Name ______________________ Date ______________ Class ______________

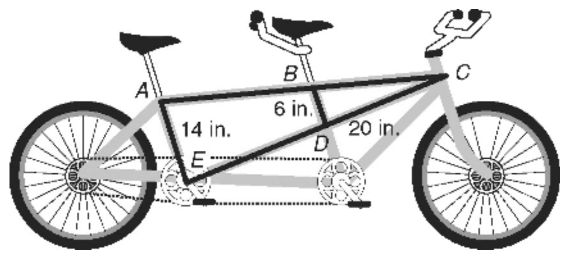
LESSON 8-3

Problem Solving

Triangle Similarity: AA, SSS, and SAS

Use the diagram for Exercises 1 and 2.

In the diagram of the tandem bike, $\overline{AE} \parallel \overline{BD}$.



1. Explain why $\triangle CBD \sim \triangle CAE$.

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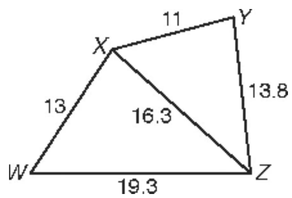
2. Find *CE* to the nearest tenth. ______________________

3. Is $\triangle WXZ \sim \triangle XYZ$? Explain.



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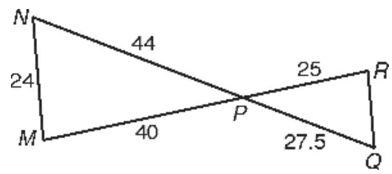
4. Find *RQ*. Explain how you found it.



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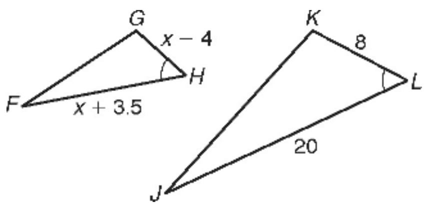
Choose the best answer.

5. Find the value of *x* that makes $\triangle FGH \sim \triangle JKL$.



A 8 C 12

B 9 D 16

6. Triangle *STU* has vertices at *S*(0, 0), *T*(2, 6), and *U*(8, 2). If $\triangle STU \sim \triangle WXY$ and the coordinates of *W* are (0, 0), what are possible coordinates of *X* and *Y*?

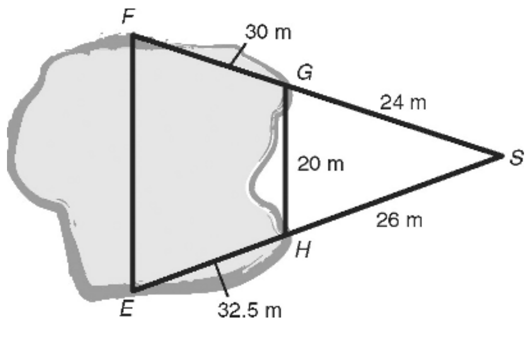
F *X*(1, 3) and *Y*(4, 1)

G *X*(1, 3) and *Y*(2, 0)

H *X*(3, 1) and *Y*(2, 4)

J *X*(0, 3) and *Y*(4, 0)

7. To measure the distance *EF* across the lake, a surveyor at *S* locates points *E*, *F*, *G*, and *H* as shown. What is *EF*?



A 25 m C 45 m

B 36 m D 90 m

5. Possible answer: Draw diagonals $\overline{HK}, \overline{HJ}, \overline{QS}$, and $\overline{QT}$. $\angle G$ and $\angle P$ are right angles, so they are congruent. $\frac{GK}{PT} = \frac{GH}{PQ} = \frac{3}{2}$, so $\triangle GHK \sim \triangle PQT$ by SAS~. It is given that $\angle I \cong \angle R$. $\frac{HI}{QR} = \frac{IJ}{RS} = \frac{3}{2}$, so $\triangle HIJ \sim \triangle QRS$ by SAS~. Because $\triangle GHK \sim \triangle PQT$, $\frac{HQ}{QT} = \frac{3}{2}$ and $\angle GHK \cong \angle PQT$. Because $\triangle HIJ \sim \triangle QRS$, $\frac{HJ}{QS} = \frac{3}{2}$ and $\angle IHJ \cong \angle RQS$. It is given that $\angle H \cong \angle Q$. So by the Angle Addition Postulate, $\angle KHJ \cong \angle TQS$. $\frac{HK}{QT} = \frac{HJ}{QS} = \frac{3}{2}$, so $\triangle KHJ \sim \triangle TQS$ by SAS~. Because $\triangle KHJ \sim \triangle TQS$, $\frac{JK}{ST} = \frac{HK}{QT} = \frac{3}{2}$. All the corresponding angles are congruent; all the corresponding sides are proportional. Thus, $GHIJK \sim PQRST$ by the definition of similar polygons.

Reteach

1. $\angle Q \cong \angle T$ by the Def. of $\cong$ ∡. By the $\triangle$ Sum Thm., $m\angle S = 39°$ and $m\angle U = 49°$, so $\angle S \cong \angle V$ and $\angle R \cong \angle U$. $\triangle QRS \sim \triangle TUV$ by AA ~.
2. $\angle HJG \cong \angle LJK$ by the Vert. ∡ Thm. $\frac{HJ}{LJ} = \frac{GJ}{KJ} = \frac{2}{3}$. $\triangle GHJ \sim \triangle KLJ$ by SAS ~.
3. $\frac{AB}{MN} = \frac{BC}{NP} = \frac{CA}{PM} = \frac{4}{5}$; $\triangle ABC \sim \triangle MNP$ by SSS ~.
4. $\overline{JK} \parallel \overline{FH}$, so $\angle J \cong \angle H$, and $\angle K \cong \angle F$ by the Alt. Int. ∡ Thm. $\triangle JKG \sim \triangle HFG$ by AA ~. $GK = 7\frac{1}{3}$
5. It is given that $\angle S \cong \angle WVU$. $\angle U \cong \angle U$ by the Reflex. Prop. of $\cong$. $\triangle UVW \sim \triangle UST$ by AA ~. $US = 39$

Challenge

1.

Statements	Reasons
$\angle PQR$ is a right angle. $\overline{QS}$ is the altitude of $\triangle PQR$ drawn from the right angle.	1. Given
$\overline{QS} \perp \overline{PR}$	2. Definition of altitude
$\angle PSQ$ and $\angle QSR$ are right angles.	3. Definition of perpendicular
$m\angle PSQ = m\angle QSR = m\angle PQR = 90°$	4. Definition of right angle
$\angle PSQ \cong \angle PQR$; $\angle QSR \cong \angle PQR$	5. Definition of congruent angles
$\angle P \cong \angle P$; $\angle R \cong \angle R$	6. Reflexive Property of Congruence
$\triangle PSQ \sim \triangle PQR$; $\triangle QSR \sim \triangle PQR$	7. AA Similarity Postulate
$\triangle PSQ \sim \triangle QSR$	8. Transitive Property

9. a. $\triangle ACD \sim \triangle ABC$; $\triangle CBD \sim \triangle ABC$; $\triangle ACD \sim \triangle CBD$

   b. $\frac{a}{f} = \frac{c}{\boxed{a}}$; $\frac{b}{e} = \frac{c}{\boxed{b}}$

   c. Proofs will vary.

Problem Solving

1. $\angle CBD \cong \angle CAE$ by Corr. ∡ Thm. and $\angle C \cong \angle C$ by the Reflex. Prop. of $\cong$. So $\triangle CBD \sim \triangle CAE$ by AA ~.
2. 46.7 in.
3. No; $\frac{WX}{XY} \neq \frac{XZ}{YZ}$
4. 15; $\triangle MNP \sim \triangle RQP$ by SAS ~. Corr. sides of ~ ∡ are proportional.
5. B
6. F
7. C

Reading Strategies

1. SAS ~
2. SSS ~
3. no conclusion
4. AA ~
5. SSS ~
6. no conclusion
7. AA ~
8. SAS ~