

Name: Kelly

Date: _____

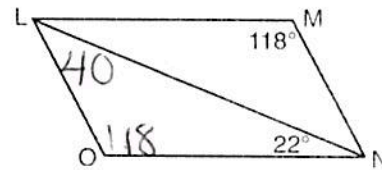
UNIT 4

LESSON 3

AIM: WHAT ARE THE PROPERTIES OF RHOMBUS AND SQUARES?

Do Now: The diagram below shows parallelogram $LMNO$ with diagonal \overline{LN} , $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

Explain why $m\angle NLO$ is 40 degrees.



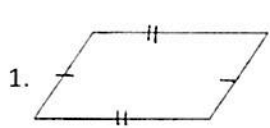
$\triangle LNO = 118^\circ$ b/c opp. \angle 's in a \square are \cong

$\triangle NLO = 40^\circ$ b/c \angle 's in a \triangle sum to 180°

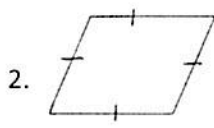
$180 - 118 - 22 = 40$

RHOMBUS	SQUARE
<p>ALL PROPERTIES OF A PARALLELOGRAM PLUS:</p> <ul style="list-style-type: none"> All sides are CONGRUENT. Diagonals are PERPENDICULAR BISECTORS. Diagonals bisect the ANGLES. 	<p>ALL PROPERTIES OF PARALLELOGRAMS, RECTANGLES AND RHOMBI!</p>

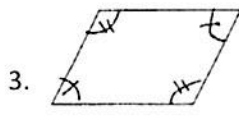
Judging by the markings on the picture and what you know about the properties of parallelograms and rhombi, state whether each shape is a parallelogram or a rhombus.



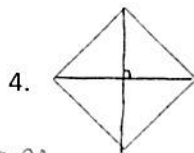
Parallelogram



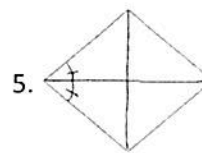
Rhombus
4-sides



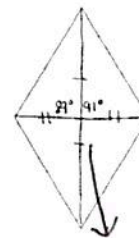
Parallelogram



Rhombus
Diagonals

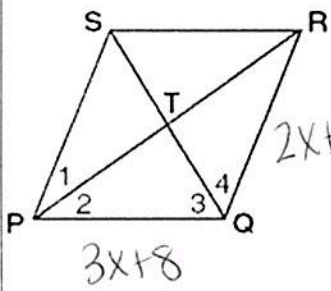


Rhombus
 \angle 's bisect by diagonals



not 90°
Parallelogram

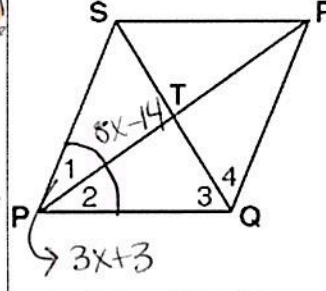
1. In the diagram below, PQRS is a rhombus with diagonals \overline{PR} and \overline{SQ} . If $PQ = 3x + 8$ and $QR = 2x + 17$, find the value of x .



all sides are =

$$\begin{array}{r} 2x+17 = 3x+8 \\ -2x-8 \quad -2x-8 \\ \hline 9 = x \end{array}$$

2. In the diagram below, PQRS is a rhombus with diagonals \overline{PR} and \overline{SQ} . If $\angle SPQ = 8x - 14$ and $m\angle 1 = 3x + 3$, then find $\angle SPQ$.



Diagonals bisect

$$\begin{array}{r} 3x+3+3x+3 = 8x-14 \\ 6x+6 = 8x-14 \\ -6x+6 \quad -6x+14 \\ \hline 20 = 2x \end{array}$$

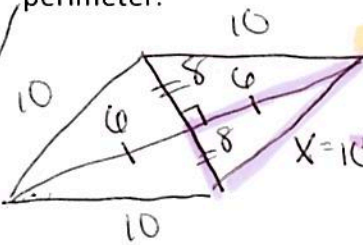
SO $42 = 3x+3$

$20 = 2x$

$x = 10$

$\angle SPQ = 8(10) - 14 = 66$

3. The diagonals of a rhombus have lengths of 12 centimeters and 16 centimeters. Find its perimeter.



Diagonals are \perp bisectors!

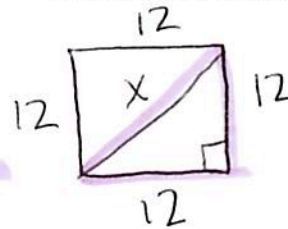
$x = 10$ Right Δ ? $a^2 + b^2 = c^2$

$$\begin{array}{r} 6^2 + 8^2 = x^2 \\ 36 + 64 = x^2 \\ \sqrt{100} = \sqrt{x^2} \\ x = 10 \end{array}$$

sum of sides

Perimeter = 40

4. What is the length of the diagonal of a square whose side length is 12?



Right Δ ? $a^2 + b^2 = c^2$

$12^2 + 12^2 = x^2$

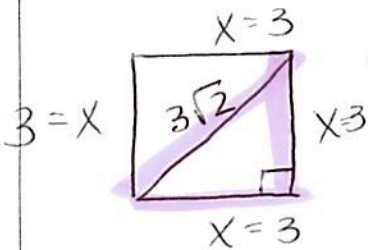
$144 + 144 = x^2$

4 right Δ 's!

$$\begin{array}{r} \sqrt{288} = \sqrt{x^2} \\ \sqrt{144} \quad \sqrt{2} \\ \hline x = 12\sqrt{2} \end{array}$$

$x = 12\sqrt{2}$

5. What is the perimeter of a square whose diagonal is $3\sqrt{2}$?



Right Δ ? $a^2 + b^2 = c^2$

$x^2 + x^2 = (3\sqrt{2})^2$

do in calc!

$2x^2 = 18$

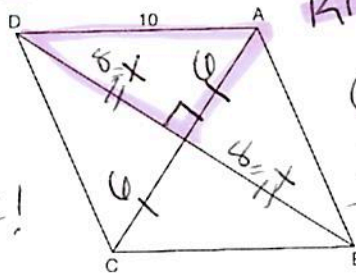
$\sqrt{x^2} = \sqrt{9}$

$x = 3$

Perim. = $3+3+3+3$

= 12

6. In rhombus ABCD, with diagonals \overline{AC} and \overline{DB} , $AD = 10$. If the length of diagonal \overline{AC} is 12, what is the length of \overline{DB} ?



Right Δ ? $a^2 + b^2 = c^2$

$6^2 + x^2 = 10^2$

$36 + x^2 = 100$

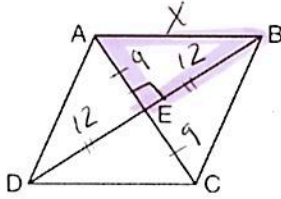
$-36 \quad -36$

$\sqrt{x^2} = \sqrt{64}$

$x = 8$

$\overline{DB} = 8+8 = 16$

7. In the diagram below of rhombus $ABCD$, the diagonals \overline{AC} and \overline{BD} intersect at E . If $AC = 18$ and $BD = 24$, what is the length of one side of rhombus $ABCD$?



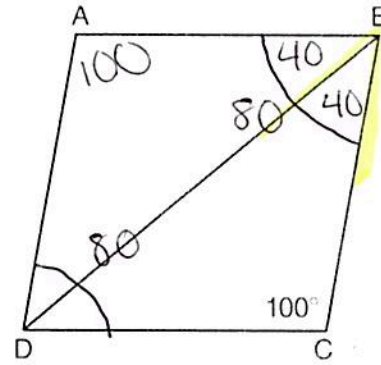
$$9^2 + 12^2 = x^2$$

$$81 + 144 = x^2$$

$$\sqrt{225} = \sqrt{x^2}$$

$$\boxed{x = 15}$$

8. In the diagram below of rhombus $ABCD$, $m\angle C = 100$. What is $m\angle DBC$?



- consecutive \angle 's are supp.

$$180 - 100 = 80$$

- Diagonals bisect \angle 's

$$\boxed{m\angle DBC = 40^\circ}$$

9. Which set of statements would describe a parallelogram that can always be classified as a rhombus?

- I. Diagonals are perpendicular bisectors of each other.
- II. Diagonals bisect the angles from which they are drawn.
- III. Diagonals form four congruent isosceles right triangles.

SKIP

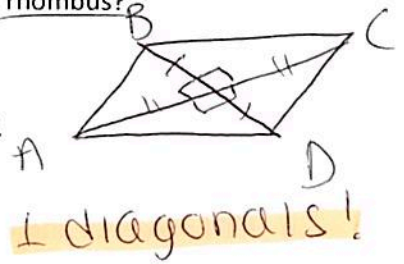
10. If $ABCD$ is a parallelogram, which statement would prove that $ABCD$ is a rhombus?

1) $\angle ABC \cong \angle CDA$

2) $\overline{AC} \cong \overline{BD}$ X
rectangle!

3) $\overline{AC} \perp \overline{BD}$

4) $\overline{AB} \perp \overline{CD}$



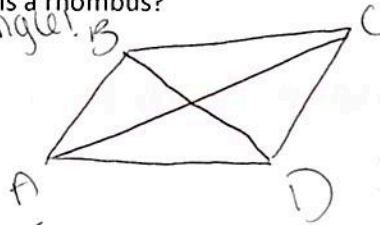
11. In parallelogram $ABCD$, diagonals \overline{AC} and \overline{BD} intersect at E . Which statement does not prove parallelogram $ABCD$ is a rhombus?

1) $\overline{AC} \cong \overline{DB}$ rectangle!

2) $\overline{AB} \cong \overline{BC}$ ✓

3) $\overline{AC} \perp \overline{DB}$ ✓

4) \overline{AC} bisects $\angle DCB$ ✓



12. A quadrilateral whose diagonals bisect each other and are perpendicular is a

1) rhombus

2) rectangle

3) trapezoid

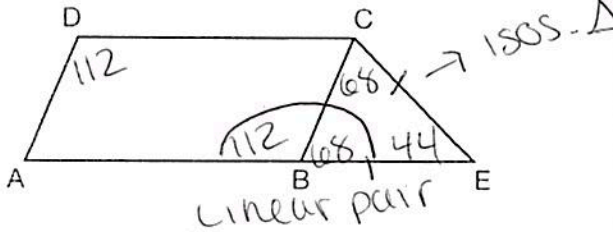
4) parallelogram

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HOMEWORK

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



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

- a) 112°
- b) 68°
- c) 136°
- d) 44°

3. Melissa is walking around the outside of a building that is in the shape of a regular polygon. She determines that the measure of one exterior angle of the building is 60° . How many sides does the building have?

- 1) 6
- 2) 9
- 3) 3
- 4) 12

$$\frac{360}{n} = \frac{60}{1}$$

$$60n = 360$$

$$\boxed{n = 6}$$

2. A parallelogram is always a rectangle if

- 1) the diagonals are congruent
- 2) the diagonals bisect each other
- 3) the diagonals intersect at right angles Rhombus!
- 4) the opposite angles are congruent

4. The sum of the interior angles of a regular polygon is 720° . How many sides does the polygon have?

- 1) 8
- 2) 6
- 3) 5
- 4) 4

$$180(n-2) = 720$$

$$180n - 360 = 720$$

$$+ 360 + 360$$

$$180n = 1080$$

$$\boxed{n = 6}$$

5. In the diagram below, $DEFG$ is a square with diagonals \overline{GE} and \overline{DF} .

a) If $DE = 5x - 14$ and $EF = 3x - 6$, find the value of x .

$$5x - 14 = 3x - 6$$

$$-3x + 14 \quad -3x + 14$$

all sides are = !

$$2x = 8$$

$$\boxed{x = 4}$$

b) If $DF = 2x - 17$ and $GE = 28 - 3x$, find the value of x .

$$2x - 17 = 28 - 3x$$

$$+3x + 17 \quad +17 + 3x$$

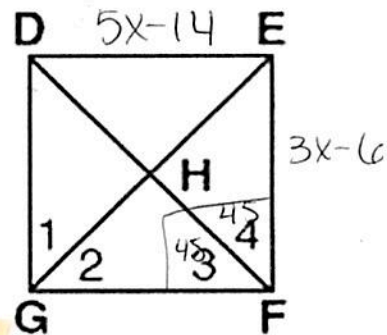
diagonals are \cong !

$$5x = 45$$

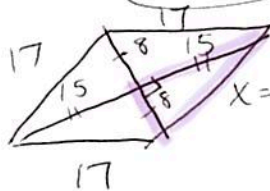
$$\boxed{x = 9}$$

c) What is the measure of angle 4?

All \angle 's are 90° , diagonals bisect \angle 's so $\boxed{\angle 4 = 45^\circ}$



6. What is the perimeter of a rhombus whose diagonals are 16 and 30? (Hint: See Question 3 in notes!)



Right Δ ? $a^2 + b^2 = c^2$

$$8^2 + 15^2 = x^2$$

$$289 = x^2$$

$$x = 17$$

$$17 + 17 + 17 + 17 = \boxed{68}$$