4-7 Using Corresponding Parts of Congruent Triangles

What You'll Learn

- To identify congruent overlapping triangles
- To prove two triangles congruent by first proving two other triangles congruent

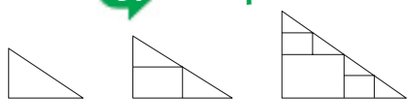
. . . And Why

To identify overlapping triangles in scaffolding, as in Example 1

Check Skills You'll Need

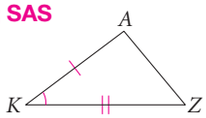
GO for Help Lessons 1-1 and 4-3

1. How many triangles will the next two figures in this pattern have? **15; 31**

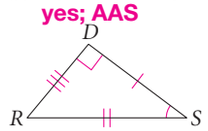


2. Can you conclude that the triangles are congruent? Explain.

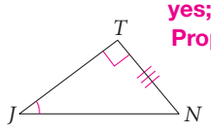
a. $\triangle AZK$ and $\triangle DRS$ **yes; SAS**



b. $\triangle SDR$ and $\triangle JTN$ **yes; AAS**



c. $\triangle ZKA$ and $\triangle NJT$ **yes; Trans. Prop. of ≅**



1 Using Overlapping Triangles in Proofs

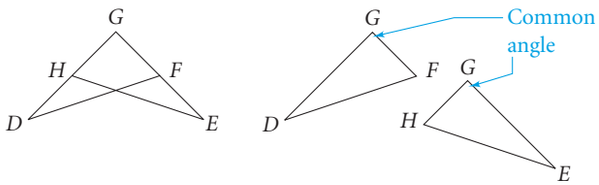
Vocabulary Tip

Overlapping triangles share part or all of one or more sides.

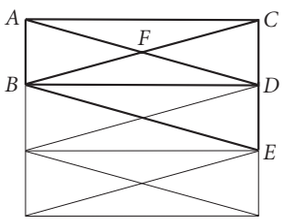
Some triangle relationships are difficult to see because the triangles overlap. Overlapping triangles may have a common side or angle. You can simplify your work with overlapping triangles by separating and redrawing the triangles.

1 EXAMPLE Identifying Common Parts

Separate and redraw $\triangle DFG$ and $\triangle EHG$. Identify the common angle.



Quick Check



1 Engineering The diagram at the left shows triangles from the scaffolding that workers used when they repaired and cleaned the Statue of Liberty.

a. Name the common side in $\triangle ADC$ and $\triangle BCD$. **$\overline{CD}$**

b. Name another pair of triangles that share a common side. Name the common side. **Answers may vary. Sample: $\triangle ABD$ and $\triangle CBD$; $\overline{BD}$**

In overlapping triangles, a common side or angle is congruent to itself by the Reflexive Property of Congruence.

Differentiated Instruction Solutions for All Learners

Special Needs L1

For Example 3, help students recognize that they cannot prove $\triangle GED \cong \triangle JEB$ unless they can first prove $\triangle AED \cong \triangle CEB$. By proving $\triangle AED \cong \triangle CEB$, students identify other pairs of congruent parts.

learning style: visual

Below Level L2

Use separable transparencies on an overhead projector and different-colored pens to help students distinguish overlapping triangles and congruent corresponding parts.

learning style: visual

4-7

1. Plan

Objectives

1 To identify congruent overlapping triangles
2 To prove two triangles congruent by first proving two other triangles congruent

Examples

1 Identifying Common Parts
2 Using Common Parts
3 Using Two Pairs of Triangles
4 Separating Overlapping Triangles

Professional Development

Math Background

The use of CPCTC in overlapping triangles is fundamental to the investigation of quadrilaterals. For example, the proof that the diagonals of a rectangle are congruent follows easily from using the SAS Postulate to prove that the overlapping right triangles formed by the diagonals are congruent.

More Math Background: p. 196D

Lesson Planning and Resources

See p. 196E for a list of the resources that support this lesson.

PowerPoint

Bell Ringer Practice

Check Skills You'll Need

For intervention, direct students to:

Planning a Proof
Lesson 4-3: Example 3
Extra Skills, Word Problems, Proof Practice, Ch. 4

Using the HL Theorem
Lesson 4-6: Examples 2 and 3
Extra Skills, Word Problems, Proof Practice, Ch. 4

2. Teach

Guided Instruction

1 EXAMPLE Teaching Tip

Marking the congruent parts of triangles is difficult when triangles overlap. By redrawing separate triangles, the congruent parts can be marked more easily.

2 EXAMPLE Teaching Tip

Both plan and proof are given to help students focus on the gradual development of a proof.

Math Tip

Redrawing overlapping triangles can clarify relationships or make them even more confusing, depending on which overlapping triangles are redrawn. Point out that students may have to try several ideas before they find a good proof plan.

Additional Examples

1 Name the parts of their sides that $\triangle DFG$ and $\triangle EHG$ share in Example 1. ***HG* and *FG***

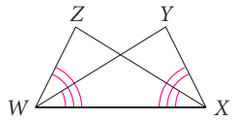
2 Write a Plan for Proof for Example 2 that does not use overlapping triangles. **Label the intersection of $\overline{ZX}$ and $\overline{WY}$ point *M*. $\overline{ZW} \cong \overline{YX}$ by CPCTC if $\triangle ZWM \cong \triangle YXM$. Show this congruence by ASA.**

Proof **2 EXAMPLE Using Common Parts**

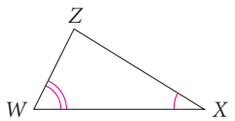
Given: $\angle ZXW \cong \angle YWX, \angle ZWX \cong \angle YXW$

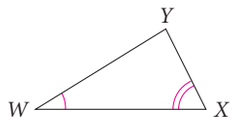
Write a plan and then a proof to show that the two "outside" segments are congruent.

Prove: $\overline{ZW} \cong \overline{YX}$



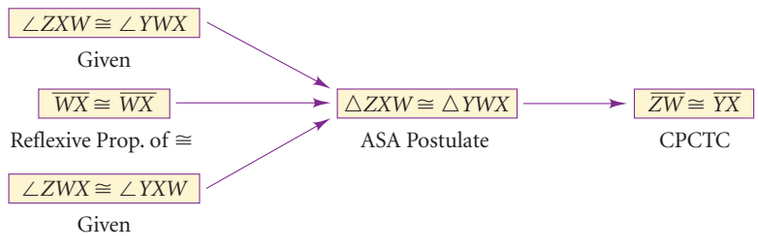
Plan: First, separate the overlapping triangles. $\overline{ZW} \cong \overline{YX}$ by CPCTC if $\triangle ZXW \cong \triangle YWX$. Show this congruence by ASA.





Proof:

2. 1. $\triangle ACD \cong \triangle BDC$ (Given)
2. $\angle ADC \cong \angle BCD$ (CPCTC)
3. $\overline{CE} \cong \overline{DE}$ (If base $\measuredangle$ are $\cong$, the opp. sides are $\cong$.)

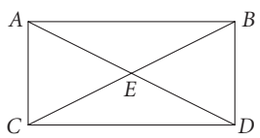


Quick Check

2 Write a plan and then a proof.

Given: $\triangle ACD \cong \triangle BDC$

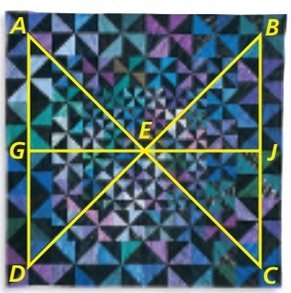
Prove: $\overline{CE} \cong \overline{DE}$ **See left.**



2 Using Two Pairs of Congruent Triangles

Sometimes you can prove one pair of triangles congruent and then use their congruent corresponding parts to prove another pair congruent.

Proof **3 EXAMPLE Using Two Pairs of Triangles**



Given: In the quilt, E is the midpoint of $\overline{AC}$ and $\overline{DB}$.

Prove: $\triangle GED \cong \triangle JEB$

Write a plan and then a proof.

Plan: $\triangle GED \cong \triangle JEB$ by ASA if $\angle D \cong \angle B$. These angles are congruent by CPCTC if $\triangle AED \cong \triangle CEB$. These triangles are congruent by SAS.

Proof: E is the midpoint of $\overline{AC}$ and $\overline{DB}$, so $\overline{AE} \cong \overline{CE}$ and $\overline{DE} \cong \overline{BE}$. $\angle AED \cong \angle CEB$ because vertical angles are congruent. Therefore, $\triangle AED \cong \triangle CEB$ by SAS. $\angle D \cong \angle B$ by CPCTC, and $\angle GED \cong \angle JEB$ because they are vertical angles. Therefore, $\triangle GED \cong \triangle JEB$ by ASA.

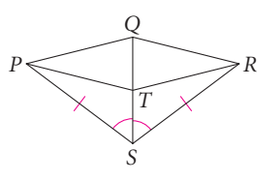
Quick Check

3 Write a plan and then a proof.

Given: $\overline{PS} \cong \overline{RS}, \angle PSQ \cong \angle RSQ$

Prove: $\triangle QPT \cong \triangle QRT$

See back of book.



Differentiated Instruction Solutions for All Learners

Advanced Learners L4
Have students copy the diagram in Example 2, drawing $\overline{ZY}$. Then have them prove that $\overline{ZY}$ and $\overline{WX}$ are parallel.

learning style: verbal

English Language Learners ELL
Some students may not understand the term *overlapping*. Use an overhead projector and transparencies with overlays to illustrate its meaning.

learning style: visual

When triangles overlap, you can keep track of information by drawing other diagrams that separate the overlapping triangles.

Proof **4 EXAMPLE** **Separating Overlapping Triangles**

Real-World Connection

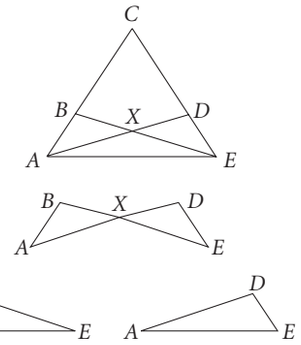
The Japanese paper-folding art of origami involves many overlapping triangles.

Given: $\overline{CA} \cong \overline{CE}$, $\overline{BA} \cong \overline{DE}$

Write a plan and then a proof to show that two small segments inside the triangle are congruent.

Prove: $\overline{BX} \cong \overline{DX}$

Plan: $\overline{BX} \cong \overline{DX}$ by CPCTC if $\triangle BXA \cong \triangle DXE$. This congruence holds by AAS if $\angle ABX \cong \angle EDX$. These are congruent by CPCTC in $\triangle BAE$ and $\triangle DEA$, which are congruent by SAS.



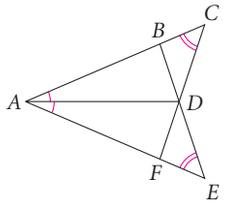
Proof:

Statements	Reasons
1. $\overline{BA} \cong \overline{DE}$	1. Given
2. $\overline{CA} \cong \overline{CE}$	2. Given
3. $\angle CAE \cong \angle CEA$	3. Isosceles Triangle Theorem
4. $\overline{AE} \cong \overline{AE}$	4. Reflexive Property of Congruence
5. $\triangle BAE \cong \triangle DEA$	5. SAS
6. $\angle ABE \cong \angle EDA$	6. CPCTC
7. $\angle BXA \cong \angle DXE$	7. Vertical angles are congruent.
8. $\triangle BXA \cong \triangle DXE$	8. AAS
9. $\overline{BX} \cong \overline{DX}$	9. CPCTC

Quick Check **4** Plan a proof. Separate the overlapping triangles in your plan. Then follow your plan and write a proof. **See margin.**

Given: $\angle CAD \cong \angle EAD, \angle C \cong \angle E$

Prove: $\overline{BD} \cong \overline{FD}$



EXERCISES

For more exercises, see *Extra Skill, Word Problem, and Proof Practice.*

Practice and Problem Solving

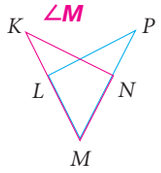
A Practice by Example

Example 1 (page 241)

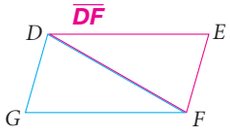
GO for Help

In each diagram, the red and blue triangles are congruent. Identify their common side or angle.

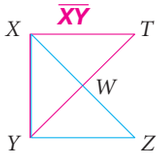
1. $\angle M$



2. $\overline{DF}$



3. $\overline{XY}$



Quick Check

4. 1. $\angle CAD \cong \angle EAD$; $\angle C \cong \angle E$ (Given)
   2. $\overline{AD} \cong \overline{AD}$ (Reflexive Prop. of $\cong$)
   3. $\triangle ACD \cong \triangle AED$ (AAS)
   4. $\overline{CD} \cong \overline{ED}$ (CPCTC)
   5. $\angle BDC \cong \angle FDE$ (Vert. $\measuredangle$ are $\cong$.)
   6. $\triangle BDC \cong \triangle FDE$ (ASA)
   7. $\overline{BD} \cong \overline{FD}$ (CPCTC)

Guided Instruction

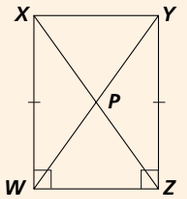
3 EXAMPLE Error Prevention

Students may think they can prove $\triangle GED \cong \triangle JEB$ directly from the information given. Discuss how proving $\triangle AED \cong \triangle CEB$ acts as a bridge from the Given to proving $\triangle GED \cong \triangle JEB$. Point out that a proof often involves finding such a bridge between ideas.

PowerPoint

Additional Examples

3 Write a paragraph proof.



Given: $\overline{XW} \cong \overline{YZ}$, $\angle XWZ$ and $\angle YZW$ are right angles.

Prove: $\triangle XPW \cong \triangle YPZ$ $\overline{XW} \cong \overline{YZ}$ (Given), $\angle XWZ \cong \angle YZW$ (right angles) and $\overline{WZ} \cong \overline{ZW}$ (Reflexive Prop.), so $\triangle XWZ \cong \triangle YZW$ by SAS. $\angle WXZ \cong \angle ZYW$ by CPCTC, $\angle XPW \cong \angle YPZ$ (vert. angles are $\cong$), and $\overline{XW} \cong \overline{YZ}$ (Given), so $\triangle XPW \cong \triangle YPZ$ by AAS.

4 Use the Given from Example 4 to write a two-column proof to show that $\angle CBE \cong \angle CDA$.

1. $\angle BCE \cong \angle DCA$ (Reflexive)
2. $\overline{CA} \cong \overline{CE}$, $\overline{BA} \cong \overline{DE}$ (Given)
3. $CA - BA = CE - DE$ (Subtraction Prop. of Equality)
4. $CA - BA = CB$, $CE - DE = CD$ (Seg. Add. Post.)
5. $CB = CD$ (Substitution)
6. $\overline{CB} \cong \overline{CD}$ (Def. of $\cong$)
7. $\triangle CBE \cong \triangle CDA$ (SAS)
8. $\angle CBE \cong \angle CDA$ (CPCTC)

Resources

- Daily Notetaking Guide 4-7 L3
- Daily Notetaking Guide 4-7—Adapted Instruction L1

Closure

Explain how CPCTC can be used in the middle of a proof. **Sometimes you can prove a pair of triangles congruent and then use CPCTC to prove another pair congruent.**

3. Practice

Assignment Guide

1 A B	1-9, 12-15
2 A B	10, 11, 16-22
C Challenge	23-25
Test Prep	26-30
Mixed Review	31-40

Homework Quick Check

To check students' understanding of key skills and concepts, go over Exercises 6, 10, 14, 19, 21.

Error Prevention!

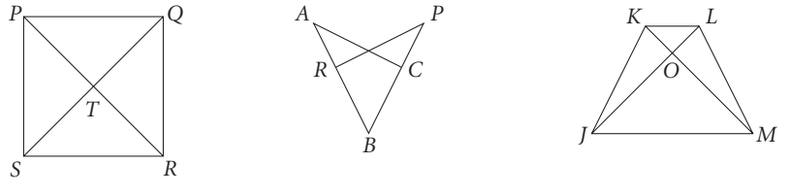
Exercise 7 In step b, identifying $\angle P$ using two different names may confuse students and prevent them from realizing that the Reflexive Property of Congruence applies. Ask: *Why is* $\angle$P *named in two ways?* **to show the order of the corresponding vertices in $\triangle TPQ$ and $\triangle RPV$**

Exercise 16 Students need to recognize that $\overline{SU} \cong \overline{VT}$ because the same quantity TU, is being added to the congruent segments $\overline{VU}$ and $\overline{ST}$.

Separate and redraw the indicated triangles. Identify any common angles or sides.

4. $\triangle PQS$ and $\triangle QPR$ **5.** $\triangle ACB$ and $\triangle PRB$ **6.** $\triangle JKL$ and $\triangle MLK$

4–6. See back of book.

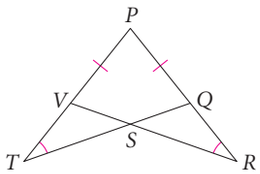


Example 2 (page 242)

7. Developing Proof Complete the flow proof.

Given: $\angle T \cong \angle R, \overline{PQ} \cong \overline{PV}$

Prove: $\angle PQT \cong \angle PVR$



$\angle T \cong \angle R$ — Given

$\angle TPQ \cong \angle RPV$ — Reflexive Prop. of $\cong$ b. ?

$\overline{PQ} \cong \overline{PV}$ — c. ? Given

$\triangle TPQ \cong \triangle RPV$ — d. ? AAS

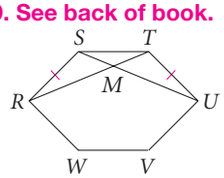
$\angle PQT \cong \angle PVR$ — e. ? CPCTC

Proof **Write a plan and then a proof.**

8. Given: $\overline{RS} \cong \overline{UT}, \overline{RT} \cong \overline{US}$

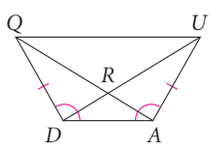
Prove: $\triangle RST \cong \triangle UTS$

8–9. See back of book.



9. Given: $\overline{QD} \cong \overline{UA}, \angle QDA \cong \angle UAD$

Prove: $\triangle QDA \cong \triangle UAD$

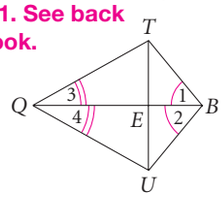


Examples 3, 4 (pages 242 and 243)

10. Given: $\angle 1 \cong \angle 2, \angle 3 \cong \angle 4$

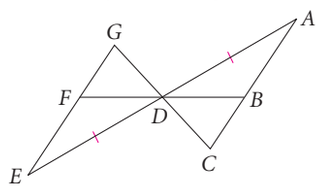
Prove: $\triangle QET \cong \triangle QEU$

10–11. See back of book.



11. Given: $\overline{AD} \cong \overline{ED}$, D is the midpoint of $\overline{BF}$.

Prove: $\triangle ADC \cong \triangle EDG$



12. 

13. 

B Apply Your Skills

Open-Ended **Draw the diagram described.**

12–15. Answers may vary. Samples are given.

12. Draw a vertical segment on your paper. On the right side of the segment draw two triangles that share the given segment as a common side. **See left.**

13. Draw two triangles that have a common angle. **See left.**

14. Draw two regular pentagons, each with its five diagonals. **a–b. See margin.**

a. In one, shade two triangles that share a common angle.

b. In the other, shade two triangles that share a common side.

15. Draw two regular hexagons and their diagonals. For these diagrams, do parts (a) and (b) of the preceding exercise. **See margin.**

GO Online Homework Help

Visit: PHSchool.com

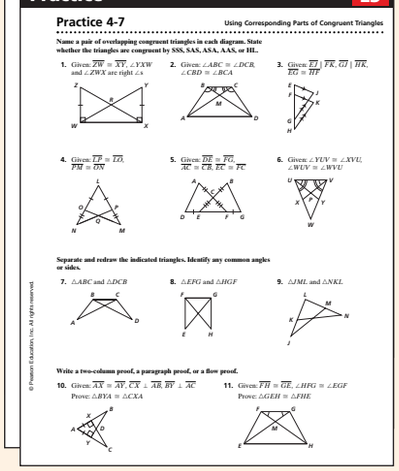
Web Code: aue-0407

14. a.  b. 

15. a.  b. 

Differentiated Instruction Resources

- GPS Guided Problem Solving L3
- Enrichment L4
- Reteaching L2
- Adapted Practice L1
- Practice L3


Practice 4-7 Using Corresponding Parts of Congruent Triangles

Name a pair of overlapping congruent triangles in each diagram. State whether the triangles are congruent by SSS, SAS, ASA, AAS, or HL.

1. Given: $\overline{ZW} \cong \overline{XY}$, $\angle YXW$ and $\angle ZWX$ are right $\angle$s
2. Given: $\angle ABC \cong \angle DCB$, $\angle CBD \cong \angle BCA$
3. Given: $\overline{EJ} \parallel \overline{FK}, \overline{GJ} \parallel \overline{HK}$, $\overline{FG} \cong \overline{HJ}$
4. Given: $\overline{LP} \cong \overline{LO}$, $\overline{PM} \cong \overline{ON}$
5. Given: $\overline{BE} \cong \overline{FL}$, $\overline{AC} \cong \overline{CB}$, $\overline{EC} \cong \overline{FC}$
6. Given: $\angle YUV \cong \angle XVU$, $\angle WUV \cong \angle WVU$

Separate and redraw the indicated triangles. Identify any common angles or sides.

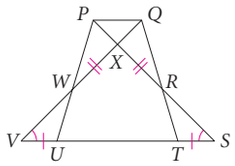
7. $\triangle ABC$ and $\triangle DCB$
8. $\triangle EFG$ and $\triangle HGF$
9. $\triangle JML$ and $\triangle NKL$

Write a two-column proof, a paragraph proof, or a flow proof.

10. Given: $\overline{AX} \cong \overline{AY}$, $\overline{CX} \perp \overline{AB}$, $\overline{BY} \perp \overline{AC}$ Prove: $\triangle BYA \cong \triangle CXA$
11. Given: $\overline{FH} \cong \overline{GE}$, $\angle HFG \cong \angle EGF$ Prove: $\triangle GEH \cong \triangle FHE$

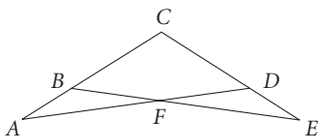
16. Multiple Choice In the diagram, $\angle V \cong \angle S$, $\overline{VU} \cong \overline{ST}$, and $\overline{PS} \cong \overline{QV}$. Which two triangles can you prove congruent by SAS? **B**

(A) $\triangle WVU \cong \triangle RST$
(B) $\triangle PSU \cong \triangle QVT$
(C) $\triangle PWX \cong \triangle QRX$
(D) none of these

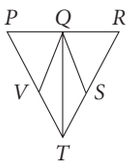


17. 1. $\overline{AC} \cong \overline{EC}$; $\overline{CB} \cong \overline{CD}$ (Given)
2. $\angle C \cong \angle C$ (Reflexive Prop. of $\cong$)
3. $\triangle ACD \cong \triangle ECB$ (SAS)
4. $\angle A \cong \angle E$ (CPCTC)

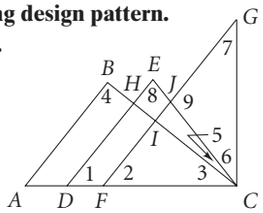
Proof **17. Given:** $\overline{AC} \cong \overline{EC}, \overline{CB} \cong \overline{CD}$
Prove: $\angle A \cong \angle E$ See left.



18. Given: $\overline{QT} \perp \overline{PR}$, $\overline{QT}$ bisects $\overline{PR}$, $\overline{QT}$ bisects $\angle VQS$.
Prove: $\overline{VQ} \cong \overline{SQ}$
See margin.



Clothes Design **The figure at the right is part of a clothing design pattern. In the figure, $\overline{AB} \parallel \overline{DE} \parallel \overline{FG}$, $\overline{AB} \perp \overline{BC}$, and $\overline{GC} \perp \overline{AC}$. $\triangle DEC$ is isosceles with base $\overline{DC}$, and $m\angle A = 56$.**



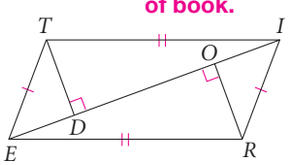
19. Find the measures of all the numbered angles in the figure. See margin.

20. $\overline{AB} \cong \overline{FC}$. Name two congruent triangles and tell how you can prove them congruent.
$\triangle ABC \cong \triangle FCG$; ASA

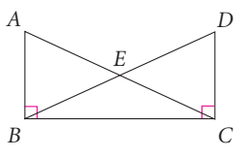
Real-World Connection

Careers A clothing designer must carefully measure angles and segments to create a sewing pattern.

Proof **21. Given:** $\overline{TE} \cong \overline{RI}$, $\overline{TI} \cong \overline{RE}$, $\angle TDI$ and $\angle ROE$ are right $\measuredangle$.
Prove: $\overline{TD} \cong \overline{RO}$ 21–22. See back of book.



22. Given: $\overline{AB} \perp \overline{BC}$, $\overline{DC} \perp \overline{BC}$, $\overline{AC} \cong \overline{DB}$
Prove: $\overline{AE} \cong \overline{DE}$



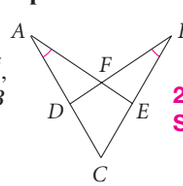
Challenge

23. Reasoning Draw a quadrilateral $ABCD$ with $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$, and its diagonals $\overline{AC}$ and $\overline{DB}$ intersecting at E. Label your diagram to indicate the parallel sides. $\overline{AD} \cong \overline{BC}$; $\overline{AB} \cong \overline{DC}$; $\overline{AE} \cong \overline{EC}$; $\overline{DE} \cong \overline{EB}$
a. List all the pairs of congruent segments that you can find in your diagram.
b. Writing Explain how you know that the segments you listed are congruent.

23b. Use $\overline{DB} \cong \overline{DB}$ (Refl. Prop.) and alt. int. $\measuredangle$ to show $\triangle ADB \cong \triangle CBD$ (ASA), $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$ (CPCTC). $\triangle AEB \cong \triangle CED$ (ASA) and $\triangle AED \cong \triangle CEB$ (ASA). Then $\overline{AE} \cong \overline{EC}$ and $\overline{DE} \cong \overline{EB}$ (CPCTC).

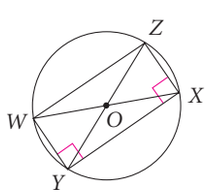
Proof **Name a pair of overlapping congruent triangles in each diagram. State whether the triangles are congruent by SSS, SAS, ASA, AAS, or HL. Plan and write a proof.**

24. Given: $\overline{AC} \cong \overline{BC}$, $\angle A \cong \angle B$



24–25. See margin.

25. Given: $\overline{WY} \perp \overline{YX}$, $\overline{ZX} \perp \overline{YX}$, $\overline{WX} \cong \overline{ZY}$



18. $\overline{PQ} \cong \overline{RQ}$ and $\angle PQT \cong \angle RQT$ by Def. of $\perp$ bisector. $\overline{QT} \cong \overline{QT}$ so $\triangle PQT \cong \triangle RQT$ by SAS. $\angle P \cong \angle R$ by CPCTC. $\overline{QT}$ bisects $\angle VQS$ so $\angle VQT \cong \angle SQT$ and $\angle PQT$ and $\angle RQT$ are both rt. $\measuredangle$. So $\angle VQP \cong \angle SQR$ since they are compl. of $\cong \measuredangle$. $\triangle PQV \cong \triangle RQS$ by ASA so $\overline{QV} \cong \overline{QS}$ by CPCTC.

19. $m\angle 1 = 56$; $m\angle 2 = 56$; $m\angle 3 = 34$; $m\angle 4 = 90$; $m\angle 5 = 22$; $m\angle 6 = 34$; $m\angle 7 = 34$; $m\angle 8 = 68$; $m\angle 9 = 112$

24. $\triangle ACE \cong \triangle BCD$ by ASA; $\overline{AC} \cong \overline{BC}$, $\angle A \cong \angle B$ (Given) $\angle C \cong \angle C$ (Reflexive Prop. of $\cong$) $\triangle ACE \cong \triangle BCD$ (ASA)

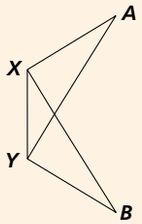
25. $\triangle WYX \cong \triangle ZXY$ by HL; $\overline{WY} \perp \overline{YX}$, $\overline{ZX} \perp \overline{YX}$, $\overline{WX} \cong \overline{ZY}$ (Given) $\angle WYX$ and $\angle ZXY$ are rt. $\measuredangle$ (Def. of $\perp$) $\overline{XY} \perp \overline{XY}$ (Reflexive Prop. of $\cong$) $\triangle WYX \cong \triangle ZXY$ (HL)

4. Assess & Reteach

PowerPoint

Lesson Quiz

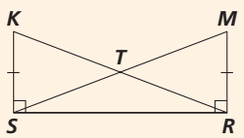
1. Identify any common sides and angles in $\triangle AXY$ and $\triangle BYX$.



$\overline{XY}$

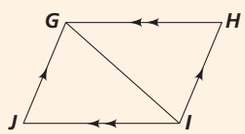
For Exercises 2 and 3, name a pair of congruent overlapping triangles. State the theorem or postulate that proves them congruent.

2.



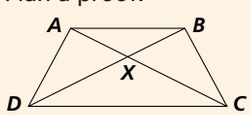
$\triangle KSR \cong \triangle MRS$; SAS

3.



$\triangle GHI \cong \triangle IJG$; ASA

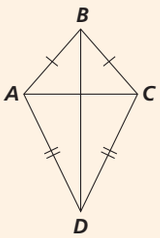
4. Plan a proof.



Given: $\overline{AC} \cong \overline{BD}$, $\overline{AD} \cong \overline{BC}$
Prove: $\overline{XD} \cong \overline{XC}$
$\overline{XD} \cong \overline{XC}$ by CPCTC if $\triangle DXA \cong \triangle CXB$. This congruence holds by AAS if $\triangle BAD \cong \triangle ABC$. Show $\triangle BAD \cong \triangle ABC$ by SSS.

Alternative Assessment

Using the diagram below, have partners work together to find all the pairs of congruent triangles. For each pair, they should write a paragraph proof that the triangles are congruent.



Test Prep

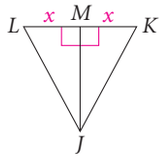
Resources

For additional practice with a variety of test item formats:

- Standardized Test Prep, p. 253
- Test-Taking Strategies, p. 248
- Test-Taking Strategies with Transparencies

Test Prep

Multiple Choice Use the diagram at the right for Exercises 26–28.



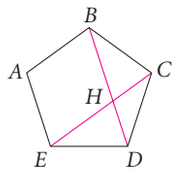
26. If $m\angle KJM = 25$, what is $m\angle LKJ$? **C**
A. 25 **B.** 30 **C.** 65 **D.** 85

27. If $m\angle KJM = 30$ and $x = 7.4$, what is the perimeter of $\triangle LKJ$? **F**
F. 44.4 **G.** 22.2 **H.** 14.8 **J.** 7.4

28. If $m\angle LJK = 47$, what is $m\angle LJM$? **A**
A. 23.5 **B.** 25 **C.** 43 **D.** 47

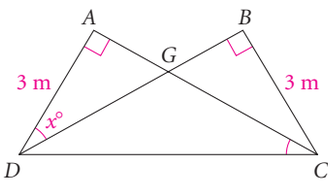
Short Response

29. The pentagon at the right is equilateral and equiangular.
a. What two triangles must be congruent to prove $\overline{HB} \cong \overline{HE}$?
b. Write a proof to show $\overline{HB} \cong \overline{HE}$.
a–b. See margin.



Extended Response

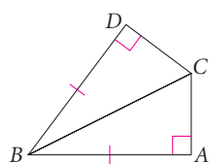
30. **a.** In the figure at the right, why is $\triangle ACD \cong \triangle BDC$? **a–e. See margin.**
b. Copy the figure. Mark each angle that has measure x.
c. What is the value of x? Explain how you found your answer.
d. What is $m\angle AGB$?
e. What is CD? Explain your answer.



Mixed Review

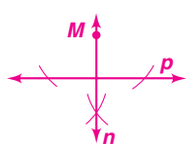
Lesson 4-6 GO for Help

31. Complete the plan for a proof.



Given: $\angle A$ and $\angle D$ are right angles, $\overline{AB} \cong \overline{DB}$.
Prove: $\triangle ABC \cong \triangle DBC$
Plan: $\triangle ABC$ and $\triangle DBC$ are **a.** right triangles with legs that are given to be **b.** ?. The hypotenuse is congruent to itself by the **c.** Reflexive Property of Congruence. $\triangle ABC \cong \triangle DBC$ by the **d.** HL Theorem.

32.



Lesson 3-8 **Constructions** **Draw a line p and a point M not on p. Construct the described line.**

32. line n through M so that $n \perp p$ See left.
33. line r through M so that $r \parallel p$ See margin.

Lesson 3-6 **Write an equation in point-slope form of the line that contains the given point and has the given slope.**

34. $P(2, -6)$; slope $\frac{1}{2}$ $y + 6 = \frac{1}{2}(x - 2)$
35. $Q(0, 5)$; slope 1 $y - 5 = 1(x - 0)$
36. $R(-3, 6)$; slope -2 $y - 6 = -2(x + 3)$
37. $S(0, 0)$; slope $-\frac{1}{3}$ $y - 0 = -\frac{1}{3}(x - 0)$

Write an equation in point-slope form of the line that contains the given points.

38–40. Eqs. may vary, depending on pt. chosen.

38. $A(1, 4), B(0, 2)$ $y - 4 = 2(x - 1)$
39. $E(3, -5), F(6, 0)$ $y + 5 = \frac{5}{3}(x - 3)$
40. $X(-4, -3), Y(2, -8)$ $y + 3 = -\frac{5}{6}(x + 4)$

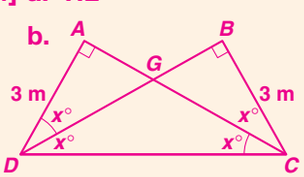
26. C

27. F

28. A

29. [2] a. $\triangle HBC \cong \triangle HED$
b. $\overline{HB} \cong \overline{HE}$ by CPCTC if $\triangle HBC \cong \triangle HED$ by ASA. Since $\triangle BDC \cong \triangle CED$ by SAS, then $\angle DBC \cong \angle CED$ by CPCTC and $\angle CHB \cong \angle DHE$ because vertical $\measuredangle$ are $\cong$.
[1] one part correct

30. [4] a. HL



c. $x = 30$. In $\triangle ADC$ $m\angle A + m\angle ADC + m\angle ACD = 180$. Substituting, $90 + x + x + x = 180$. Solving, $x = 30$.

d. 120; it is suppl. to a 60° $\angle$.

e. 6 m; $DC = 2(AD)$

[3] 4 parts answered correctly

[2] 3 parts answered correctly

[1] 2 parts answered correctly

33.