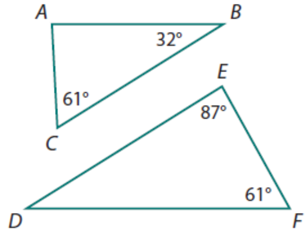
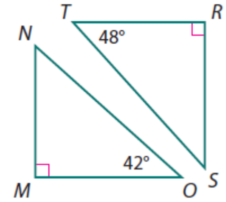
4 Examine each pair of triangles. Using the information given, determine whether the triangles are similar or the information is inconclusive. Explain your reasoning.

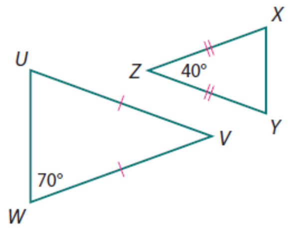
a.



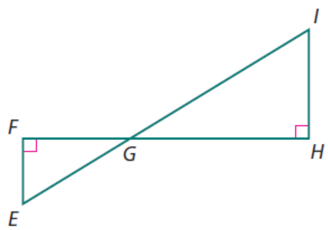
b.



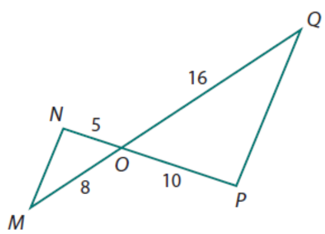
c.



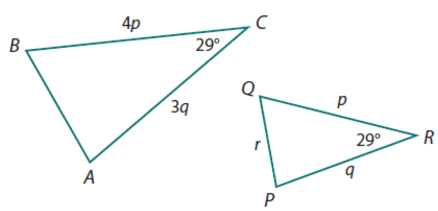
d.



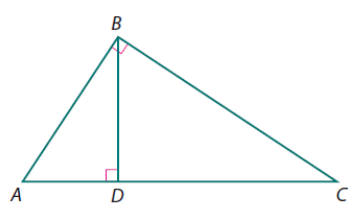
e.



f.



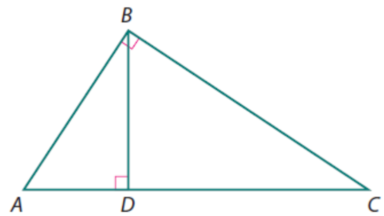
5 In the diagram below, $\triangle ABC$ is a right triangle. $\overline{BD}$ is the altitude drawn to the hypotenuse $\overline{AC}$.



a. Identify three pairs of similar triangles. Be sure that corresponding vertices are labeled in the same order.

b. Describe the strategies you would use to prove each pair of triangles similar.

14 Look back at your work for Applications Task 5. Since $\triangle ABD \sim \triangle BCD$, it follows that $\frac{AD}{BD} = \frac{BD}{CD}$. Note that BD appears twice in the proportion. The length of $\overline{BD}$ is the *geometric mean* of the lengths of $\overline{AD}$ and $\overline{CD}$.

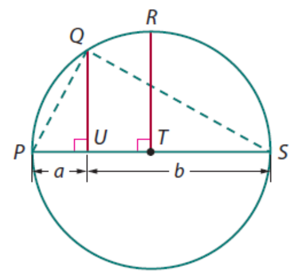


a. Using the language of geometric mean, state a theorem about the altitude to the hypotenuse of any right triangle.

b. The **geometric mean** of two positive numbers a and b is the positive number x such that $\frac{a}{x} = \frac{x}{b}$, or $x = \sqrt{ab}$. What is the geometric mean of 4 and 9? Of 7 and 12?

c. For any two positive numbers, describe the relation between the arithmetic mean and the geometric mean using $<$, $\leq$, $=$, $>$, or $\geq$.

d. At the right is a circle with center T.



i. Explain why one of the segments, $\overline{QU}$ and $\overline{RT}$, has length the geometric mean of a and b and the other has length the arithmetic mean of a and b.

ii. How could you use the diagram to justify your answer to Part c?

e. Under what circumstances are the arithmetic mean and geometric mean of a and b equal?

26 In Connections Task 14, you conjectured and then provided a geometric proof that if a and b are two positive numbers, their arithmetic mean is greater than or equal to their geometric mean. Use the facts that $(a + b)^2 \geq 0$ and $(a - b)^2 \geq 0$ and algebraic reasoning to prove the **arithmetic-geometric mean inequality**, $\frac{a + b}{2} \geq \sqrt{ab}$.

34 Solve each proportion.

a. $\frac{t}{12} = \frac{6}{9}$

b. $\frac{m + 4}{m} = \frac{12}{5}$

c. $\frac{y - 3}{10} = \frac{2y + 5}{3}$

36 Rewrite each expression in $ax^2 + bx + c$ form.

a. $(x - 5)(x + 5)$

b. $3(2x + 1)(6 - x)$

c. $x(8 - 3x) + (5x + 3)$

d. $(10x - 6)^2$