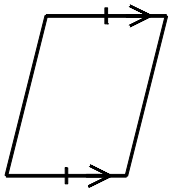
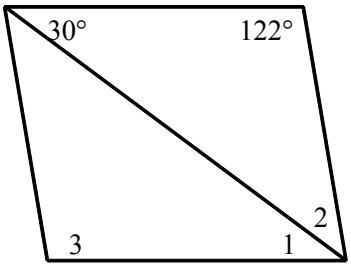
NAME:_____

*P.I. G.G.38: Investigate, justify, and apply theorems about parallelograms involving their angles, sides, and diagonals*

1. Based on the markings, determine if the figure is a parallelogram. If so, justify your answer.



2. Find the measures of the numbered angles in the parallelogram.




[A] $m\angle 1 = 28;\ m\angle 2 = 30;\ m\angle 3 = 122$

[B] $m\angle 1 = 30;\ m\angle 2 = 28;\ m\angle 3 = 122$

[C] $m\angle 1 = 15;\ m\angle 2 = 61;\ m\angle 3 = 150$

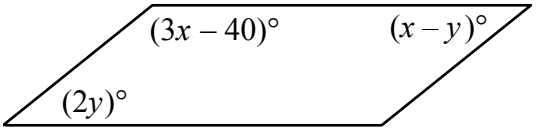
[D] $m\angle 1 = 30;\ m\angle 2 = 15;\ m\angle 3 = 150$

3. If $m\angle 1 = m\angle 3 = 11x,\ m\angle 2 = 3x - 30,$ and $m\angle 4 = x,$ find the value of $x$.


[A] 15 [B] 75 [C] 30 [D] 150

4. If $m\angle 1 = m\angle 3 = 5x,\ m\angle 2 = 3x - 60,$ and $m\angle 4 = x,$ find the value of $x$.


5. Determine the values of $x$ and $y$ for which $ABCD$ is a parallelogram.




[A] $x = 140, y = 40$ [B] $x = 60, y = 20$

[C] $x = 20, y = 20$ [D] $x = 20, y = 60$

[E] none of the above

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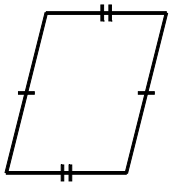
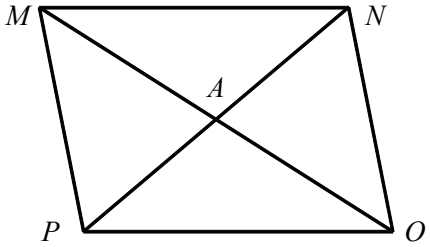
6. Based on the markings, determine if the figure is a parallelogram. If so, justify your answer.



7. Find $AM$ in the parallelogram if $PN = 7$ and $AO = 3$.




8. If $ON = 8x - 2$, $LM = 7x + 7$, $NM = x - 4$, and $OL = 2y + 3$, find the values of $x$ and $y$ for which $LMNO$ must be a parallelogram.


[A] $x = 9;\ y = 1$ [B] $x = -\frac{1}{5};\ y = -1$

[C] $x = 9;\ y = -1$ [D] $x = 5;\ y = -1$

9. If $ON = 7x - 5$, $LM = 6x + 4$, $NM = x + 6$, and $OL = 8y + 3$, find the values of $x$ and $y$ for which $LMNO$ must be a parallelogram.


10. Compare the quantity in Column A with the quantity in Column B.
Given: $AC > BC$ in parallelogram $ABCD$.

| Column A | Column B |
|---|---|
| $m\angle A$ | $m\angle B$ |

[A] The quantity in Column A is greater.

[B] The quantity in Column B is greater.

[C] The two quantities are equal.

[D] The relationship cannot be determined on the basis of the information supplied.

11. Graph the points $A(-1,\ 2)$, $B(1,\ 8)$, and $C(5,\ 2)$. Find all possible coordinates of the point $D$ so that $ABCD$ is a parallelogram.

12. Points $A(2, 3)$, $B(7, 3)$, and $C(4, -1)$ are three vertices of a parallelogram. Theorem 9-3 states that the diagonals of a parallelogram bisect each other. Use this to find the coordinates of the fourth vertex of the parallelogram $ABCD$.

[1] yes; a pair of opposite sides are congruent and parallel

[2] B

[3] A

[4] 30

[5] B

[6] yes; both pairs of opposite sides are congruent

[7] 3

[8] A

[9] $x = 9\,;\ y = \frac{3}{2}$

[10] D

[11] $(3,\ -4),\ (7,\ 8),$ and $(-5,\ 8)$

[12] Since the diagonals of a parallelogram bisect each other, $D$ has to be a point $(x,\ y)$ so that $(3,\ 1),$ the midpoint of $\overline{AC},$ is also the midpoint of $\overline{BD}.$ Using the midpoint formula, $D$ is the point $(-1,\ -1).$