Gently take out pages

M2-121 through M2-206

Warm Up

1. How many centimeters are in a meter?
2. Write a ratio equal to 1 that represents the relationship between meters and centimeters.
3. Use the ratio you wrote in Question 2 to convert 520 centimeters to meters.

Learning Goals

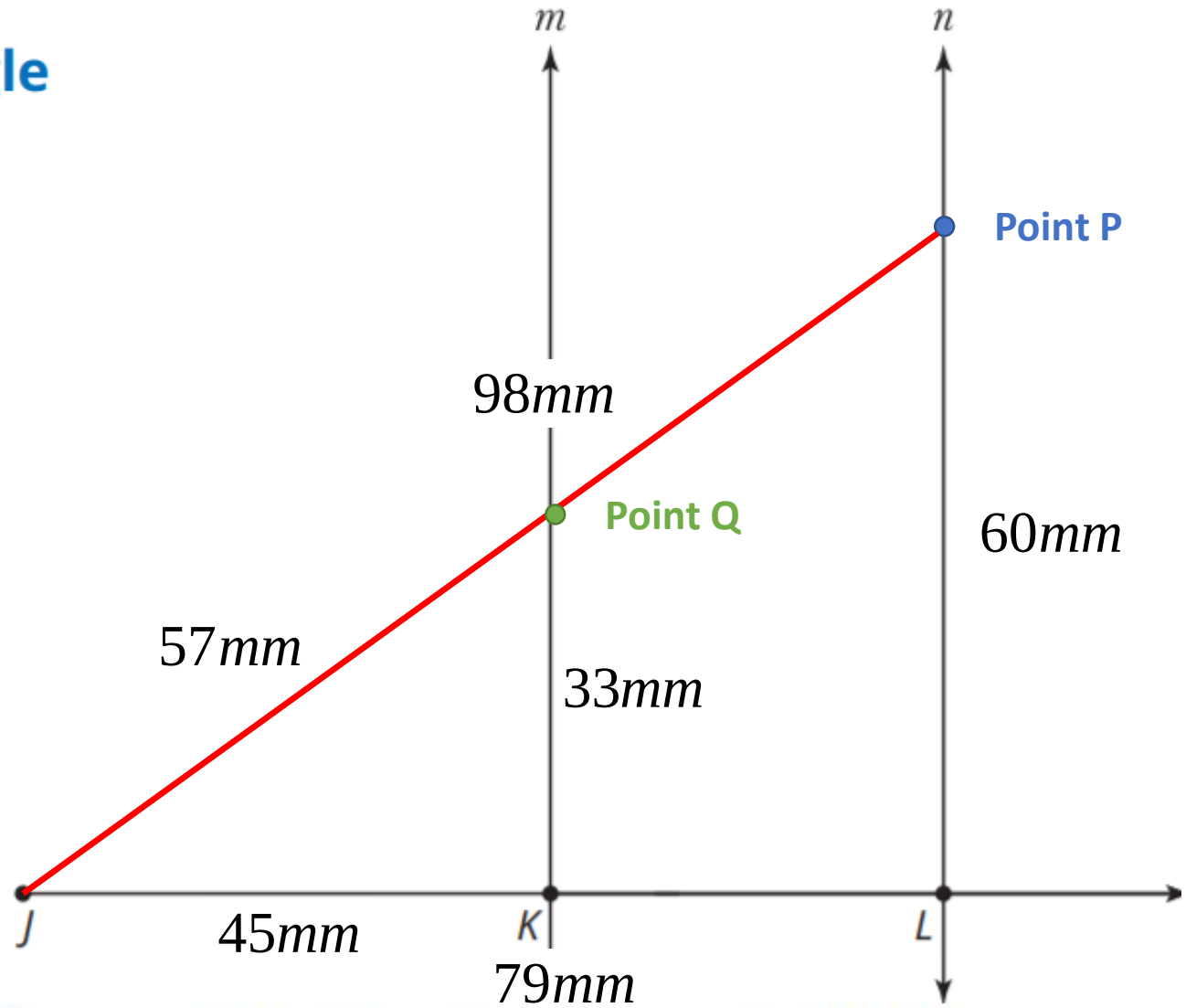
- Explore trigonometric ratios as measurement conversions.
- Analyze the properties of similar right triangles.

Key Terms

- reference angle
- opposite side
- adjacent side

You're Acute Angle

Lines *m* and *n* are parallel.



1. **Locate a point on line *n* and label it point *P* to create △*JLP*. Then label the intersection of $\overline{JP}$ and line *m* as point *Q* to create △*JKQ*.**

2. Verify that $\triangle JLP \sim \triangle JKQ$. Explain your reasoning.

$\angle J \cong \angle J$ Reflexive $\quad$ $\angle JQK \cong \angle QPL$ Cooresponding angles are congruent

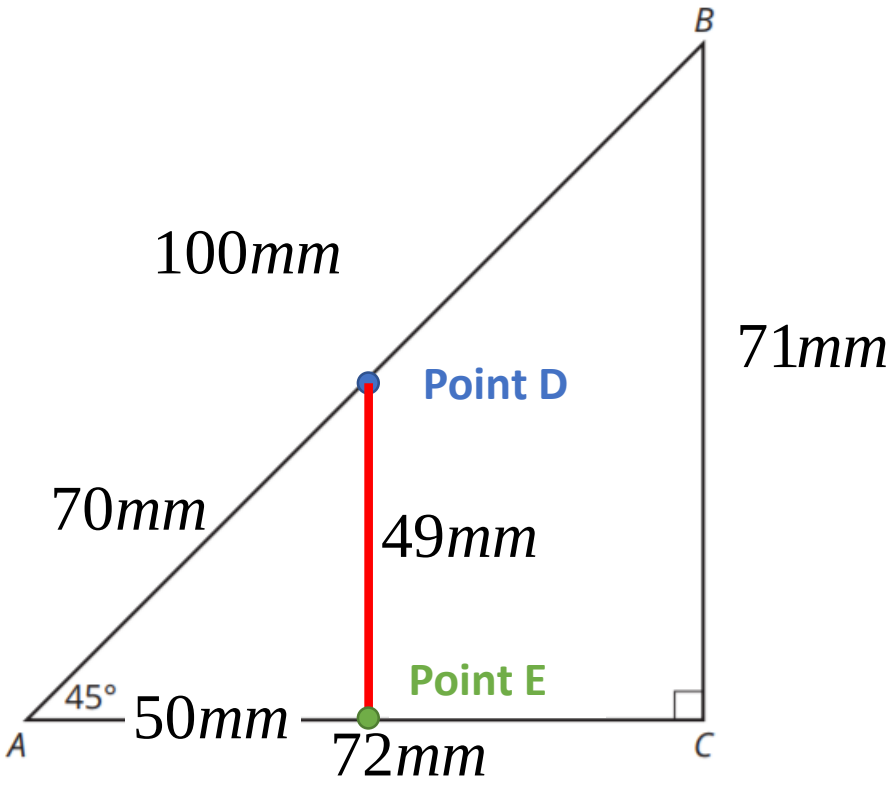
$AA \sim$

3. Measure and analyze the side length ratios of the triangles: $\frac{KQ}{JK}$ to $\frac{LP}{JL}$, $\frac{KQ}{JQ}$ to $\frac{LP}{JP}$, $\frac{JK}{JQ}$ to $\frac{JL}{JP}$.

$$\frac{KQ}{JK} = \frac{33}{45} \approx 0.73 \qquad \frac{KQ}{JQ} = \frac{33}{57} \approx 0.58 \qquad \frac{JK}{JQ} = \frac{45}{57} \approx 0.79$$

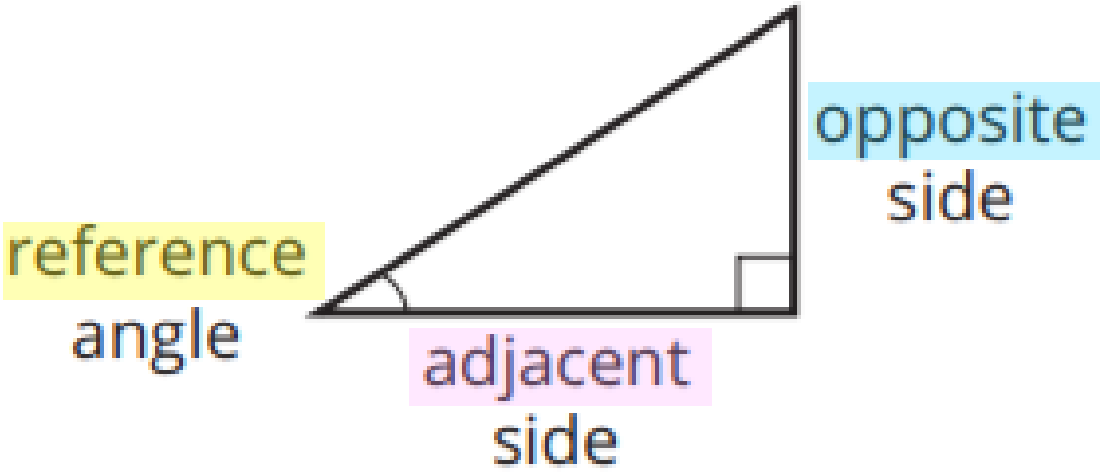
$$\frac{LP}{JL} = \frac{60}{79} \approx 0.76 \qquad \frac{LP}{JP} = \frac{60}{98} \approx 0.61 \qquad \frac{JL}{JP} = \frac{79}{98} \approx 0.80$$

Triangle *ABC* shown is a 45°-45°-90° triangle.



1. **Choose any point along the hypotenuse of $\triangle ABC$ and label it point *D*. Then construct a vertical line segment, $\overline{DE}$, connecting with side $\overline{AC}$ so that $\overline{DE} \perp \overline{AC}$. Label the other endpoint as point *E*.**

You know that the hypotenuse of a right triangle is the side that is opposite the right angle. In trigonometry, the legs of a right triangle are often referred to as the *opposite side* and the *adjacent side*. These references are based on the angle of the triangle that you are considering, which is called the **reference angle**. The **opposite side** is the side opposite the reference angle. The **adjacent side** is the side adjacent to the reference angle that is *not* the hypotenuse.



3. For $\triangle ABC$ and $\triangle ADE$, identify the opposite side, adjacent side, and hypotenuse, using $\angle A$ as the reference angle.

4. Record the side length measurements for both triangles in the table.

Triangle Name	Length of Side Opposite $\angle A$	Length of Side Adjacent to $\angle A$	Length of Hypotenuse
$\triangle ABC$	$71mm$	$72mm$	$100mm$
$\triangle ADE$	$49mm$	$50mm$	$70mm$

5. Determine each side length ratio using $\angle A$ as the reference angle.

Triangle Name	$\frac{\text{side opposite } \angle A}{\text{hypotenuse}}$	$\frac{\text{side adjacent to } \angle A}{\text{hypotenuse}}$	$\frac{\text{side opposite } \angle A}{\text{side adjacent to } \angle A}$
$\triangle ABC$	$\frac{71}{100} \approx 0.71$	$\frac{72}{100} \approx 0.72$	$\frac{71}{72} \approx 1$
$\triangle ADE$	$\frac{49}{70} \approx 0.70$	$\frac{50}{70} \approx 0.71$	$\frac{49}{50} \approx 1$

6. Explain why Gabriel is correct.

Gabriel

The side length ratios of the opposite side to the hypotenuse or the adjacent side to the hypotenuse is a percent. If the ratio is approximately 0.70, that means the length of the side is about 70% the length of the hypotenuse.

Example :

0.84 is 84%

Let's analyze the recorded measurements.

7. Compare the side length ratios of the triangles from your table. What do you notice?

The corresponding ratios of each triangle were very close to each other

8. Compare your measurements and ratios with those of your classmates. What do you notice?

Even though we drew our line segments in different places in the triangle and came up with different measurements for the triangles' sides, the side length ratios in our tables were equal or very close to equal.

Ask yourself:

What patterns do you see in the measurements you recorded?