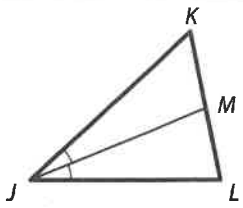
2 Triangle Angle Bisector Theorem An angle bisector of a triangle also divides the side opposite the angle proportionally.

Theorem 7.11 Triangle Angle Bisector

An angle bisector in a triangle separates the opposite side into two segments that are proportional to the lengths of the other two sides.



Example If $\overline{JM}$ is an angle bisector of $\triangle JKL$,

then $\frac{KM}{LM} = \frac{KJ}{LJ}$ ← segments with vertex K ← segments with vertex L

StudyTip

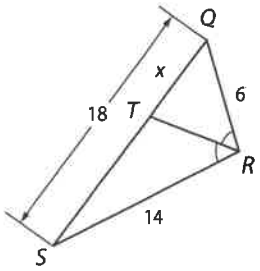
Proportions Another proportion that could be written using the Triangle Angle Bisector Theorem is $\frac{KM}{KJ} = \frac{LM}{LJ}$.

You will prove Theorem 7.11 in Exercise 25.

Example 3 Use the Triangle Angle Bisector Theorem

Find x.

Since $\overline{RT}$ is an angle bisector of $\triangle QRS$, you can use the Triangle Angle Bisector Theorem to write a proportion.

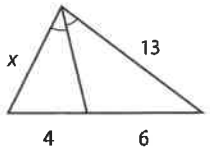


$\frac{QT}{ST} = \frac{QR}{SR}$	Triangle Angle Bisector Theorem
$\frac{x}{18 - x} = \frac{6}{14}$	Substitution
$(18 - x)(6) = x \cdot 14$	Cross Products Property
$108 - 6x = 14x$	Simplify.
$108 = 20x$	Add $6x$ to each side.
$5.4 = x$	Divide each side by 20.

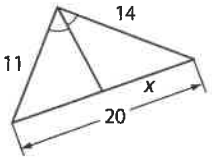
GuidedPractice

Find the value of x.

3A.



3B.

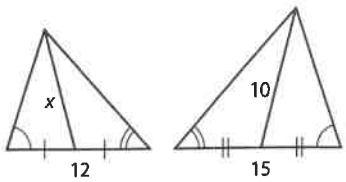


Check Your Understanding

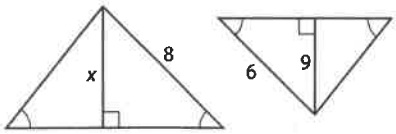
= Step-by-Step Solutions begin on page R14.

Example 1 **Find x.**

1.

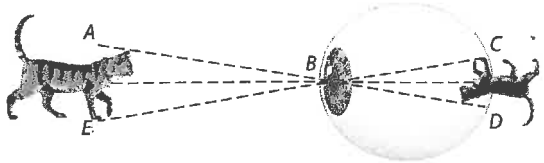


2.



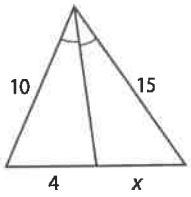
Example 2

3. **VISION** A cat that is 10 inches tall forms a retinal image that is 7 millimeters tall. If $\triangle ABE \sim \triangle DBC$ and the distance from the pupil to the retina is 25 millimeters, how far away from your pupil is the cat?



Example 3 **Find the value of each variable.**

4.



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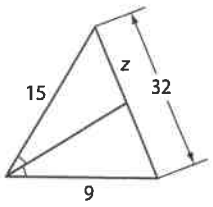
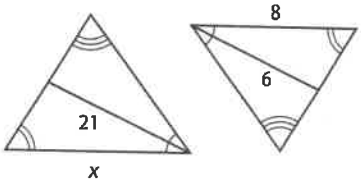


Practice and Problem Solving

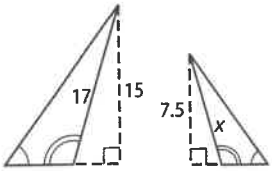
Extra Practice is on page R7.

Example 1 **Find x.**

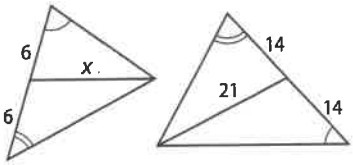
6.



7.



8.



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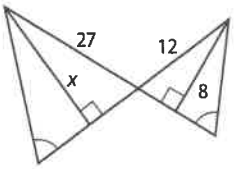
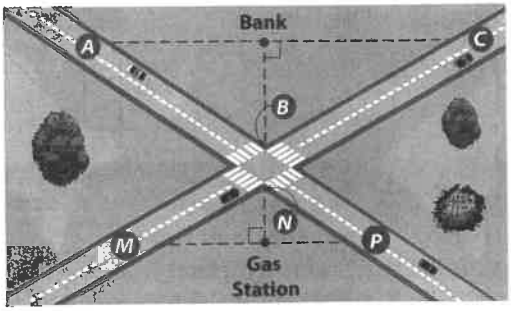
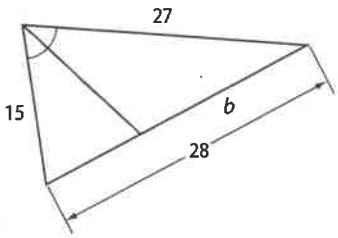


Example 2 **10. ROADWAYS** The intersection of the two roads shown forms two similar triangles. If AC is 382 feet, MP is 248 feet, and the gas station is 50 feet from the intersection, how far from the intersection is the bank?



Example 3 **CCSS SENSE-MAKING** **Find the value of each variable.**

11



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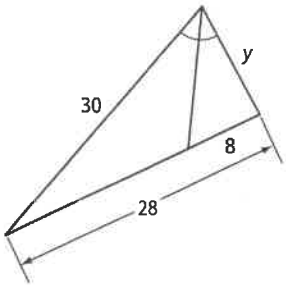
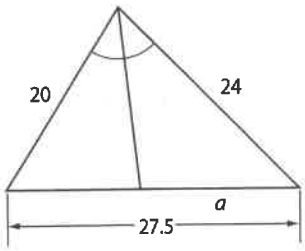
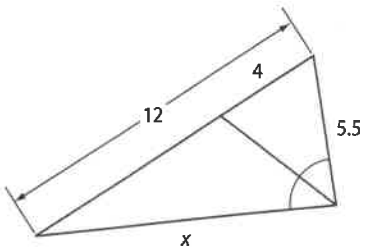


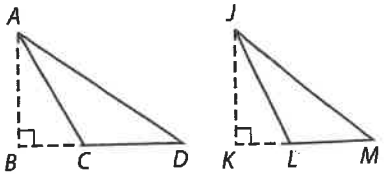
13.



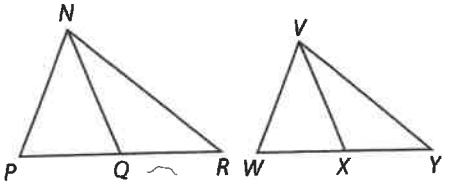
14.



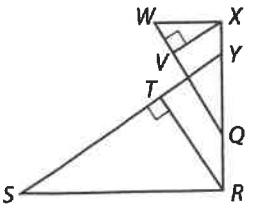
ALGEBRA If $\overline{AB}$ and $\overline{JK}$ are altitudes, $\triangle DAC \sim \triangle MJL$, $AB = 9$, $AD = 4x - 8$, $JK = 21$, and $JM = 5x + 3$, find x.



16. ALGEBRA If $\overline{NQ}$ and $\overline{VX}$ are medians, $\triangle PNR \sim \triangle WVY$, $NQ = 8$, $PR = 12$, $WY = 7x - 1$, and $VX = 4x + 2$, find x.



17. If $\triangle SRY \sim \triangle WXQ$, $\overline{RT}$ is an altitude of $\triangle SRY$, $\overline{XV}$ is an altitude of $\triangle WXQ$, $RT = 5$, $RQ = 4$, $QY = 6$, and $YX = 2$, find XV.

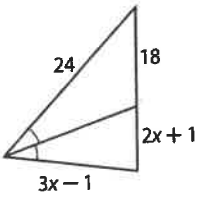


18. PROOF Write a paragraph proof of Theorem 7.9.

19. PROOF Write a two-column proof of Theorem 7.10.

ALGEBRA Find x.

20.



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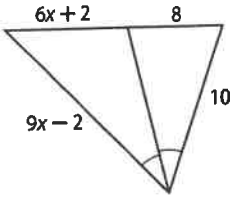

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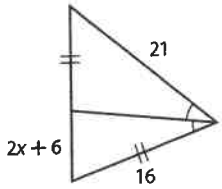

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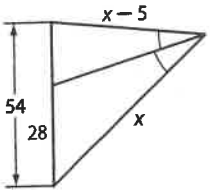
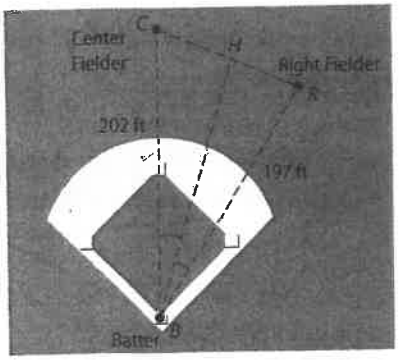


24. SPORTS Consider the triangle formed by the path between a batter, center fielder, and right fielder as shown. If the batter gets a hit that bisects the triangle at $\angle B$, is the center fielder or the right fielder closer to the ball? Explain your reasoning.

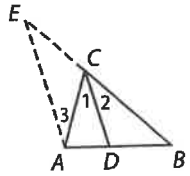


CCSS ARGUMENTS Write a two-column proof.

25. Theorem 7.11

Given: $\overline{CD}$ bisects $\angle ACB$.
By construction, $\overline{AE} \parallel \overline{CD}$.

Prove: $\frac{AD}{DB} = \frac{AC}{BC}$



26. Given: $\angle H$ is a right angle.
L, K, and M are midpoints.

Prove: $\angle LKM$ is a right angle.