In Exercises 1–4, find each lettered angle measure.

1. 

2. 

3. 

4. 

5. Use a protractor to draw pentagon $ABCDE$ with $m\angle A = 85^\circ$, $m\angle B = 125^\circ$, $m\angle C = 110^\circ$, and $m\angle D = 70^\circ$. What is $m\angle E$? Measure it, and check your work by calculating.

6. One exterior angle of a regular polygon measures $10^\circ$. What is the measure of each interior angle? How many sides does the polygon have?

7. The sum of the measures of the interior angles of a regular polygon is $2340^\circ$. How many sides does the polygon have?

8. $ABCD$ is a square. $ABE$ is an equilateral triangle.

$x = ____$

9. $ABCDEF$ is a regular hexagon. $ABGH$ is a square.

$x = ____$

10. $ABCDE$ is a regular pentagon. $ABFG$ is a square.

$x = ____$

11. Find $m\angle HFD$. 

$\text{In Exercises 1–4, find each lettered angle measure.}$

$\text{5. Use a protractor to draw pentagon } ABCDE \text{ with } m\angle A = 85^\circ,$ $m\angle B = 125^\circ, m\angle C = 110^\circ, \text{ and } m\angle D = 70^\circ. \text{ What is } m\angle E? \text{ Measure it, and check your work by calculating.}$

$\text{6. One exterior angle of a regular polygon measures } 10^\circ. \text{ What is the measure of each interior angle? How many sides does the polygon have?}$

$\text{7. The sum of the measures of the interior angles of a regular polygon is } 2340^\circ. \text{ How many sides does the polygon have?}$

$\text{8. } ABCD \text{ is a square. } ABE \text{ is an equilateral triangle.}$

$x = ____$

$\text{9. } ABCDEF \text{ is a regular hexagon. } ABGH \text{ is a square.}$

$x = ____$

$\text{10. } ABCDE \text{ is a regular pentagon. } ABFG \text{ is a square.}$

$x = ____$

$\text{11. Find } m\angle HFD.$
Lesson 5.2 • Exterior Angles of a Polygon

In Exercises 1–3, find each lettered angle measure.

1. \( a = \_\_\_\_\_\_ \), \( b = \_\_\_\_\_\_ \)  
2. \( a = \_\_\_\_\_\_ \), \( b = \_\_\_\_\_\_ \)  
3. \( a = \_\_\_\_\_\_ \), \( b = \_\_\_\_\_\_ \), \( c = \_\_\_\_\_\_ \)

4. How many sides does a regular polygon have if each exterior angle measures \( 30^\circ \)?

5. How many sides does a polygon have if the sum of the measures of the interior angles is \( 3600^\circ \)?

6. If the sum of the measures of the interior angles of a polygon equals the sum of the measures of its exterior angles, how many sides does it have?

7. If the sum of the measures of the interior angles of a polygon is twice the sum of its exterior angles, how many sides does it have?

8. \( \overline{XT} \) is the side of an equilateral triangle. \( \overline{XS} \) is the side of a square. \( \overline{XP} \) is the side of a regular pentagon. \( \overline{XH} \) is the side of a regular hexagon. \( \overline{XO} \) is the side of a regular octagon.
   \[
   \begin{align*}
   m\angle TXS &= \_\_\_\_\_\_ \quad m\angle SXP &= \_\_\_\_\_\_ \\
   m\angle PXH &= \_\_\_\_\_\_ \quad m\angle HXO &= \_\_\_\_\_\_ \\
   m\angle OXY &= \_\_\_\_\_\_ 
   \end{align*}
   \]

9. If the number of sides of a regular polygon doubles, what happens to the measure of each exterior angle?

10. Find each lettered angle measure.

11. Construct an equiangular quadrilateral that is not regular.

12. Use a protractor and a ruler to draw a regular polygon.
Lesson 5.3 • Kite and Trapezoid Properties

In Exercises 1–4, find each lettered measure.

1. Perimeter = 116. $x = \underline{\ }$

![Diagram of a kite with angles 28° and 137°]

2. $x = \underline{\ }, y = \underline{\ }$

![Diagram of a trapezoid with angles 56° and 34°]

3. $x = \underline{\ }, y = \underline{\ }$

![Diagram of a trapezoid with angles 22° and 117°]

4. $x = \underline{\ }, y = \underline{\ }$

![Diagram of a trapezoid with angles 78° and 41°]

5. Construct an isosceles trapezoid given base $\overline{AB}$, $\angle B$, and distance between bases $XY$.

6. STOP is an isosceles trapezoid. What are the coordinates of $T$?

![Diagram of a trapezoid with vertices $P$, $O$, $S$, $T$, $0(0, 4)$, $O(8, 4)$, $S(-5, -5)$, and $T(\underline{\ }, \underline{\ })$]

7. KLMN is a kite. What are the coordinates of $N$?

![Diagram of a kite with vertices $L(-1, 1)$, $M(4, 4)$, $K(-2, -2)$, and $N(\underline{\ }, \underline{\ })$]

8. Perimeter $PQRS = 220$. $PS = \underline{\ }$

![Diagram of a trapezoid with vertices $S$, $R$, $Q$, and $P$]

9. $b = 2a + 1$. $a > \underline{\ }$

![Diagram of a kite with vertices $M$, $N$, $K$, and $L$]

10. Construct kite $ABCD$ with $\overline{AB}$, $\overline{BC}$, and $\overline{BD}$.

![Diagram of a kite with vertices $A$, $B$, $C$, and $D$]

11. Write a paragraph or flowchart proof of the Converse of the Isosceles Trapezoid Conjecture.
Lesson 5.4 • Properties of Midsegments

In Exercises 1–3, each figure shows a midsegment.

1. \( a = \) _____, \( b = \) _____,
   \( c = \) _____

2. \( x = \) _____, \( y = \) _____,
   \( z = \) _____

3. \( x = \) _____, \( y = \) _____,
   \( z = \) _____

4. \( a, b, \) and \( c \) are midpoints. Perimeter \( \triangle PQR = 132 \), \( RQ = 55 \), and \( PZ = 20 \).
   Perimeter \( \triangle XYZ = \) _____
   \( PQ = \) _____
   \( ZX = \) _____

5. \( MN \) is the midsegment. Find the coordinates of \( M \) and \( N \). Find the slopes of \( AB \) and \( MN \).

7. Find each measure, or write “cannot be determined.”
   \( DC = 68 \), \( AB = 44 \), \( BN = 15 \), and \( DM = 12 \).
   \( MN = \) _____
   Perimeter \( \triangle ABCD = \) _____
   \( MP = \) _____
   \( m\angle DON = \) _____
   \( DP = \) _____
   \( m\angle A + m\angle B = \) _____
   \( m\angle B + m\angle C = \) _____

8. \( M, N, \) and \( O \) are midpoints. What type of quadrilateral is \( AMNO \)? How do you know? Give a flowchart proof showing that \( \triangle ONC \cong \triangle MBN \).

9. Give a paragraph or flowchart proof.
   **Given:** \( \triangle PQR \) with \( PD = DF = FH = HR \)
   and \( QE = EG = GI = IR \)
   **Show:** \( HI \parallel FG \parallel DE \parallel PQ \)
Lesson 5.5 • Properties of Parallelograms

In Exercises 1–7, \(ABCD\) is a parallelogram.

1. Perimeter \(ABCD = \)_____
2. \(AO = 11,\) and \(BO = 7.\)
3. Perimeter \(ABCD = 46.\)

\[ AC = \_____,\ BD = \_____
\]

\[ AB = \_____,\ BC = \_____
\]

4. \(a = \_____,\ b = \_____,\ c = \_____
\]

5. Perimeter \(ABCD = 119,\) and \(BC = 24.\ AB = \_____
\]

6. \(a = \_____,\ b = \_____,\ c = \_____
\]

7. Perimeter \(ABCD = 16x - 12.\ AD = \_____
\]

8. If the diagonals of a quadrilateral are 15 cm and 9 cm, what is the perimeter of the quadrilateral formed by connecting the midpoints of the sides?

9. Construct a parallelogram with diagonals \(AC\) and \(BD.\)
   Is your parallelogram unique? If not, construct a different (noncongruent) parallelogram.

10. Ball B is struck at the same instant by two forces, \(\vec{F}_1\) and \(\vec{F}_2.\)
    Copy the figure and show the resultant force on the ball.

11. Find each lettered angle measure.

12. If the perimeter of a parallelogram is 132 cm, the longest possible length of a diagonal is less than _____.

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Lesson 5.6 • Properties of Special Parallelograms

1. PQRS is a rectangle and OS = 16.
   \[ OQ = \quad \]
   \[ m\angle QRS = \quad \]
   \[ SQ = \quad \]

2. KLMN is a square and NM = 8.
   \[ m\angle OKL = \quad \]
   \[ m\angle MOL = \quad \]
   \[ \text{Perimeter } KLMN = \quad \]

3. ABCD is a rhombus, AD = 11, and DO = 6.
   \[ OB = \quad \]
   \[ BC = \quad \]
   \[ m\angle AOD = \quad \]

4. Construct rectangle ABCD with diagonal \( \overline{AC} \) and \( \angle CAB \).

In Exercises 5–13, match each description with all the terms that fit it.

a. Trapezoid  
   c. Parallelogram  
   e. Kite  
   h. All quadrilaterals
b. Isosceles triangle  
   d. Rhombus  
   f. Rectangle  
   g. Square

5. _____ Diagonals bisect each other.
6. _____ Diagonals are perpendicular.
7. _____ Diagonals are congruent.
8. _____ Measures of interior angles sum to 360°.
9. _____ Opposite sides are congruent.
10. _____ Opposite angles are congruent.
11. _____ Both diagonals bisect angles.
12. _____ Diagonals are perpendicular bisectors of each other.
13. _____ Has exactly one pair of congruent sides.

In Exercises 14–17, determine whether quadrilateral ABCD with the given coordinates is a trapezoid, parallelogram, rectangle, or none of these.

14. \( A(4, 0), B(12, 4), C(10, 8), D(2, 4) \)
15. \( A(-5, -2), B(10, 3), C(6, 5), D(-3, 2) \)
16. \( A(-4, -1), B(0, -3), C(4, 0), D(-1, 5) \)
17. \( A(2, -6), B(8, -2), C(0, 4), D(-6, 0) \)
18. PQRS is a square. What are the coordinates of \( R \) and \( S \)?
Lesson 5.7 • Proving Quadrilateral Properties

Write or complete each flowchart proof.

1. **Given:** ABCD is a parallelogram and BP ≅ DQ
   **Show:** AC and PQ bisect each other
   **Flowchart Proof**
   - \( \angle APR \equiv \angle CQR \)
   - \( BP \equiv DQ \)
   - \( AB \equiv CD \)
   - Subtraction of congruent segments
   - AIA Conjecture
   - \( \triangle APR \equiv \underline{\text{_____}} \)
   - \( AR \equiv \underline{\text{_____}} \)
   - AC and QP bisect each other
   - Definition of bisect

2. **Given:** Dart ABCD with \( AB \equiv BC \) and \( CD \equiv AD \)
   **Show:** \( \angle A \equiv \angle C \)

3. Show that the diagonals of a rhombus divide the rhombus into four congruent triangles.

4. **Given:** Parallelogram ABCD with angle bisectors AX and CY
   **Show:** AXCY is a parallelogram

5. **Given:** Parallelogram ABCD, BY \perp AC, DX \perp AC
   **Show:** DX \equiv BY