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2-7

Reading to Learn Mathematics

Proving Segment Relationships

Pre-Activity **How can segment relationships be used for travel?**

Read the introduction to Lesson 2-7 at the top of page 101 in your textbook.

- What is the total distance that the plane will fly to get from San Diego to Dallas? 1430 mi
- Before leaving home, a passenger used a road atlas to determine that the distance between San Diego and Dallas is about 1350 miles. Why is the flying distance greater than that?

Lesson 2-7

Do Problems 1 & 2 only

Reading the Lesson

1. If E is between Y and S, which of the following statements are *always* true? B, E

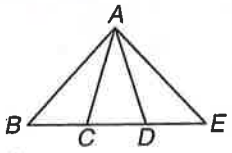
   A. $YS + ES = YE$ **B.** $YS - ES = YE$

   C. $YE > ES$ **D.** $YE \cdot ES = YS$

   E. $SE + EY = SY$ **F.** E is the midpoint of $\overline{YS}$.

2. Give the reason for each statement in the following two-column proof.

   Given: C is the midpoint of $\overline{BD}$.
   D is the midpoint of $\overline{CE}$.
   Prove: $\overline{BD} \cong \overline{CE}$



Statements	Reasons
1. C is the midpoint of $\overline{BD}$.	1. Given
2. $BC = CD$	2. Def of midpoint
3. D is the midpoint of $\overline{CE}$.	3. Given
4. $CD = DE$	4. Def of midpoint
5. $BC = DE$	5. Transitive Prop. of Eq.
6. $BC + CD = CD + DE$	6. Addition Prop.
7. $BC + CD = BD$ $CD + DE = CE$	7. Segment Addition Post.
8. $BD = CE$	8. Substitution
9. $\overline{BD} \cong \overline{CE}$	9. Def of $\cong$ Segments

Helping You Remember

3. One way to keep the names of related postulates straight in your mind is to associate something in the name of the postulate with the content of the postulate. How can you use this idea to distinguish between the Ruler Postulate and the Segment Addition Postulate?

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Skills Practice

Proving Segment Relationships

Justify each statement with a property of equality, a property of congruence, or a postulate.

1. $QA = QA$ Reflexive

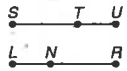
2. If $\overline{AB} \cong \overline{BC}$ and $\overline{BC} \cong \overline{CE}$, then $\overline{AB} \cong \overline{CE}$.
Transitive

3. If Q is between P and R, then $PR = PQ + QR$.
Seg Add Post

4. If $AB + BC = EF + FG$ and $AB + BC = AC$, then $EF + FG = AC$.
Substitution

Complete each proof.

5. **Given:** $\overline{SU} \cong \overline{LR}$, $\overline{TU} \cong \overline{LN}$
Prove: $\overline{ST} \cong \overline{NR}$



Proof:

Statements	Reasons
a. $\overline{SU} \cong \overline{LR}$, $\overline{TU} \cong \overline{LN}$	a. Given
b. SU = LR, TU = LN	b. Definition of $\cong$ segments
c. $SU = ST + TU$ $LR = LN + NR$	c. Seg add post
d. $ST + TU = LN + NR$	d. Substitution
e. $ST + LN = LN + NR$	e. Substitution
f. $ST + LN - LN = LN + NR - LN$	f. Substitution
g. ST = NR	g. Substitution Property
h. $\overline{ST} \cong \overline{NR}$	h. Def of $\cong$ seg

6. **Given:** $\overline{AB} \cong \overline{CD}$
Prove: $\overline{CD} \cong \overline{AB}$
Proof:

Statements	Reasons
a. $\overline{AB} \cong \overline{CD}$	a. Given
b. $AB = CD$	b. Def of $\cong$ seg
c. $CD = AB$	c. symmetric propof =
d. $\overline{CD} \cong \overline{AB}$	d. Definition of $\cong$ segments

Lesson 2-7

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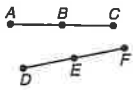
Practice

Proving Segment Relationships

Complete the following proof.

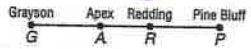
1. **Given:** $\overline{AB} \cong \overline{DE}$
B is the midpoint of $\overline{AC}$.
E is the midpoint of $\overline{DF}$.
Prove: $\overline{BC} \cong \overline{EF}$



Proof:

Statements	Reasons
a. $\overline{AB} \cong \overline{DE}$ B is midpoint of $\overline{AC}$ E is midpoint of $\overline{DF}$	a. Given Def. of $\cong$ seg.
b. $AB = DE$	b. Seg Add Post
c. AB = BC DE = EF	c. Definition of Midpoint
d. $AC = AB + BC$ $DF = DE + EF$	d. Seg Add Post
e. $AB + BC = DE + EF$	e. Substitution
f. $AB + BC = AB + EF$	f. Substitution
g. $AB + BC - AB = AB + EF - AB$	g. Subtraction Property
h. $BC = EF$	h. Substitution
i. $\overline{BC} \cong \overline{EF}$	i. Def of $\cong$ seg.

2. **TRAVEL** Refer to the figure. DeAnne knows that the distance from Grayson to Apex is the same as the distance from Redding to Pine Bluff. Prove that the distance from Grayson to Redding is equal to the distance from Apex to Pine Bluff.



Given: $\overline{GA} \cong \overline{RP}$
Prove: $\overline{GR} \cong \overline{AP}$

Statements	Reasons
1) $\overline{GA} \cong \overline{RP}$	1) Given
2) GA = RP	2) Def of $\cong$ seg.
3) GA + AR = AR + RP	3) Add. Prop
4) GR = GA + AR, AP = AR + RP	4) Seg. Add. Post
5) GR = AP	5) Substitution
6) $\overline{GR} \cong \overline{AP}$	6) Def of $\cong$ seg.