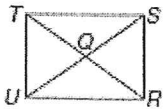
Name:_____

Notes: Rectangles, Rhombi and Squares



Properties of Rectangles A rectangle is a quadrilateral with four right angles. Here are the properties of rectangles.

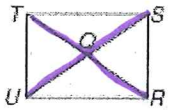
A rectangle has all the properties of a parallelogram.

- Opposite sides are parallel.
- Opposite angles are congruent.
- Opposite sides are congruent.
- Consecutive angles are supplementary.
- The diagonals bisect each other.

Also:

- All four angles are right angles. — $\angle UTS$, $\angle TSR$, $\angle SRU$, and $\angle RUT$ are right angles.
- The diagonals are congruent. — $\overline{TR} \cong \overline{US}$

Example 1 In rectangle $RSTU$ above, $US = 6x + 3$ and $RT = 7x - 2$. Find x.

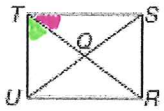


US ≅ TR diags of a rectangle are ≅

$6x+3=7x-2$

$\boxed{x=5}$

Example 2 In rectangle $RSTU$ above, $m\angle STR = 8x + 3$ and $m\angle UTR = 16x - 9$. Find $m\angle STR$.



$\angle UTS = 90$ by def of a rectangle

$\angle STR + \angle UTR = \angle UTS$

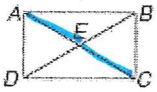
$8x+3+16x-9=90$

$\boxed{x=4}$

$\angle STR = 8(4)+3$

$\boxed{\angle STR = 35°}$

3. If $AE = 3x + 3$ and $EC = 5x - 15$, find AC.



AE = EC diag. of a rect bisect each other

$3x+3=5x-15$

$\boxed{x=9}$

$AC = 3(9)+3+5(9)-15$

$\boxed{AC=60}$

4. If $DE = 6x - 7$ and $AE = 4x + 9$, find DB.

AE = DE diags of a rect are ≅ And bisect each other

$4x+9=6x-7$

$\boxed{x=8}$

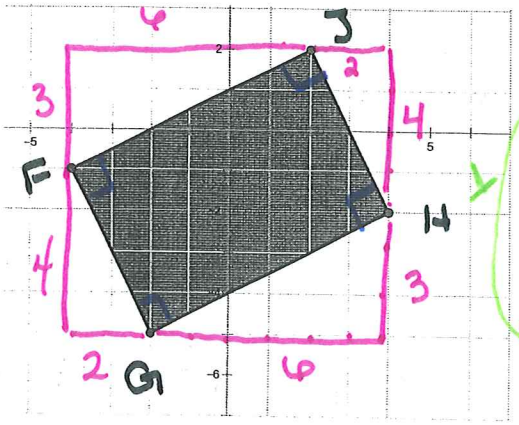
$DB = 2(6(8)-7)$

$\boxed{DB=82}$

5. Determine whether the figure with vertices F(-4,-1),G(-2,-5), H(4,-2) and J(2,2) is a rectangle.

To be a rectangle, you must test for consecutive ⊥ sides

check slopes



Slope JH $= -\frac{4}{2} = -2$

Slope GH $= \frac{3}{6} = \frac{1}{2}$ ⊥

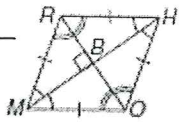
Slope FG $= -\frac{4}{2} = -2$

Slope FJ $= \frac{3}{6} = \frac{1}{2}$ ⊥

FGHJ is a rectangle because con. sides are ⊥ which make 4 right ∠s

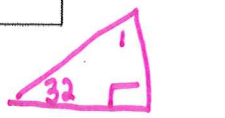
Name _____

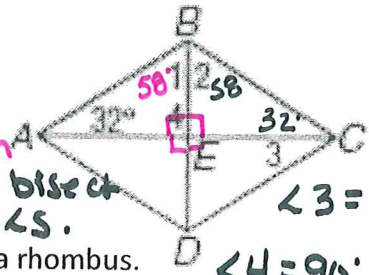
Properties of Rhombi A rhombus is a quadrilateral with four congruent sides. Opposite sides are congruent, so a rhombus is also a parallelogram and has all of the properties of a parallelogram. Rhombi also have the following properties.



The diagonals are perpendicular.	$\overline{MH} \perp \overline{RO}$
Each diagonal bisects a pair of opposite angles.	$\overline{MH}$ bisects $\angle RMO$ and $\angle RHO$. $\overline{RO}$ bisects $\angle MRH$ and $\angle MOH$.
If the diagonals of a parallelogram are perpendicular, then the figure is a rhombus.	If *RHOM* is a parallelogram and $\overline{RO} \perp \overline{MH}$, then *RHOM* is a rhombus.

EX1. In rhombus ABCD, m<BAC=32°
Find the measure of each numbered angle.

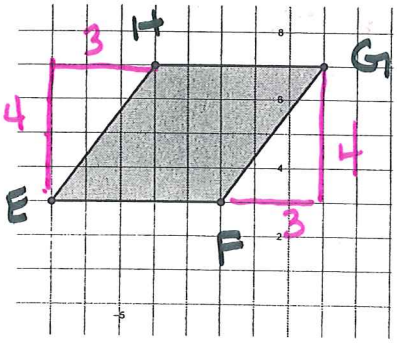




<1 = 58° △ sum
<2 = 58 diag bisect the <s.
<3 = 32°
<4 = 90° diags of a Rhombus are ⊥

2. Determine whether the figure with vertices E(-7,3), F(-2,3), G(1,7) H(-4,7) is a rhombus.

To be a rhombus, you must test for 4 ≅ sides



Find all distances

$\boxed{HG = 5}$

$\boxed{EF = 5}$

$EH^2 = 3^2 + 4^2$

$\sqrt{EH^2} = \sqrt{25}$

$\boxed{EH = 5}$

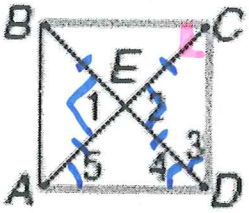
$GF^2 = 3^2 + 4^2$

$\boxed{GF = 5}$

HG ≅ EF ≅ EH ≅ GF
So all 4 sides are ≅ ∴ EFGH is a Rhombus.

Properties of Squares A square has all the properties of a rhombus and all the properties of a rectangle.

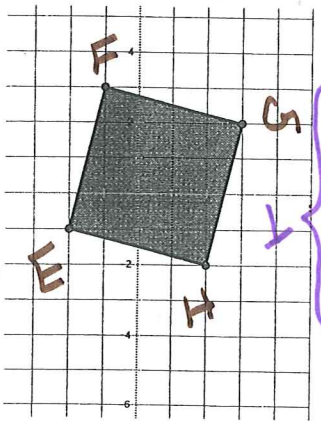
1. **Example** Find the measure of each numbered angle of square *ABCD*.



<1 = 90°
<2 = 90°
<5 = 45°
<4 = 45°
<3 = 45°

2. Determine whether the figure with vertices E(-2,-1), F(-1,3), G(3,2), and H(2,-2) is a square.

To be a square, you must test for 4 right <s 4 ≅ sides



slopes:
Slope GH = $\frac{4}{1}$ = 4 ⊥
Slope EH = $-\frac{1}{4}$ ⊥
Slope FE = 4 ⊥
Slope FG = $-\frac{1}{4}$ ⊥

distances:
FG = $\sqrt{17}$
EH = $\sqrt{17}$
GH = $\sqrt{17}$
FE = $\sqrt{17}$
≅

ALL 4 <s are Right <s because consecutive sides are ⊥ and FG ≅ EH ≅ GH ≅ FE
So ALL 4 sides are ≅ ∴ It is a square.