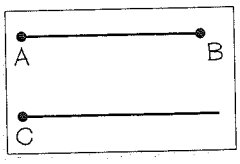
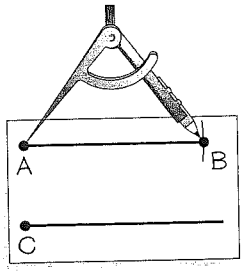
ACTIVITY
Construction

Copy a Segment

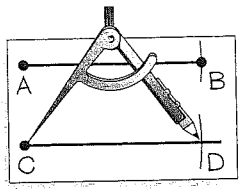
Use the following steps to construct a segment that is congruent to $\overline{AB}$.



1 Use a straightedge to draw a segment longer than $\overline{AB}$. Label the point C on the new segment.



2 Set your compass at the length of $\overline{AB}$.



3 Place the compass point at C and mark a second point, D, on the new segment. $\overline{CD}$ is congruent to $\overline{AB}$.

You will practice copying a segment in Exercises 12–15. It is an important construction because copying a segment is used in many constructions throughout this course.

GUIDED PRACTICE

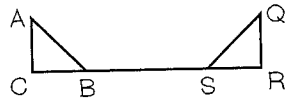
Vocabulary Check ✓

1. An example of the Symmetric Property of Segment Congruence is "If $\overline{AB} \cong$ __?__, then $\overline{CD} \cong$ __?__."

Concept Check ✓

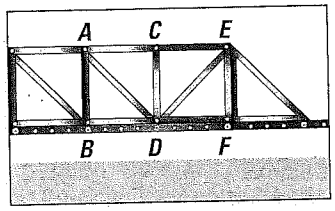
2. **ERROR ANALYSIS** In the diagram below, $\overline{CB} \cong \overline{SR}$ and $\overline{CB} \cong \overline{QR}$. Explain what is wrong with Michael's argument.

~~Because $\overline{CB} \cong \overline{SR}$ and $\overline{CB} \cong \overline{QR}$, then $\overline{CB} \cong \overline{AC}$ by the Transitive Property of Segment Congruence.~~



Skill Check ✓

BRIDGES The diagram below shows a portion of a trestle bridge, where $\overline{BF} \perp \overline{CD}$ and D is the midpoint of $\overline{BF}$.



3. Give a reason why $\overline{BD}$ and $\overline{FD}$ are congruent.
4. Are $\angle CDE$ and $\angle FDE$ complementary? Explain.
5. If $\overline{CE}$ and $\overline{BD}$ are congruent, explain why $\overline{CE}$ and $\overline{FD}$ are congruent.

PRACTICE AND APPLICATIONS

STUDENT HELP

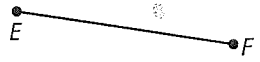
Extra Practice to help you master skills is on p. 806.

PROVING THEOREM 2.1 **Copy and complete the proof for two of the cases of the Properties of Segment Congruence Theorem.**

6. Reflexive Property of Segment Congruence

GIVEN ▸ EF is a line segment

PROVE ▸ $\overline{EF} \cong \overline{EF}$

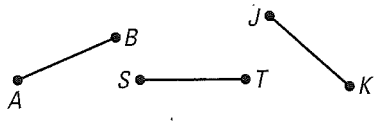


Statements	Reasons
1. $EF = EF$	1. ?
2. ?	2. Definition of congruent segments

7. Transitive Property of Segment Congruence

GIVEN ▸ $\overline{AB} \cong \overline{JK}$, $\overline{JK} \cong \overline{ST}$

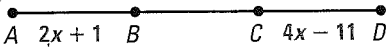
PROVE ▸ $\overline{AB} \cong \overline{ST}$



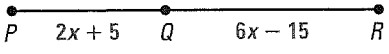
Statements	Reasons
1. $\overline{AB} \cong \overline{JK}$, $\overline{JK} \cong \overline{ST}$	1. ?
2. $AB = JK$, $JK = ST$	2. ?
3. $AB = ST$	3. ?
4. $\overline{AB} \cong \overline{ST}$	4. ?

USING ALGEBRA **Solve for the variable using the given information. Explain your steps.**

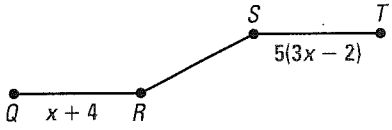
8. GIVEN ▸ $\overline{AB} \cong \overline{BC}$, $\overline{CD} \cong \overline{BC}$



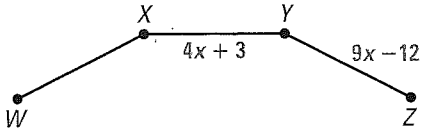
9. GIVEN ▸ $PR = 46$



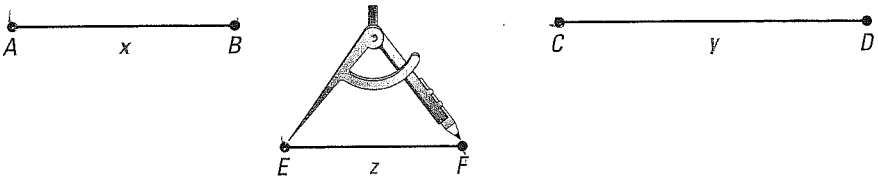
10. GIVEN ▸ $\overline{ST} \cong \overline{SR}$, $\overline{QR} \cong \overline{SR}$



11. GIVEN ▸ $\overline{XY} \cong \overline{WX}$, $\overline{YZ} \cong \overline{WX}$



CONSTRUCTION **In Exercises 12–15, use the segments, along with a straightedge and compass, to construct a segment with the given length.**



12. $x + y$ **13.** $y - z$ **14.** $3x - z$ **15.** $z + y - 2x$

STUDENT HELP

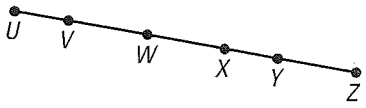
HOMEWORK HELP

Example 1: Exs. 6, 7

Example 2: Exs. 16–18

Example 3: Exs. 16–18

16. **DEVELOPING PROOF** Write a complete proof by rearranging the reasons listed on the pieces of paper.



GIVEN ▸ $\overline{UV} \cong \overline{XY}$, $\overline{VW} \cong \overline{WX}$, $\overline{WX} \cong \overline{YZ}$

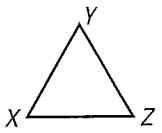
PROVE ▸ $\overline{UW} \cong \overline{XZ}$

Statements	Reasons
1. $\overline{UV} \cong \overline{XY}$, $\overline{VW} \cong \overline{WX}$, $\overline{WX} \cong \overline{YZ}$	Transitive Property of Segment Congruence
2. $\overline{VW} \cong \overline{YZ}$	Addition property of equality
3. $UV = XY$, $VW = YZ$	Definition of congruent segments
4. $UV + VW = XY + YZ$	Given
5. $UV + VW = UW$, $XY + YZ = XZ$	Segment Addition Postulate
6. $UW = XZ$	Definition of congruent segments
7. $\overline{UW} \cong \overline{XZ}$	Substitution property of equality

TWO-COLUMN PROOF **Write a two-column proof.**

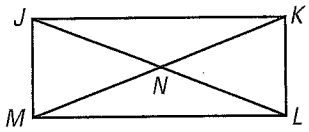
17. **GIVEN** ▸ $XY = 8$, $XZ = 8$, $\overline{XY} \cong \overline{ZY}$

PROVE ▸ $\overline{XZ} \cong \overline{ZY}$

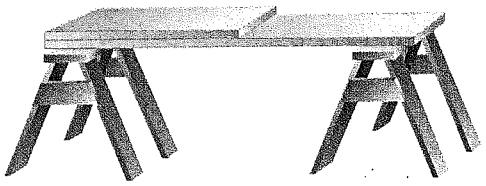


18. **GIVEN** ▸ $\overline{NK} \cong \overline{NL}$, $NK = 13$

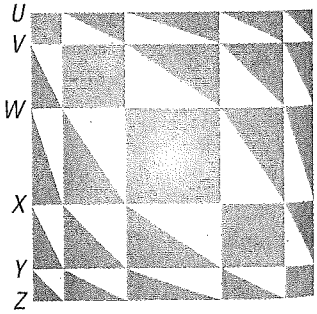
PROVE ▸ $NL = 13$



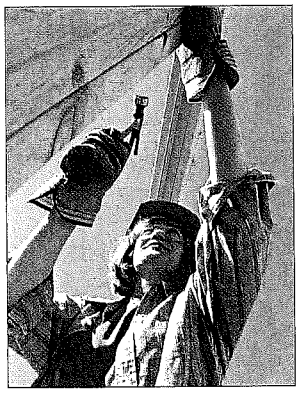
19. **CARPENTRY** You need to cut ten wood planks that are the same size. You measure and cut the first plank. You cut the second piece, using the first plank as a guide, as in the diagram below. The first plank is put aside and the second plank is used to cut a third plank. You follow this pattern for the rest of the planks. Is the last plank the same length as the first plank? Explain.



20. **OPTICAL ILLUSION** To create the illusion, a special grid was used. In the grid, corresponding row heights are the same measure. For instance, $\overline{UV}$ and $\overline{ZY}$ are congruent. You decide to make this design yourself. You draw the grid, but you need to make sure that the row heights are the same. You measure $\overline{UV}$, $\overline{UW}$, $\overline{ZY}$, and $\overline{ZX}$. You find that $\overline{UV} \cong \overline{ZY}$ and $\overline{UW} \cong \overline{ZX}$. Write an argument that allows you to conclude that $\overline{VW} \cong \overline{YX}$.



FOCUS ON CAREERS

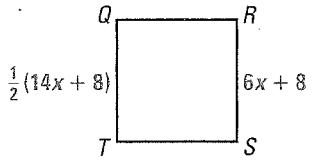


REAL LIFE **CARPENTRY**
For many projects, carpenters need boards that are all the same length. For instance, equally-sized boards in the house frame above insure stability.

INTERNET **CAREER LINK**
www.mcdougallittell.com

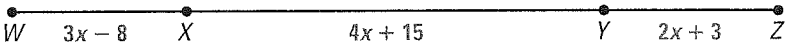
Test Preparation

21. MULTIPLE CHOICE In $QRST$, $\overline{QT} \cong \overline{TS}$ and $\overline{RS} \cong \overline{TS}$. What is x?



Ⓐ 1 Ⓑ 4 Ⓒ 12 Ⓓ 16 Ⓔ 32

22. MULTIPLE CHOICE In the figure shown below, $\overline{WX} \cong \overline{YZ}$. What is the length of $\overline{XZ}$?



Ⓐ 25 Ⓑ 34 Ⓒ 59 Ⓓ 60 Ⓔ 84

★ Challenge

REPRESENTING SEGMENT LENGTHS In Exercises 23–26, suppose point *T* is the midpoint of $\overline{RS}$ and point *W* is the midpoint of $\overline{RT}$. If $\overline{XY} \cong \overline{RT}$ and $\overline{TS}$ has a length of *z*, write the length of the segment in terms of *z*.

23. $\overline{RT}$ **24.** $\overline{XY}$ **25.** $\overline{RW}$ **26.** $\overline{WT}$

27. CRITICAL THINKING Suppose M is the midpoint of $\overline{AB}$, P is the midpoint of $\overline{AM}$, and Q is the midpoint of $\overline{PM}$. If a and b are the coordinates of points A and B on a number line, find the coordinates of P and Q in terms of a and b.

EXTRA CHALLENGE
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MIXED REVIEW

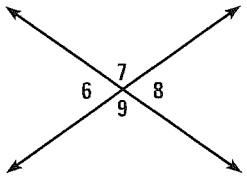
FINDING COUNTEREXAMPLES Find a counterexample that shows the statement is false. (Review 1.1)

28. For every number n, $2^n > n + 1$.

29. The sum of an even number and an odd number is always even.

30. If a number is divisible by 5, then it is divisible by 10.

FINDING ANGLE MEASURES In Exercises 31–34, use the diagram to find the angle measure. (Review 1.6 for 2.6)



31. If $m\angle 6 = 64°$, then $m\angle 7 =$ ___?___.

32. If $m\angle 8 = 70°$, then $m\angle 6 =$ ___?___.

33. If $m\angle 9 = 115°$, then $m\angle 8 =$ ___?___.

34. If $m\angle 7 = 108°$, then $m\angle 8 =$ ___?___.

35. Write the contrapositive of the conditional statement, "If Matthew wins this wrestling match, then he will win first place." (Review 2.1)

36. Is the converse of a true conditional statement always true? Explain. (Review 2.1)

USING SYMBOLIC NOTATION Let *p* be "the car is in the garage" and let *q* be "Mark is home." Write the statement in words and symbols. (Review 2.3)

37. The conditional statement $p \rightarrow q$

38. The converse of $p \rightarrow q$

39. The inverse of $p \rightarrow q$

40. The contrapositive of $p \rightarrow q$