

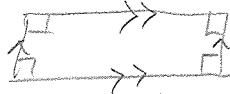
Geometry (H)
Section 5.4 – Special Parallelograms

Name: KEY

Today we will be studying the properties of special parallelogram.

Define each of the following and draw a diagram, mark any parts that are congruent.

Rectangle – quadrilateral with 4 right \angle s.



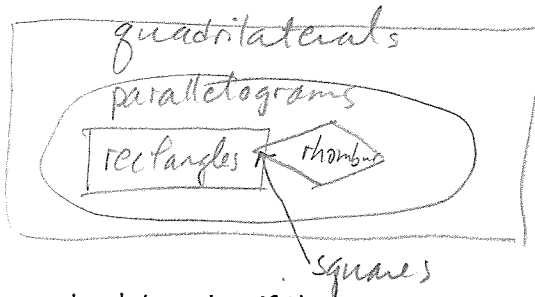
How is each one a \square ?

Rhombus – quad. with 4 \cong sides.



Square – quad w/ 4 \cong sides & \cong \angle s

A Venn diagram can be drawn to show the relationship between all the quadrilaterals we've studied so far.



- special quads can go into room of parallelograms
- with some exceptions, you can go out, but you can't go in!

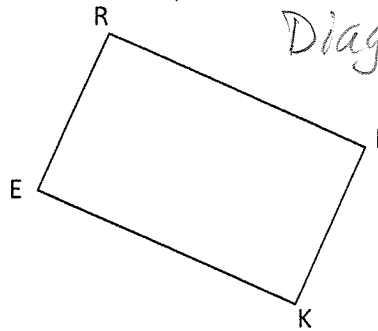
Use the Venn diagram to determine if the statement is sometimes, always or never true.

1. A square is a parallelogram. A
2. A rectangle is a square. S
3. A square is a rectangle. A
4. A parallelogram is a rhombus. S
5. A square is a rhombus. A
6. A rhombus has opposite angles congruent. A
7. A rectangle is a rhombus. S

Because a rhombus, rectangle and square are parallelograms they take on the properties of a parallelogram. However, the rectangle and rhombus have some additional properties relating to their diagonals.

Look at the rectangle below. Draw in the diagonals and measure them. What seems to be true about them?

$RK = 4.3 \text{ cm}$
 $EI = 4.3 \text{ cm}$



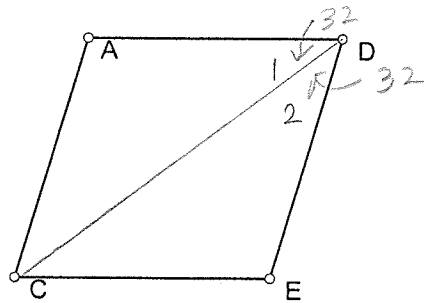
Diagonals have equal measures $\rightarrow \cong$.

Look at the rhombus below. Draw in the diagonals. Are they congruent? *NO*
 Measure one angle at the intersection of the diagonals. What seems to be true?

measure = 90°

Now measure the angles formed at D and C. What do you observe with their measurements?

$CD = 5.4 \text{ cm}$
 $AE = 4 \text{ cm}$



$m\angle D = m\angle C$
 $m\angle 1 = m\angle 2$

Note: A square is a rectangle and rhombus so it has all the properties of both.

Let summarize our findings:

Properties of a Rectangle:

Thm: diagonals are \cong .

Properties of a Rhombus:

Thm: diagonals are \perp
 Thm: diagonals bisect their \angle s

Properties of a Square:

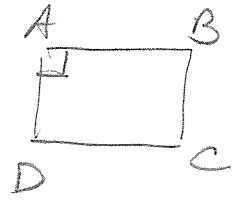
has properties of
 - rectangle
 - rhombus
 - square

All of the above properties can be proven. Let's look at 2 additional theorems.

Thm: If an angle of a parallelogram is a right angle, then the parallelogram is a rectangle.

Given: $\square ABCD$, $\angle A$ is right

Diagram:



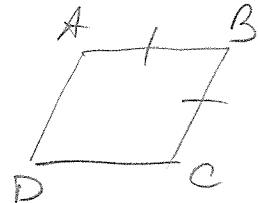
Prove: $ABCD$ is right. (Prove the definition: 4 right \angle s)

Proof on next page \longrightarrow

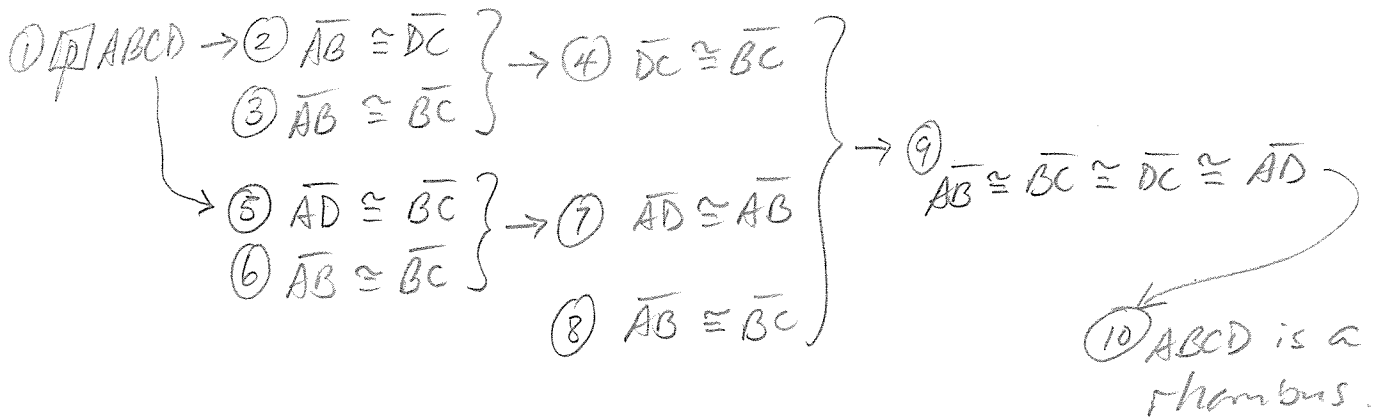
Thm: If two consecutive sides of a parallelogram are congruent, then the parallelogram is a rhombus.

Given: $\square ABCD$, $\overline{AB} \cong \overline{BC}$

Diagram:



Prove: $ABCD$ is a rhombus
(show 4 sides \cong)



① Given

② $\square \rightarrow$ opp sides \cong

③ Given

④ Transitive prop.

⑤ $\square \rightarrow$ opp sides \cong

⑥ Given

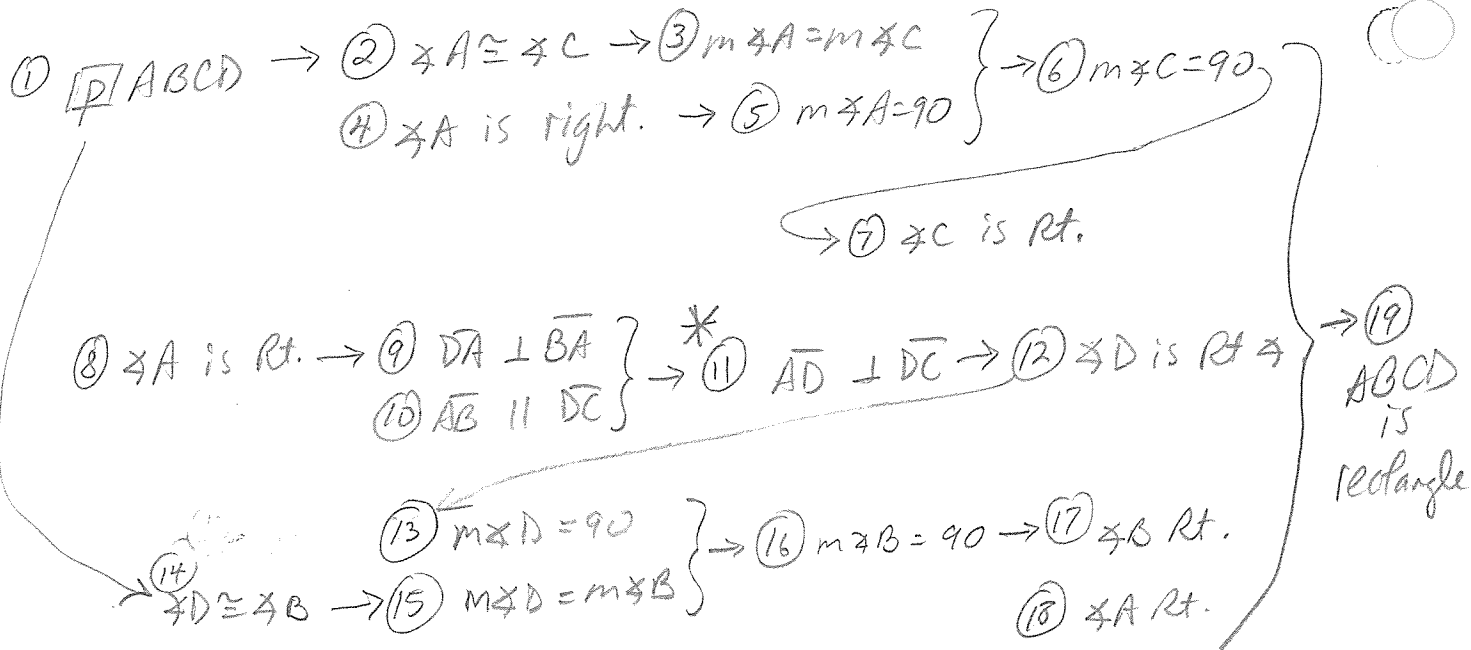
⑦ Transitive prop

⑧ Given

⑨ Transitive property

⑩ Definition of a rhombus

Thm #1 This proof uses a theorem we're rarely used. We can always benefit from seeing different ways



Reasons

- ① Given
- ② $\square \rightarrow$ opp $\overline{AS} \cong$
- ③ Def of $\cong \overline{AS}$
- ④ Given
- ⑤ Def of Rt. \angle
- ⑥ Substitution
- ⑦ Def of Rt. \angle
- ⑧ Given
- ⑨ Def of \perp lines
- ⑩ $\square \rightarrow$ opp sides \parallel

- * ⑪ If a transversal is \perp to one of 2 \parallel lines, then it is \perp to other also.
- (Thm 3-4)
- ⑫ \perp lines form Rt \angle s.
- ⑬ Def of Rt \angle .
- ⑭ $\square \rightarrow$ opp $\overline{AS} \cong$
- ⑮ Def of $\cong \overline{AS}$
- ⑯ Substitution
- ⑰ Def of Rt \angle
- ⑱ Given
- ⑲ Def of rectangle