Aim 31: What are the properties of a Rhombus and a Rectangle?

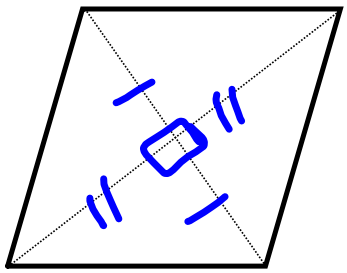
Do Now:

1) A parallelogram that is equilateral is called a rhombus.

2) A parallelogram that is equiangular is called a rectangle

Rhombus (*Equilateral Parallelogram*)

If a rhombus is a parallelogram and equilateral, what can we say about the 4 triangles below?

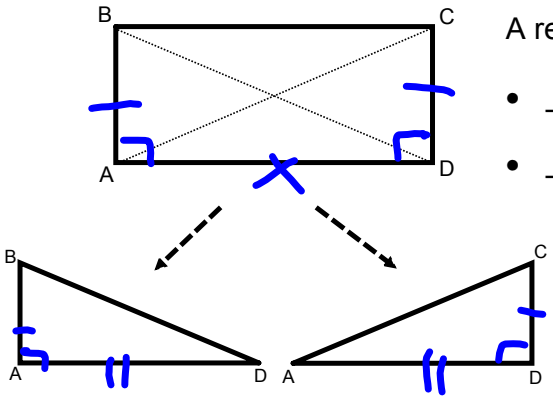


A rhombus has all of the properties of a parallelogram plus:

- all sides are ≅
- diagonals are ⊥
- diagonals bisect the angles

The 4 Δ's are ≅ by SAS.

Rectangle (*Equilangular Parallelogram*)

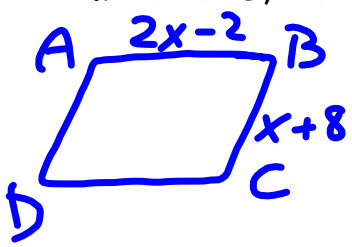


A rectangle has all of the properties of a parallelogram plus:

- all right angles
- diagonals are ≅

The 2 Δ's are ≅ by SAS

1. In **rhombus** ABCD, AB = 2x - 2 and BC = x + 8. Find the perimeter of ABCD.



All sides ≅ in a rhombus.

$2x-2=x+8$

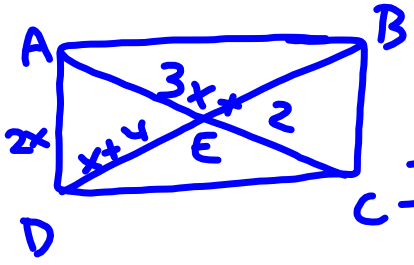
$-x+2 \quad -x+2$

$x=10$

$BC=10+8=18$

Perimeter = 72 $\left(\begin{matrix}18\\4\end{matrix}\right)$

2. In rectangle ABCD, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E. If AC = 3x + 2, DE = x + 4, and AD = 2x. Find the length of $\overline{CD}$.



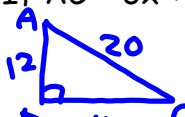
$2DE=AC$

$2(x+4)=3x+2$

$2x+8=3x+2$

$-2x-2 \quad -2x-2$

$6=x$



Pythag. Thm.

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

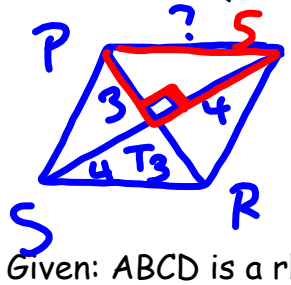
$12^2+y^2=20^2$

$144+y^2=400$

$y^2=256$

CD = 16

3. In **rhombus** PQRS, diagonals PR and QS intersect at T. If PR = 6 and QS = 8, find the perimeter of rhombus PQRS.



Diag. bisect each other & are ⊥.

Use Pyt. Thm. to find PQ. $3^2+4^2=x^2$

$9+16=x^2$

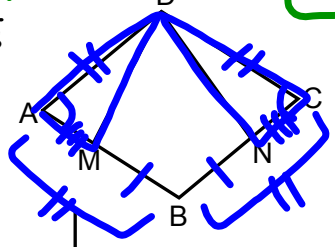
$25=x^2$

$5=x$

Perimeter = $5\times4=20$

4. Given: ABCD is a rhombus; $\overline{MB} \cong \overline{NB}$

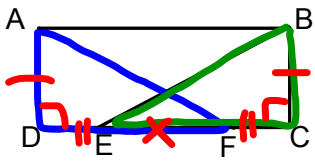
Prove: $\triangle AMD \cong \triangle CND$



Statements	Reasons
2) $\overline{AD} \cong \overline{CD}$	2) All sides of rhombus are ≅
3) $\angle A \cong \angle C$	3) Opp. ∠s of a rhom. are ≅
4) $\overline{AB} \cong \overline{BC}$	4) Same as # 2
5) $\overline{AB}-\overline{MB} \cong \overline{BC}-\overline{NB}$, $\overline{AM} \cong \overline{CN}$	5) Segment Subtraction
6) $\triangle AMD \cong \triangle CND$	6) SAS

5. Given: Rectangle ABCD, $\overline{DE} \cong \overline{CF}$

Prove: $\Delta ADF \cong \Delta BCE$

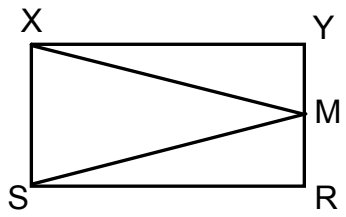


Statements	Reasons
2) $\overline{AD} \cong \overline{BC}$	2) Opp. sides of rect. are $\cong$
3) $\angle D \cong \angle C$	3) A rect. has $\cong$ rt. $\angle$s.
4) $\overline{EF} \cong \overline{EF}$	4) Reflexive
5) $DE + EF \cong CF + EF$ $DF \cong EC$	5) Segment Add.
6) $\Delta ADF \cong \Delta BCE$	6) SAS

6. Given: XYRS is a rectangle;
M is the midpoint of $\overline{YR}$.

Prove: ΔXMS is isosceles

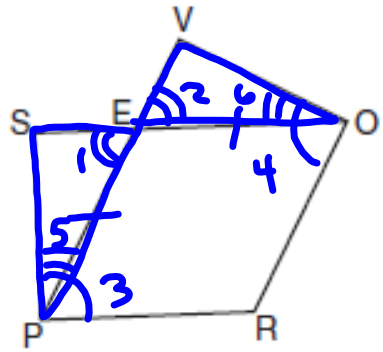
HW (7 lines)



Statements	Reasons

7. Given: $PROE$ is a rhombus, $\overline{SEO}$, $\overline{PEV}$, $\angle SPR \cong \angle VOR$

Prove: $\overline{SE} \cong \overline{EV}$



Statements	Reasons
2) $\overline{PE} \cong \overline{EO}$	2) All sides of a rh. are $\cong$
3) $\angle 1 \cong \angle 2$	3) Vertical $\angle$s are $\cong$
4) $\angle 3 \cong \angle 4$	4) Opp. $\angle$s of a rh. are $\cong$
5) $\angle SPR - \angle 3 \cong \angle VOR - \angle 4$ $\angle 5 \cong \angle 6$	5) Angle Subtraction
6) $\triangle SEP \cong \triangle OEV$	6) ASA
7) $\overline{SE} \cong \overline{EV}$	7) CPCTC

8. In **rectangle** ABCD, diagonals AC and BD intersect at E. If AE = 20, and BD = 2x + 30, find x.

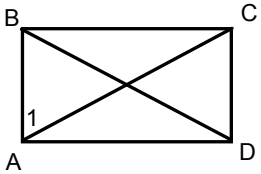
HW

9. In **rhombus** ABCD, diagonal BD is drawn. If m* ABD = 30°, find m* BCD.

HW

10. In rectangle ABCD shown below, $\overline{AC}$ and $\overline{BD}$ are diagonals. If m*1 = 49, find m*ADB.

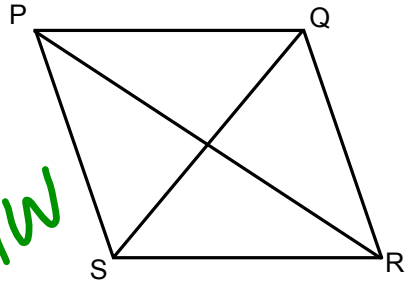
HW



11. The degree measures of two opposite angles of a parallelogram are represented by $3x + 40$ and $x + 70$. Is the parallelogram a rectangle? Justify your answer.

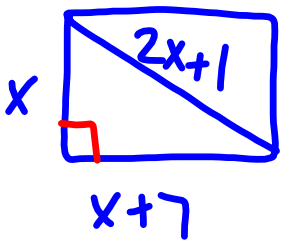
HW

12. PQRS is a parallelogram. $m\angle SQP = 4x - 2$, $m\angle QSR = 3x + 6$, and $m\angle QPR = 8x - 4$. Solve for x. What specials type of parallelogram is PQRS? Justify your answer.



HW

13. The length of a rectangle is seven more than the width.
A diagonal is one more than twice the width.
Find the width, length, perimeter and area of the rectangle using an algebraic solution.



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

$x^2 + (x+7)^2 = (2x+1)^2$

$x^2 + x^2 + 14x + 49 = 4x^2 + 4x + 1$

$2x^2 + 14x + 49 = 4x^2 + 4x + 1$

$0 = 2x^2 - 10x - 48$

$0 = x^2 - 5x - 24$

$(x-8)(x+3)$

$x = 8 \quad x \neq -3$

8, 15, 17