

6-2

Properties of Parallelograms



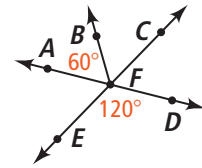
Vocabulary

Review

- Supplementary angles are two angles whose measures sum to .
- Suppose $\angle X$ and $\angle Y$ are *supplementary*. If $m\angle X = 75$, then $m\angle Y =$.

Underline the correct word to complete each sentence.

- A linear pair is complementary / supplementary.
- $\angle AFB$ and $\angle EFD$ at the right are complementary / supplementary.



Vocabulary Builder

consecutive (adjective) kun sek yoo tiv

Definition: Consecutive items follow one after another in uninterrupted order.

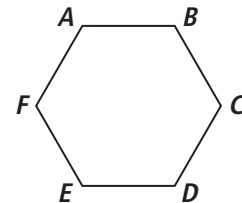
Math Usage: Consecutive angles of a polygon share a common side.

Examples: The numbers $-3, -2, -1, 0, 1, 2, 3, \dots$ are **consecutive** integers.

Non-Example: The letters A, B, C, E, P, \dots are NOT **consecutive** letters of the alphabet.

Use Your Vocabulary

Use the diagram at the right. Draw a line from each angle in Column A to a *consecutive* angle in Column B.



Column A

- $\angle A$
- $\angle C$
- $\angle D$

Column B

- $\angle F$
- $\angle E$
- $\angle D$

Write the next two *consecutive* months in each sequence.

8. January, February, March, April, ,

9. December, November, October, September, ,

Theorems 6-3, 6-4, 6-5, 6-6

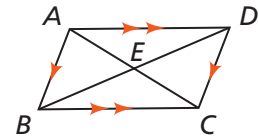
Theorem 6-3 If a quadrilateral is a parallelogram, then its opposite sides are congruent.

Theorem 6-4 If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.

Theorem 6-5 If a quadrilateral is a parallelogram, then its opposite angles are congruent.

Theorem 6-6 If a quadrilateral is a parallelogram, then its diagonals bisect each other.

Use the diagram at the right for Exercises 10–12.



10. Mark parallelogram $ABCD$ to model Theorem 6-3 and Theorem 6-5.

11. $\overline{AE} \cong$

12. $\overline{BE} \cong$



Problem 1 Using Consecutive Angles

Got It? Suppose you adjust the lamp so that $m\angle S$ is 86. What is $m\angle R$ in $\square PQRS$?

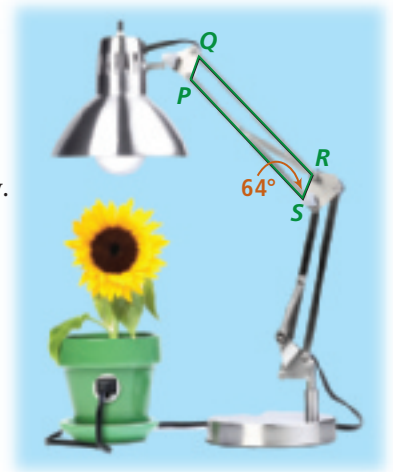
Underline the correct word or number to complete each statement.

13. $\angle R$ and $\angle S$ are adjacent / consecutive angles, so they are supplementary.

14. $m\angle R + m\angle S =$ 90 / 180

15. Now find $m\angle R$.

16. $m\angle R =$.



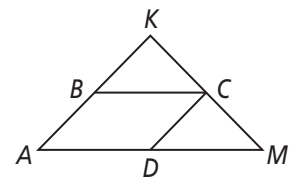
Problem 2 Using Properties of Parallelograms in a Proof

Got It? Use the diagram at the right.

Given: $\square ABCD$, $\overline{AK} \cong \overline{MK}$ Prove: $\angle BCD \cong \angle CMD$

17. Circle the classification of $\triangle AKM$.

- equilateral
 isosceles
 right



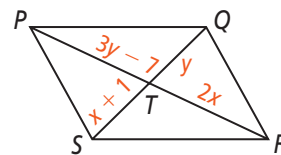
18. Complete the proof. The reasons are given.

Statements	Reasons
1) $\overline{AK} \cong$ <input type="text"/>	1) Given
2) $\angle DAB \cong$ <input type="text"/>	2) Angles opposite congruent sides of a triangle are congruent.
3) $\angle BCD \cong$ <input type="text"/>	3) Opposite angles of a parallelogram are congruent.
4) $\angle BCD \cong$ <input type="text"/>	4) Transitive Property of Congruence



Problem 3 Using Algebra to Find Lengths

Got It? Find the values of x and y in $\square PQRS$ at the right. What are PR and SQ ?



19. Circle the reason $\overline{PT} \cong \overline{TR}$ and $\overline{ST} \cong \overline{TQ}$.

Diagonals of a parallelogram bisect each other.

Opposite sides of a parallelogram are congruent.

\overline{PR} is the perpendicular bisector of \overline{QS} .

20. Cross out the equation that is NOT true.

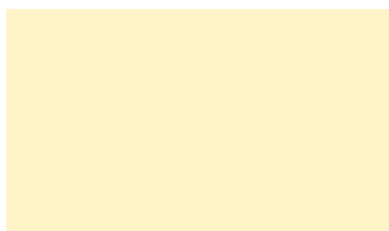
$3(x + 1) - 7 = 2x$

$y = x + 1$

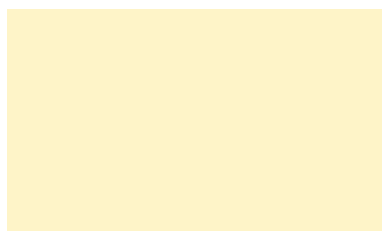
$3y - 7 = x + 1$

$3y - 7 = 2x$

21. Find the value of x .



22. Find the value of y .



23. Find PT .

$PT = 3(\quad) - 7$

$PT = (\quad) - 7$

$PT = (\quad)$

24. Find ST .

$ST = (\quad) + 1$

$ST = (\quad)$

25. Find PR .

$PR = 2(\quad)$

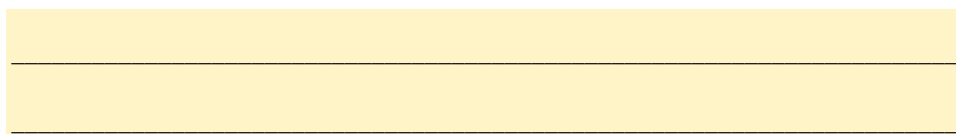
$PR = (\quad)$

26. Find SQ .

$SQ = 2(\quad)$

$SQ = (\quad)$

27. Explain why you do not need to find TR and TQ after finding PT and ST .



take note

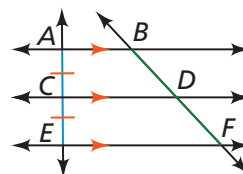
Theorem 6-7

If three (or more) parallel lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.

Use the diagram at the right for Exercises 28 and 29.

28. If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD} \parallel \overleftrightarrow{EF}$ and $\overline{AC} \cong \overline{CE}$, then $\overline{BD} \cong$ \square .

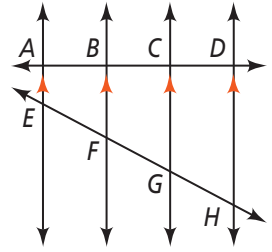
29. Mark the diagram to show your answer to Exercise 28.





Problem 4 Using Parallel lines and Transversals

Got It? In the figure at the right, $\overleftrightarrow{AE} \parallel \overleftrightarrow{BF} \parallel \overleftrightarrow{CG} \parallel \overleftrightarrow{DH}$. If $EF = FG = GH = 6$ and $AD = 15$, what is CD ?

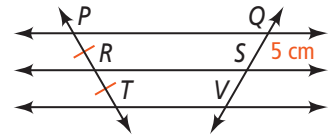


- 30. You know that the parallel lines cut off congruent segments on transversal .
- 31. By Theorem 6-7, the parallel lines also cut off congruent segments on .
- 32. $AD = AB + BC +$ by the Segment Addition Postulate.
- 33. $AB =$ $= CD$, so $AD =$ $\cdot CD$. Then $CD =$ $\cdot AD$.
- 34. You know that $AD = 15$, so $CD =$ $\cdot 15 =$.



Lesson Check • Do you UNDERSTAND?

Error Analysis Your classmate says that $QV = 10$. Explain why the statement may not be correct.



- 35. Place a \checkmark in the box if you are given the information. Place an \times if you are not given the information.

- three lines cut by two transversals
- three parallel lines cut by two transversals
- congruent segments on one transversal

- 36. What needs to be true for QV to equal 10?

- 37. Explain why your classmate's statement may not be correct.



Math Success

Check off the vocabulary words that you understand.

- parallelogram
- opposite sides
- opposite angles
- consecutive angles

Rate how well you *understand parallelograms*.

