Name _____ Date _____ Class _____

LESSON 9-1

# Properties of Parallelograms

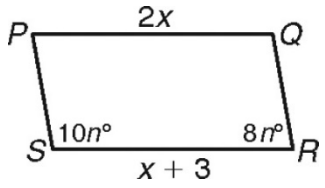
## *Practice and Problem Solving: A/B*

***PQRS* is a parallelogram. Find each measure.**

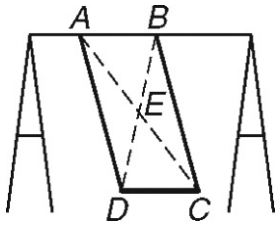
1. *RS*

2. m∠*S*

3. m∠*R*




The figure shows a swing blown to one side by a breeze. As long as the seat of the swing is parallel to the top bar, the swing makes a parallelogram. In $\square$ ***ABCD***, $DC = 2$ ft, $\boldsymbol{BE} = 4\frac{1}{2}$ ft, and m∠***BAD*** $= 75°$.




**Find each measure.**

4. *AB*

5. *ED*

6. *BD*

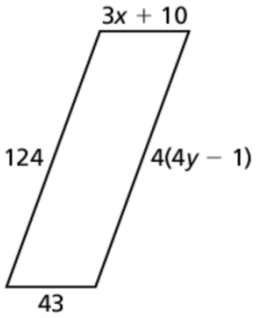
7. m∠*ABC*

8. m∠*BCD*

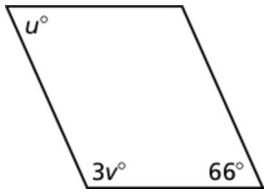
9. m∠*ADC*

**In Exercises 10–13, find the value of each variable in the parallelogram.**

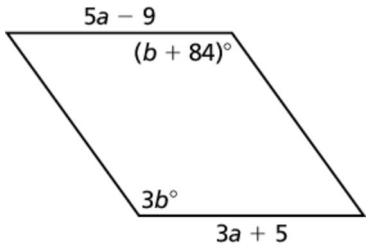
**10.**




**11.**




**12.**



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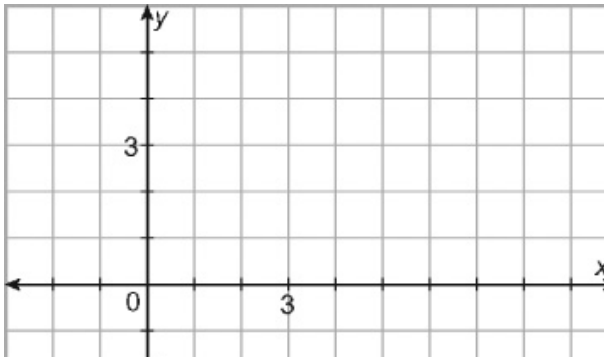
**Three vertices of ▱ *GHIJ* are *G*(0, 0), *H*(2, 3), and *J*(6, 1). Use the grid to the right to complete Problems 14–20.**




14. Plot vertices *G*, *H*, and *J* on the coordinate plane.

15. Find the rise (difference in the *y*-coordinates) from *G* to *H*.

16. Find the run (difference in the *x*-coordinates) from *G* to *H*.

17. Using your answers from Problems 15 and 16, find the coordinates of vertex *I*.
(_____, _____)

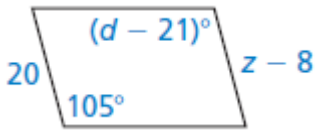
18. Plot vertex *I*. Connect the points to draw ▱ *GHIJ*.

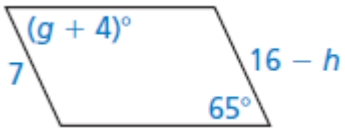
19. Check your answer by finding the slopes of $\overline{IH}$ and $\overline{JG}$. slope of $\overline{IH}$ = _____

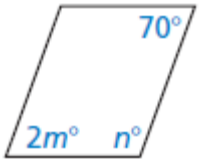
slope of $\overline{JG}$ = _____

20. What do the slopes tell you about $\overline{IH}$ and $\overline{JG}$?

In Exercises 21–26, find the value of each variable in the parallelogram.

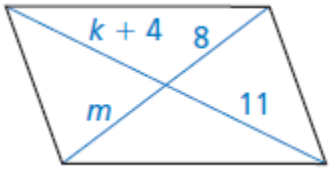
21. 


22. 


23. 


24. 

25.

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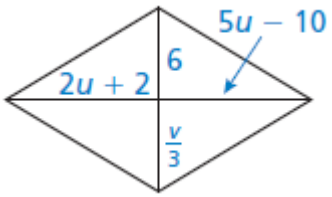



**In Exercises 27 – 34, find the indicated measure in $\square LMNQ$. Explain your reasoning.**

*27. LM*

*28.LP*

*29.LQ*

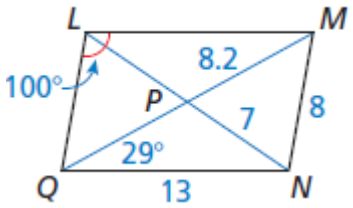
*30.MQ*

*31. $m\angle LMN$*

*32. $m\angle NQL$*

*33. $m\angle MNQ$*

*34. $m\angle LMQ$*




36. $\angle J$ and $\angle K$ are consecutive angles in a parallelogram, $m\angle J = (3x + 7)°$, and $m\angle K = (5x - 11)°$. Find the measure of each angle.

37. The sides of $\square MNPQ$ are represented by the expressions below. Sketch $\square MNPQ$ and find its perimeter.

$MQ = -2x + 37$ $\quad QP = y + 14$

$NP = x - 5$ $\quad MN = 4y + 5$

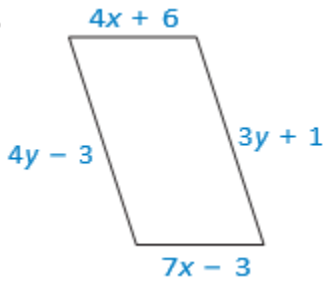
**Use the given method to determine whether the quadrilateral with the given vertices is a parallelogram.**

15. Find the slopes of all four sides: $J(-4, -1)$, $K(-7, -4)$, $L(2, -10)$, $M(5, -7)$.

16. Find the lengths of all four sides: $P(2, 2)$, $Q(1, -3)$, $R(-4, 2)$, $S(-3, 7)$.

In Exercises 9–12, find the values of $x$ and $y$ that make the quadrilateral a parallelogram.

18.

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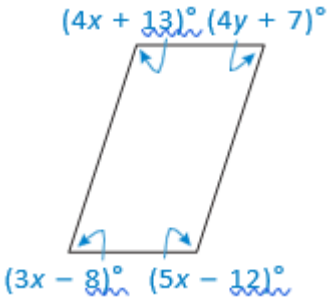


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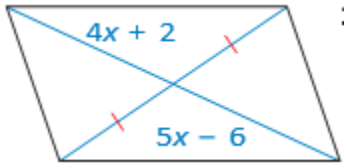


21.