a rectangle and a rhombus

Trapezoid: A quad with exactly 1 pair (bases) ∥ sides

Isosceles Trapezoid: A trapezoid with non ∥ sides ≅

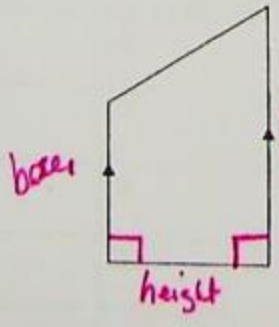
Kite: A quad with 2 pair disjoint ≅ sides



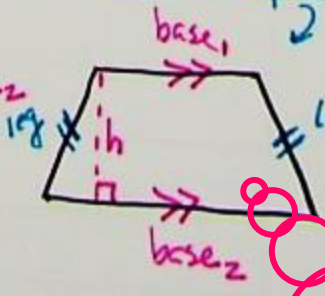
Parts of a trapezoid:

$A = \frac{(b_1+b_2)}{2} h$

$A = \frac{1}{2} h(b_1+b_2)$



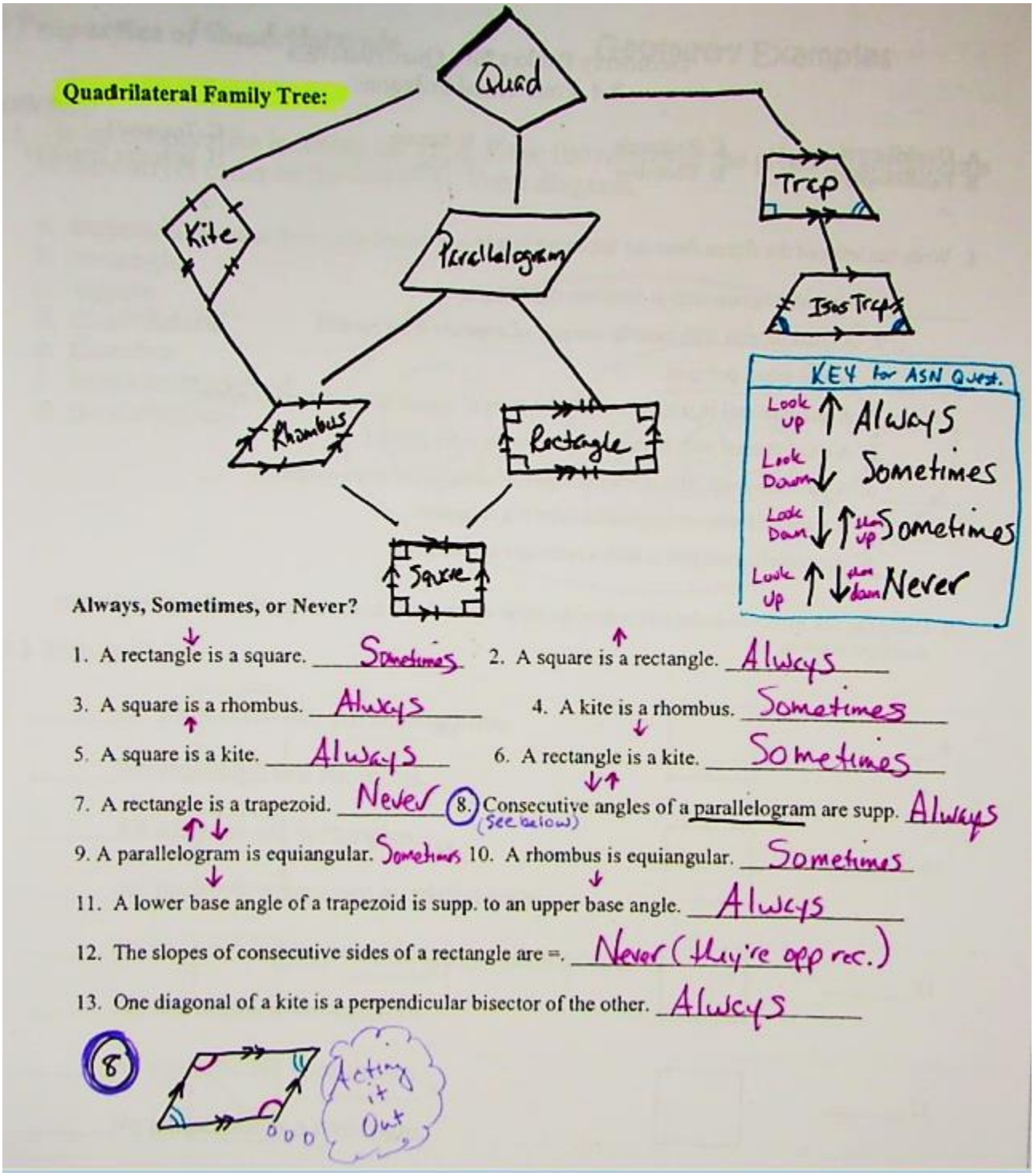
Isosceles trapezoid



Remember: Same-Side Interior Supp Angles with TRAPEZOIDS!

If **Isosceles** Trapezoid, then the **LEGS** (non-parallel sides) are **CONGRUENT**!

5.4 Notes: Four-Sided Polygons



Always, Sometimes, or Never?

1. A rectangle is a square. Sometimes
2. A square is a rectangle. Always
3. A square is a rhombus. Always
4. A kite is a rhombus. Sometimes
5. A square is a kite. Always
6. A rectangle is a kite. Sometimes
7. A rectangle is a trapezoid. Never
8. Consecutive angles of a parallelogram are supp. Always (see below)
9. A parallelogram is equiangular. Sometimes
10. A rhombus is equiangular. Sometimes
11. A lower base angle of a trapezoid is supp. to an upper base angle. Always
12. The slopes of consecutive sides of a rectangle are =. Never (they're opp rec.)
13. One diagonal of a kite is a perpendicular bisector of the other. Always

Explanation for the ALWAYS, SOMETIMES, and NEVER questions above:

1) A rectangle is **SOMETIMES** a square if ALL sides are congruent – instead of just both pairs of opposite sides.
2) A square is **ALWAYS** a RECTANGLE and a RHOMBUS – by definition a square is a ||gram with all the properties of both!
3) Same as #2
4) A kite is **SOMETIMES** a rhombus if the kite has ALL sides congruent (i.e.: if half properties of the kite become full properties)
5) A square is **ALWAYS** a kite – the square has full properties of which the kite has only half.
6) A rectangle is **SOMETIMES** a kite, if the rectangle happens to be a square!
7) A rectangle is **NEVER** a trapezoid – trapezoids only have **ONE PAIR of parallel sides**, not TWO pairs like the rectangle has!
8) Use the parallel lines to see that all CONSECUTIVE ANGLES (angles next to each other) in a ||gram are **ALWAYS** Same-Side Interior SUPP!
9) A parallelogram is **SOMETIMES** equiangular if the parallelogram is a rectangle or a square.
10) A rhombus is **SOMETIMES** equiangular – if the rhombus is a square!
11) A lower base angle of a trapezoid is **ALWAYS** supp to an upper base angle – because they are between parallel lines. (Same-Side Interior SUPP!)
12) The slopes of **consecutive sides** of a rectangle have to be **OPPOSITE RECIPROCALS** due to the right angles, so these slopes would **NEVER** be the same!
13) One diagonal of a kite is **ALWAYS** a perpendicular bisector of the other – Draw a kite and think about how *EQUIDISTANCE Theorem applies*!!!

5.4 Notes: Four-Sided Polygons

Geometry Packet 5B - Quadrilaterals

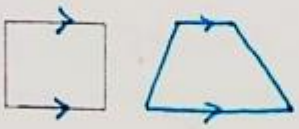
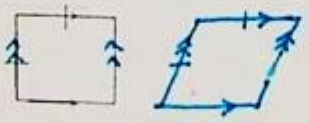
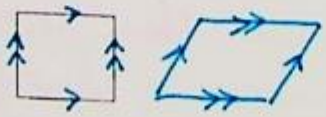
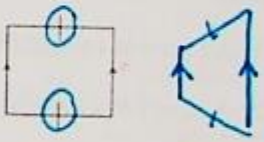
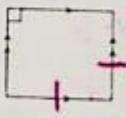
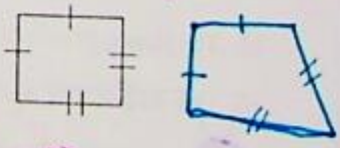
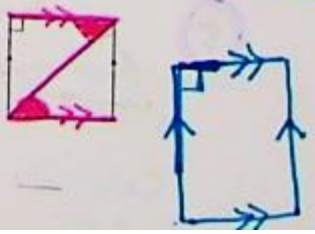
Notes p 23 **5.4 Four-sided Polygons**

~~A~~. Quadrilateral
~~B~~. Parallelogram
~~C~~. Rectangle
~~D~~. Rhombus
~~E~~. Square
~~F~~. Kite
~~G~~. Trapezoid
~~H~~. Isosceles Trapezoid

I. Write the letter of the figure from the list above that is *best* described by each definition given below.

Rect C 1. A parallelogram with at least one right angle.
Trap G 2. A quadrilateral with exactly one pair of opposite sides parallel.
Quad A 3. A four-sided polygon.
Kite F 4. A quadrilateral in which two disjoint pairs of consecutive sides are congruent.
Ilgram B 5. A quadrilateral with both pairs of opposite sides parallel.
Rhom. D 6. A parallelogram with at least one pair of consecutive sides congruent.
IsTrap H 7. A trapezoid whose nonparallel sides are congruent.
Sq. E 8. A parallelogram that is both a rectangle and rhombus.

II. Using the tick marks to assist you, select the letter of the figure from the list above that gives the *most* descriptive name.

9. G Trapezoid 
10. D Rhombus 
11. B Parallelogram 
12. A Quad 
13. H Isosc. Trap 
14. E Square* 
• opp sides ll ilgram
• one pair cons sides ≅ rhombus
• rhombus w/ Rt ∠
15. F Kite 
16. C Rectangle
llgram w/ Rt ∠ 

ADVICE: Be very careful when evaluating the tick marks and **DO NOT** "**overdetermine**" the figure when identifying the best name for it. That is – do not give a figure right angles or parallel lines unless you can prove right angles or parallel lines from the "given" information (revealed by tick marks).