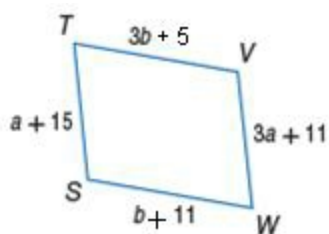


6-2 Parallelograms

ALGEBRA Find the value of each variable in each parallelogram.



18.

SOLUTION:

Opposite sides of a parallelogram are congruent. So,
 $3b + 5 = b + 11$ and $a + 15 = 3a + 11$.

Solve for a .

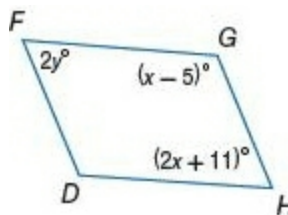
$$\begin{aligned} a + 15 &= 3a + 11 \\ -2a &= -4 \\ a &= 2 \end{aligned}$$

Solve for b .

$$\begin{aligned} 3b + 5 &= b + 11 \\ 2b &= 6 \\ b &= 3 \end{aligned}$$

ANSWER:

$$a = 2, b = 3$$



19.

SOLUTION:

Consecutive angles in a parallelogram are supplementary. So, $(x - 5) + (2x + 11) = 180$.

Solve for x .

$$\begin{aligned} (x - 5) + (2x + 11) &= 180 \\ x - 5 + 2x + 11 &= 180 \\ 3x + 6 &= 180 \\ 3x &= 174 \\ x &= 58 \end{aligned}$$

Substitute $x = 58$ in $m\angle H$.

$$\begin{aligned} m\angle H &= 2x + 11 \\ &= 2(58) + 11 \\ &= 116 + 11 \\ &= 127 \end{aligned}$$

Opposite angles of a parallelogram are congruent. So,
 $m\angle F = m\angle H$.

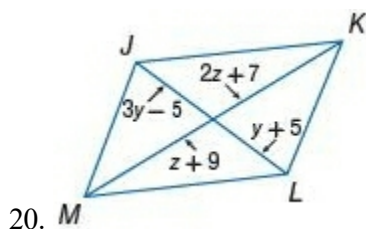
Substitute.

$$\begin{aligned} 2y &= 127 \\ y &= 63.5 \end{aligned}$$

ANSWER:

$$x = 58, y = 63.5$$

6-2 Parallelograms



SOLUTION:

Diagonals of a parallelogram bisect each other. So,
 $2z + 7 = z + 9$ and $3y - 5 = y + 5$.

Solve for z .

$$\begin{aligned} 2z + 7 &= z + 9 \\ z &= 2 \end{aligned}$$

Solve for y .

$$\begin{aligned} 3y - 5 &= y + 5 \\ 2y &= 10 \\ y &= 5 \end{aligned}$$

ANSWER:

$$z = 2, y = 5$$

COORDINATE GEOMETRY Find the coordinates of the intersection of the diagonals of $\square WXYZ$ with the given vertices.

21. $W(-1, 7)$, $X(8, 7)$, $Y(6, -2)$, $Z(-3, -2)$

SOLUTION:

Since the diagonals of a parallelogram bisect each other, their intersection point is the midpoint of \overline{WY} or the midpoint of \overline{XZ} . Find the midpoint of \overline{WY} . Use the Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$

Substitute.

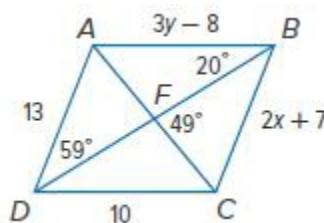
$$\left(\frac{-1 + 6}{2}, \frac{7 + (-2)}{2} \right) = (2.5, 2.5)$$

The coordinates of the intersection of the diagonals of parallelogram $WXYZ$ are $(2.5, 2.5)$.

ANSWER:

$$(2.5, 2.5)$$

ALGEBRA Use $\square ABCD$ to find each measure or value.



34. $m\angle DAC$

SOLUTION:

Since vertical angles are congruent,
 $m\angle AFD = m\angle BFC = 49$.

The sum of the measures of interior angles in a triangle is 180.

$$\text{Here, } m\angle AFD + m\angle DAF + m\angle ADF = 180.$$

Substitute.

$$\begin{aligned} 49 + m\angle DAF + 59 &= 180 \\ m\angle DAF + 108 &= 180 \\ m\angle DAF &= 72 \end{aligned}$$

$\angle DAF$ and $\angle DAC$ represent the same angle. So,
 $m\angle DAC = 72$.

ANSWER:

$$72$$

6-2 Parallelograms

46. The park near Karla's home is shaped like a parallelogram, as shown in the figure. Side \overline{JK} is 3 times as long as side \overline{KL} , and the perimeter of the park is 1200 feet.

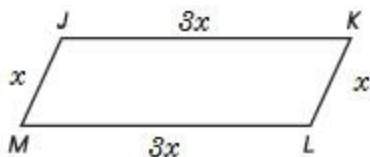


What is the length of \overline{KL} ?

- A 450 ft
- B 400 ft
- C 300 ft
- D 150 ft

SOLUTION:

Since \overline{JK} is three times as long as \overline{KL} , if the length of \overline{KL} is x , then the length of \overline{JK} is $3x$. The opposite sides of a parallelogram are congruent, therefore we can label all four sides of the parallelogram as shown in the figure below.



To find the perimeter, add up all the sides of the parallelogram or use the formula $2\ell + 2w = P$.

$$\begin{aligned} 2(3x) + 2(x) &= 1200 && \text{Substitution} \\ 6x + 2x &= 1200 && \text{Multiply} \\ 8x &= 1200 && \text{Add like terms.} \\ x &= 150 && \text{Divide both sides by 8} \end{aligned}$$

$KL = 150$ ft, so the correct answer is choice D.

ANSWER:

D

47. In parallelogram $ABCD$, $\angle A$ and $\angle B$ are consecutive angles. The measure of $\angle A$ is 40 more than the measure of $\angle B$. What is the measure of $\angle A$?

- A 65
- B 70
- C 110
- D 140

SOLUTION:

The measure of $\angle A$ is 40 degrees more than the measure of $\angle B$, so let $m\angle B = x$ and $m\angle A = x + 40$. Consecutive angles of a parallelogram are supplementary. Therefore, $m\angle A + m\angle B = 180$.

$$\begin{aligned} x + x + 40 &= 180 && \text{Substitution} \\ 2x + 40 &= 180 && \text{Combine like terms} \\ 2x &= 140 && \text{Subtract 40 from each side.} \\ x &= 70 && \text{Simplify.} \end{aligned}$$

The measure of $\angle A$ is 40 more than the measure of $\angle B$, so $m\angle A = 70 + 40 = 110$.

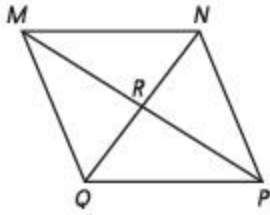
The correct answer is choice C.

ANSWER:

C

6-2 Parallelograms

48. In the figure, quadrilateral $MNPQ$ is a parallelogram. Which of the following statements about the figure must be true?



- I. $\angle MNP \cong \angle PQM$
- II. $\overline{MR} \cong \overline{PR}$
- III. $\overline{MQ} \cong \overline{MN}$

- A I only
- B II only
- C III only
- D I and II only
- E I, II, and III

SOLUTION:

In a parallelogram, the opposite angles are congruent by *Theorem 6.4*. Therefore, I is always true.

Additionally, *Theorem 6.7* states that the diagonals bisect each other. So, II is always true. However, the consecutive sides of a parallelogram are not always congruent. Therefore, III is not always true. So, the correct answer is choice D.

ANSWER:

D