Properties of Similar Triangles | MPM2D

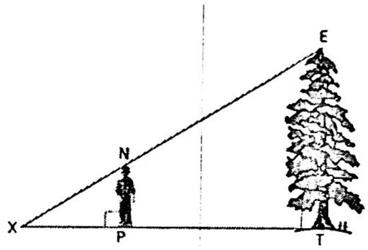
Geometric shapes are often used in construction and design. Triangles are particularly useful for their structural properties. In this unit, we are going to be studying "trigonometry", and various applications.

Trigonometry – "Triangle Measurement"

Congruent Triangles – Triangles with the same shape AND size

Similar Triangles – Triangles that have the same shape, but not necessarily the same size.

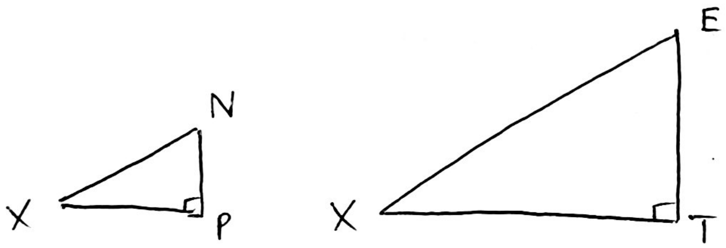
Today we are going to talk about some properties that are true regarding similar triangles, and discuss how we can show that triangles are in fact similar.



Example 1: Use angles to show that two triangles are similar

Identify a pair of similar triangles and explain why they are similar. Support each statement with a reason.

Let's start by draw ingthe two overlapping triangles in the space below.



$\Delta NPX \sim \Delta ETX$

~~$\Delta NPX \sim \Delta TXE$~~

Triangles are similar if they have the same shape, so we can show these triangles are similar if we can identify 3 pairs of similar triangles.

Statement	Reason
$\angle NXP = \angle EXT$	Shared Angle
$\angle XPN = \angle XTE$	Both are 90° Angles
$\angle XNP = \angle XET$	3 angles in a triangle add to 180°
$\Delta NPX \sim \Delta ETX$	The angles in each triangle are the same.

Note: In practice, you only need to show two pairs of angles are equal.

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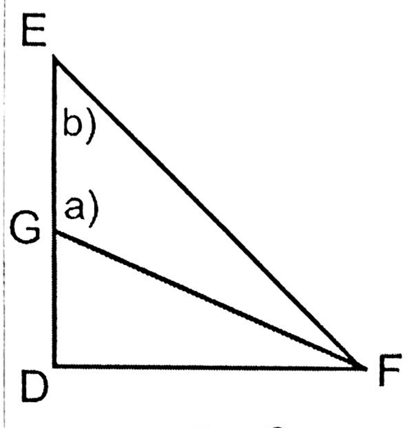
Mr. Smith will go over some important literacy connections with you (lifted from the textbook), and then we will apply them to a problem.

Example: List multiple ways using the three-letter system to identify the angle in the following diagram:

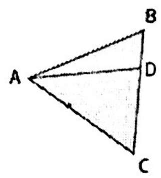


Angle a) EGF or FGE

Angle b) FED or DEF or GEF or FEG

Literacy Connections

In △ABC, the interior angle at vertex B can be called ∠ABC, ∠CBA, or ∠B. In the first two cases, the middle letter corresponds to the vertex of the angle.



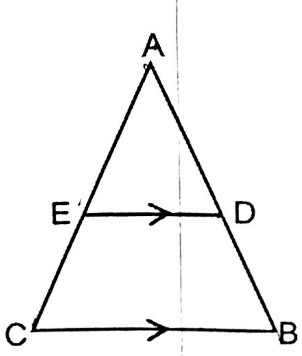
The three-letter system is useful to describe the three interior angles at vertex A: ∠BAD, ∠DAC, and ∠BAC. Referring simply to ∠A can lead to confusion.

Literacy Connections

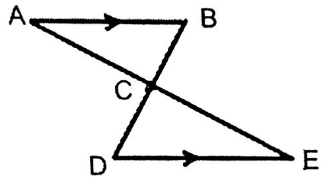
The symbol ~ means "is similar to." When you write a similarity statement, the order of the vertices must correctly identify pairs of equal angles and pairs of corresponding sides. In Example 1, △XPN ~ △XTE is correct because the vertices correctly indicate pairs of equal angles and pairs of corresponding sides.

Example: Identify the pairs of identical angles, and identify the similar triangles in the following diagrams:

a)

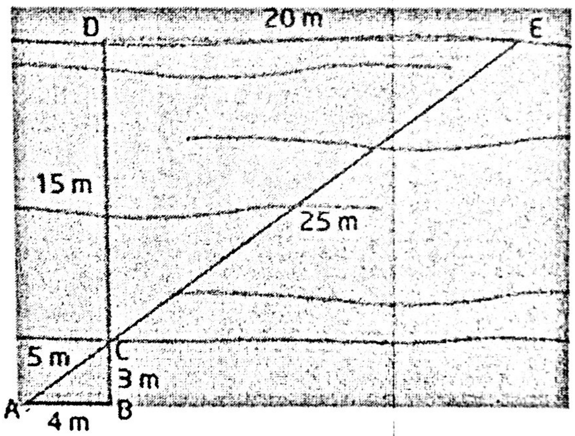
Visual:	Statement	Reason
	∠CAB = ∠EAD	Shared angle.
	∠BCA = ∠DEA	F - pattern
	△AED ~ △ACB	There are two pairs of identical angles.

b)

Visual:	Statement	Reason
	∠CAB = ∠CED	Z - Pattern.
	∠ABC = ∠EDC	Z - Pattern
	~~∠ACB = ∠ECD~~	~~Opposite Angles~~
	ΔABC ~ ΔEDC	3 pairs of identical angles.

Example: Use sides to show that triangles are similar

Which pair of triangles appear to be similar in the following diagram?



ΔABC ~ ΔEDC

If you can show that 3 pairs of corresponding sides are proportional, then the triangles are similar.

Determine the following:

$\frac{ED}{AB} = \frac{20}{4}$

$= 5$

$\frac{CE}{CA} = \frac{25}{5}$

$= 5$

$\frac{DC}{BC} = \frac{15}{3}$

$= 5$

Conclusion: Since the 3 ratios of corresponding sides are equal, ΔABC ~ ΔEDC.