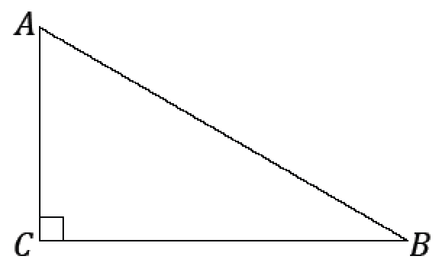
Lesson 25: Incredibly Useful Ratios

Classwork

Exercises 1–3

Use the right triangle $\triangle ABC$ to answer Exercises 1–3.



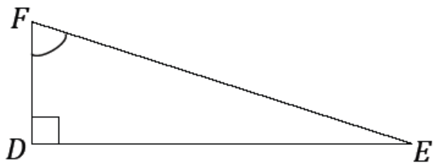
1. Name the side of the triangle opposite $\angle A$.

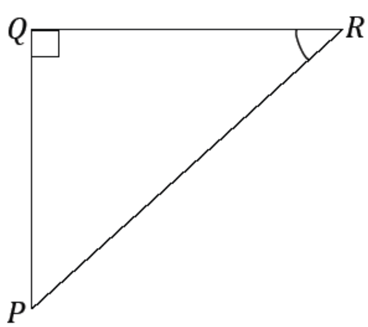
2. Name the side of the triangle opposite $\angle B$.

3. Name the side of the triangle opposite $\angle C$.

Exercises 4–6

For each exercise, label the appropriate sides as *adjacent, opposite,* and *hypotenuse,* with respect to the marked acute angle.

4. 

5. 

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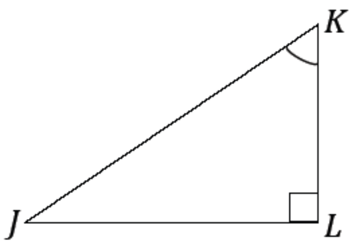


Exploratory Challenge

Note: Angle measures are approximations.

For each triangle in your set, determine missing angle measurements and side lengths. Side lengths should be measured to one decimal place. Make sure that each of the $\frac{\text{adj}}{\text{hyp}}$ and $\frac{\text{opp}}{\text{hyp}}$ ratios are set up and missing values are calculated and rounded appropriately.

Group 1					
	Triangle	**Angle Measures**	**Length Measures**	$\frac{\textbf{opp}}{\textbf{hyp}}$	$\frac{\textbf{adj}}{\textbf{hyp}}$
1.	$\triangle ABC$			$\frac{12}{13} \approx 0.92$	$\frac{5}{13} \approx 0.38$
2.	$\triangle DEF$	$m\angle D \approx 53^\circ$	$DE = 3$ cm $EF = 4$ cm $DF = 5$ cm		
3.	$\triangle GHI$	$m\angle I \approx 41^\circ$	$GH = 5.3$ cm	$\frac{5.3}{} \approx 0.66$	$= 0.75$
4.	$\triangle JKL$		$KL = 6.93$ cm $JL = 8$ cm	$\frac{}{8} =$	$\frac{}{8} \approx 0.87$
5.	$\triangle MNO$			$\frac{4}{8.5} \approx 0.47$	$\frac{7.5}{8.5} \approx 0.88$

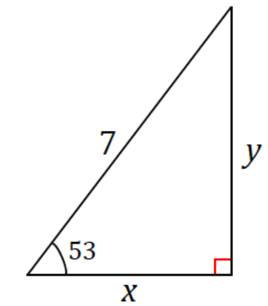
Group 2					
	Triangle	Angle Measures	Length Measures	$\frac{\text{opp}}{\text{hyp}}$	$\frac{\text{adj}}{\text{hyp}}$
1.	$\triangle A'B'C'$			$\frac{6}{6.5} \approx 0.92$	$\frac{2.5}{6.5} \approx 0.38$
2.	$\triangle D'E'F'$	$m\angle D' \approx 53^\circ$	$D'E' = 6$ cm $E'F' = 8$ cm $D'F' = 10$ cm		
3.	$\triangle G'H'I'$	$m\angle I' \approx 41^\circ$	$G'H' = 7.9$ cm	$\frac{7.9}{} \approx 0.66$	$= 0.75$
4.	$\triangle J'K'L'$		$K'L' = 10.4$ cm $J'L' = 12$ cm	$\frac{}{12} =$	$\frac{}{12} \approx 0.87$
5.	$\triangle M'N'O'$			$\frac{8}{17} \approx 0.47$	$\frac{15}{17} \approx 0.88$

With a partner, discuss what you can conclude about each pair of triangles between the two sets.

Exercises 7–10

For each question, round the unknown lengths appropriately. Refer back to your completed chart from the Exploratory Challenge; each indicated acute angle is the same approximated acute angle measure as in the chart. Set up and label the appropriate length ratios, using the terms opp, adj, and hyp in the setup of each ratio.

7.



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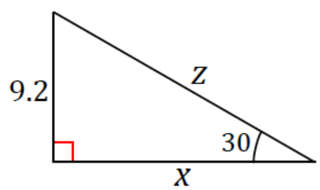

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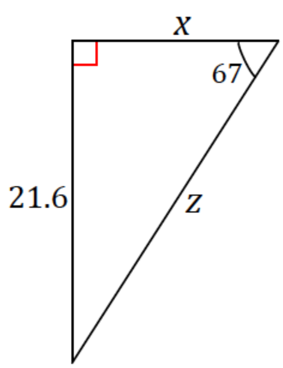
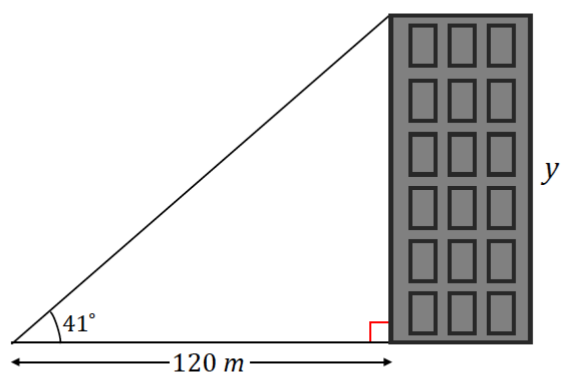


10. From a point 120 m away from a building, Serena measures the angle between the ground and the top of a building and finds it measures $41°$.

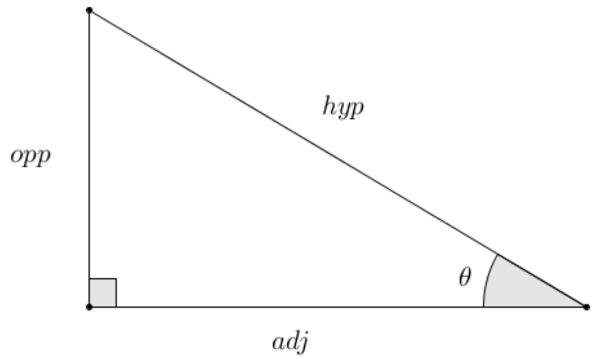
    What is the height of the building? Round to the nearest meter.



Problem Set

The table below contains the values of the ratios $\frac{\text{opp}}{\text{hyp}}$ and $\frac{\text{adj}}{\text{hyp}}$ for a variety of right triangles based on a given acute angle, θ, from each triangle. Use the table and the diagram of the right triangle below to complete each problem.

θ (degrees)	0	10	20	30	40	45	50	60	70	80	90
$\frac{\text{opp}}{\text{hyp}}$	0	0.1736	0.3420	$\frac{1}{2} = 0.5$	0.6428	0.7071	0.7660	0.8660	0.9397	0.9848	1
$\frac{\text{adj}}{\text{hyp}}$	1	0.9848	0.9397	0.8660	0.7660	0.7071	0.6428	$\frac{1}{2} = 0.5$	0.3420	0.1736	0



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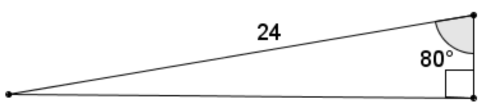
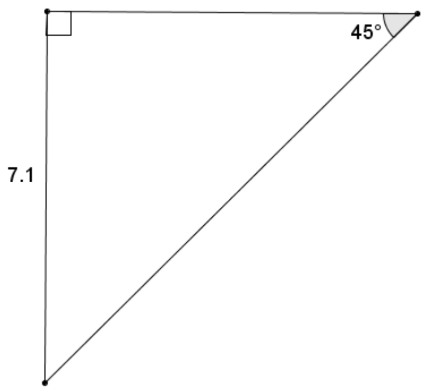
For each problem, approximate the unknown lengths to one decimal place. Write the appropriate length ratios using the terms opp, adj, and hyp in the setup of each ratio.

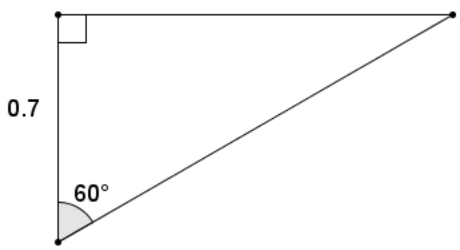
1. Find the approximate length of the leg opposite the $80°$ angle.



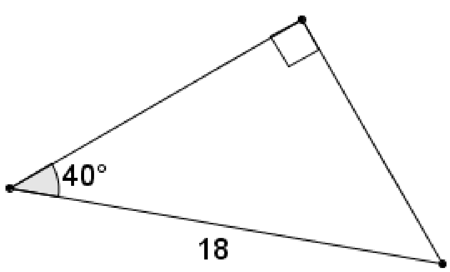
2. Find the approximate length of the hypotenuse.



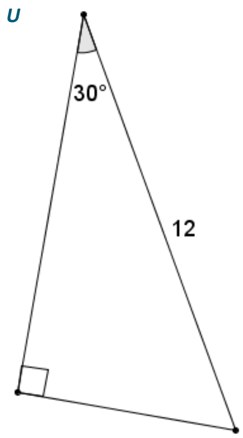
3. Find the approximate length of the hypotenuse.



4. Find the approximate length of the leg adjacent to the $40°$ angle.

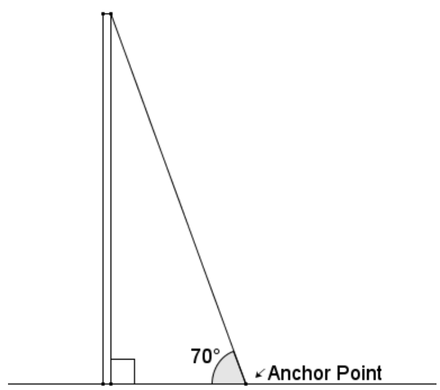


5. Find the length of both legs of the right triangle below. Indicate which leg is adjacent and which is opposite the given angle of $30°$.



6. Three city streets form a right triangle. Main Street and State Street are perpendicular. Laura Street and State Street intersect at a $50°$ angle. The distance along Laura Street to Main Street is 0.8 mile. If Laura Street is closed between Main Street and State Street for a festival, approximately how far (to the nearest tenth) will someone have to travel to get around the festival if they take only Main Street and State Street?

7. A cable anchors a utility pole to the ground as shown in the picture. The cable forms an angle of $70°$ with the ground. The distance from the base of the utility pole to the anchor point on the ground is 3.8 meters. Approximately how long is the support cable?



8. Indy says that the ratio of $\frac{\text{opp}}{\text{adj}}$ for an angle of $0°$ has a value of 0 because the opposite side of the triangle has a length of 0. What does she mean?