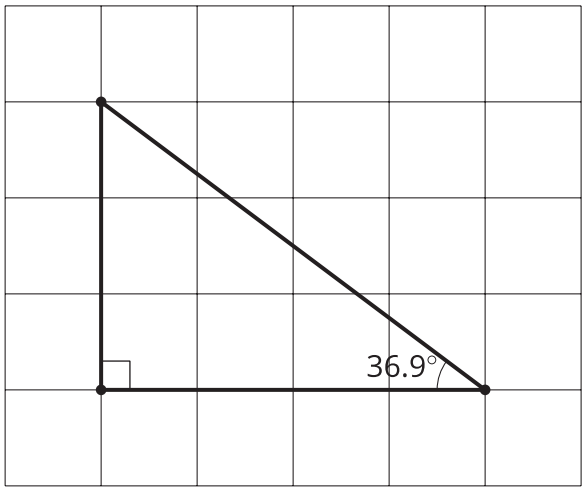
Finding All the Unknown Values in Triangles

Let's find all the unknown values in right triangles.

16.1 Which Three Go Together: Triangles

Which three go together? Why do they go together?

A



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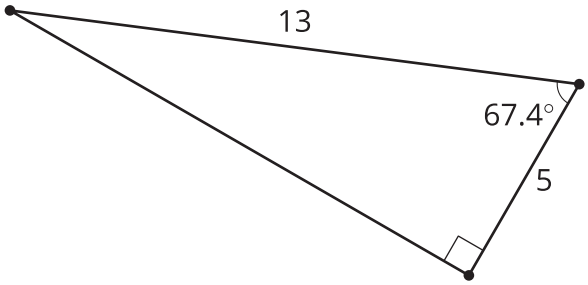

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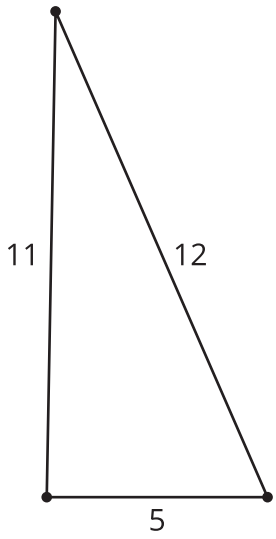

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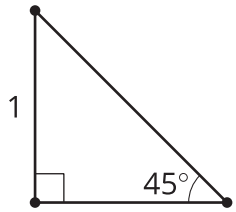


16.2 Info Gap: Similar Sequence

Your teacher will give you either a problem card or a data card. Do not show or read your card to your partner.

If your teacher gives you the problem card:

1. Silently read your card, and think about what information you need to answer the question.
2. Ask your partner for the specific information that you need. “Can you tell me _____?”
3. Explain to your partner how you are using the information to solve the problem. “I need to know _____ because _____.”

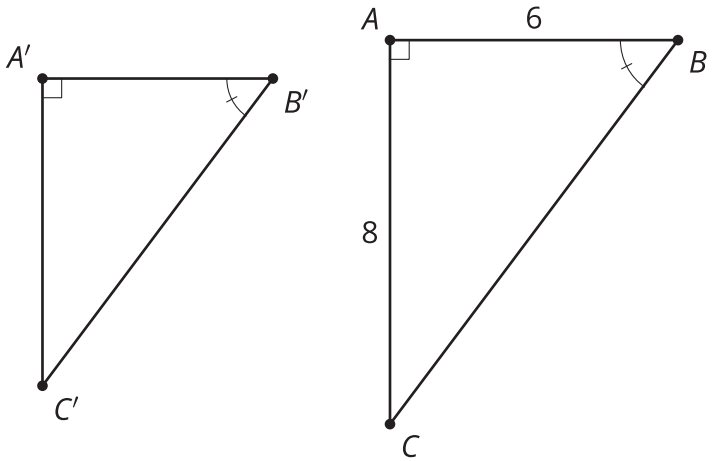
   Continue to ask questions until you have enough information to solve the problem.
4. Once you have enough information, share the problem card with your partner, and solve the problem independently.
5. Read the data card, and discuss your reasoning.

If your teacher gives you the data card:

1. Silently read your card. Wait for your partner to ask for information.
2. Before telling your partner any information, ask, “Why do you need to know _____?”
3. Listen to your partner’s reasoning, and ask clarifying questions. Give only information that is on your card. Do not figure out anything for your partner!

   These steps may be repeated.
4. Once your partner has enough information to solve the problem, read the problem card, and solve the problem independently.
5. Share the data card, and discuss your reasoning.

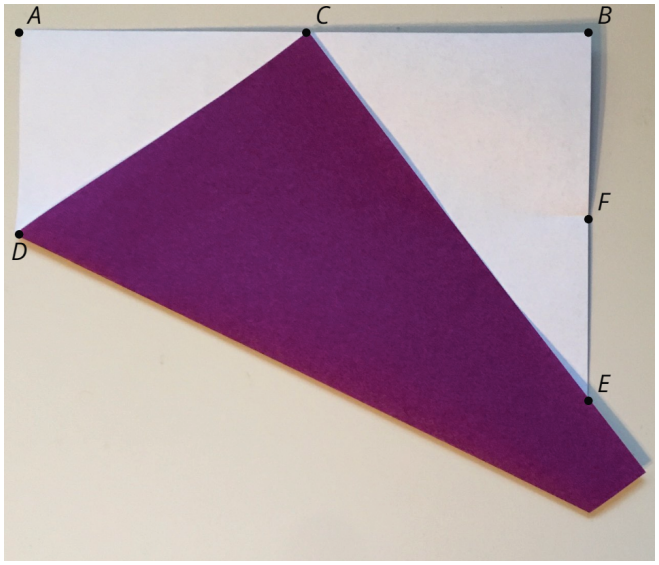
16.3 Relatively Reasonable



Triangle ABC is similar to triangle $A'B'C'$. Give reasonable measurements for all 3 sides of triangle $A'B'C'$. Explain your reasoning.

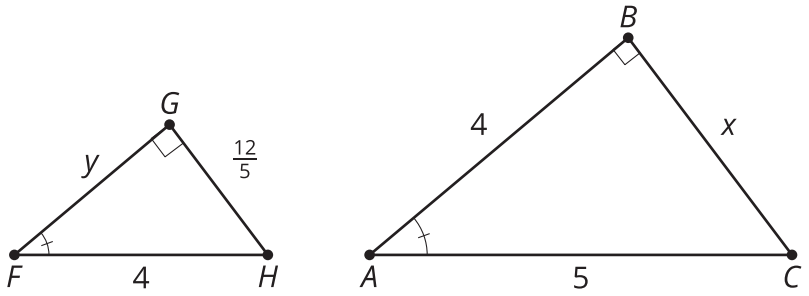
Are you ready for more?

Find or make a square piece of paper. Fold the bottom left corner to the midpoint of the top edge. Label a point F at the midpoint of the segment created on the right edge, BE. Prove that F is $\frac{1}{3}$ of the way down the whole side of the square.



Lesson 16 Summary

$\angle A \cong \angle F$



We have multiple strategies to find unknown side lengths in similar right triangles.

Because triangle ABC is a right triangle, $4^2 + x^2 = 5^2$. Because triangle FGH is a right triangle, $y^2 + \left(\frac{12}{5}\right)^2 = 4^2$. Because triangle ABC is similar to triangle FGH, there are many equations to write using proportional relationships. We can use any combination of these equations to solve for x and y.

By similarity, $\frac{5}{4}(y) = 4$ so $y = \frac{16}{5}$. Substituting $y = \frac{16}{5}$ into the Pythagorean Theorem gives $\left(\frac{16}{5}\right)^2 + \left(\frac{12}{5}\right)^2 = 4^2$ which is true.

By the Pythagorean Theorem, $x^2 = 5^2 - 4^2 = 9$, so $x = 3$. By similarity $x = \frac{12}{5} \cdot \frac{5}{4}$, which also equals 3.