

Congruence, Similarity and the Triangle Sum Theorem (Part 2)
Using Given & Prove

Up to this point, you have been using proof structure to show your work as you determine all available information on a triangle. Today, you will use true proof structure to determine only what the problem asks you to “prove.”

A proof prompt has two parts: “**Given**,” which is the problem and “**Prove**,” which is, essentially, the answer key. Your job is to determine the best way to get from the “Given” to the “Prove.” Keep in mind though, the “Prove” is the final step and cannot be used anywhere else in your solution. Remember that the “Prove” statement is the answer, not part of the problem.

Symmetric Property of Equality:
(*Symm. Prop. =*)

The ability to switch what is on the two sides of the equal sign.

Example:

$19 = m\angle B$	Given
$m\angle B = 19$	Symm. Prop. =

Example:

Given: $\triangle ABC \cong \triangle DEF$, $m\angle A = 58^\circ$ & $m\angle B = 59^\circ$

Prove: $m\angle F = 63^\circ$

Statements	Reasons
$\triangle ABC \cong \triangle DEF$ $m\angle A = 58^\circ$ & $m\angle B = 59^\circ$	Given
$m\angle A + m\angle B + m\angle C = 180$	<u>\triangle Sum Thm</u>
$58 + 59 + m\angle C = 180$	Subst.
$117 + m\angle C = 180$	Simp.
$m\angle C = 63^\circ$	Subtr. Prop. =
$\angle C \cong \angle F$	CPCTC
$m\angle C = m\angle F$	Def \cong
$63^\circ = m\angle F$	Subst.
$m\angle F = 63^\circ$	Symm. Prop. =

or

Statements	Reasons
$\triangle ABC \cong \triangle DEF$ $m\angle A = 58^\circ$ & $m\angle B = 59^\circ$	Given
$\angle C \cong \angle F$	CPCTC
$m\angle C = m\angle F$	Def \cong
$m\angle A + m\angle B + m\angle C = 180$	<u>\triangle Sum Thm</u>
$58 + 59 + m\angle F = 180$	Subst.
$117 + m\angle F = 180$	Simp.
$m\angle F = 63^\circ$	Subtr. Prop. =

Example:

Given: $\triangle ABC \sim \triangle DFE$, $m\angle D = 97^\circ$ & $m\angle E = 26^\circ$

Prove: $m\angle B = 57^\circ$

Statements	Reasons
$\triangle ABC \sim \triangle DFE$ $m\angle D = 97^\circ$ & $m\angle E = 26^\circ$	Given
$m\angle D + m\angle F + m\angle E = 180$	<u>\triangle Sum Thm</u>
$97 + m\angle F + 26 = 180$	Subst.
$m\angle F + 123 = 180$	Simp.
$m\angle F = 57^\circ$	Subtr. Prop. =
$\angle B \cong \angle F$	CASTC
$m\angle B = m\angle F$	Def \cong
$m\angle B = 57^\circ$	Subst.

or

Statements	Reasons
$\triangle ABC \sim \triangle DFE$ $m\angle D = 97^\circ$ & $m\angle E = 26^\circ$	Given
$\angle B \cong \angle F$	CASTC
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$m\angle D + m\angle F + m\angle E = 180$	<u>\triangle Sum Thm</u>
$97 + m\angle B + 26 = 180$	Subst.
$m\angle B + 123 = 180$	Simp.
$m\angle B = 57^\circ$	Subtr. Prop. =

Name: _____

1. Given: $\triangle ABC \sim \triangle DEF$, $m\angle B = 89^\circ$ & $m\angle C = 19^\circ$
 Prove: $m\angle D = 72^\circ$

Statements	Reasons

2. Given: $\triangle ABC \sim \triangle EDF$, $m\angle F = 72^\circ$ & $m\angle E = 66^\circ$
 Prove: $m\angle B = 42^\circ$

Statements	Reasons

3. Given: $\triangle ABC \cong \triangle FED$, $m\angle E = 75^\circ$ & $m\angle F = 102^\circ$
 Prove: $m\angle C = 3^\circ$

Statements	Reasons

Name: _____

4. Given: $\triangle ABC \sim \triangle DEF$, $m\angle A = 42^\circ$ & $m\angle C = 82^\circ$
 Prove: $m\angle E = 56^\circ$

Statements	Reasons

5. Given: $\triangle ABC \cong \triangle FDE$, $m\angle D = 54^\circ$ & $m\angle F = 89^\circ$
 Prove: $m\angle C = 37^\circ$

Statements	Reasons

6. Given: $\triangle ABC \sim \triangle EFD$, $m\angle E = 64^\circ$ & $m\angle D = 52^\circ$
 Prove: $m\angle B = 64^\circ$

Statements	Reasons

Name: _____

7. Given: $\triangle ABC \sim \triangle DFE$, $m\angle A = 12^\circ$ & $m\angle B = 93^\circ$
 Prove: $m\angle E = 75^\circ$

Statements	Reasons

8. Given: $\triangle ABC \cong \triangle EFD$, $m\angle B = 30^\circ$ & $m\angle C = 90^\circ$
 Prove: $m\angle E = 60^\circ$

Statements	Reasons

Congruence, Similarity & the Triangle Sum Theorem (Part 2) Answers

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\cong , \sim & the Δ Sum Thm (Part 2) Answers Continued

3. Option A:		3. Option B:	
Statements	Reasons	Statements	Reasons
$\Delta ABC \cong \Delta FED$, $m\angle E = 75^\circ$ & $m\angle F = 102^\circ$	Given	$\Delta ABC \cong \Delta FED$, $m\angle E = 75^\circ$ & $m\angle F = 102^\circ$	Given
$m\angle F + m\angle E + m\angle D = 180$	Δ Sum Thm	$\angle C \cong \angle D$	CPCTC
$102 + 75 + m\angle D = 180$	Subst.	$m\angle C = m\angle D$	Def \cong
$177 + m\angle D = 180$	Simp.	$m\angle F + m\angle E + m\angle C = 180$	Δ Sum Thm
$m\angle D = 3^\circ$	Subtr. Prop. =	$102 + 75 + m\angle C = 180$	Subst.
$\angle C \cong \angle D$	CPCTC	$177 + m\angle C = 180$	Simp.
$m\angle C = m\angle D$	Def \cong	$m\angle C = 3^\circ$	Subtr. Prop. =
$m\angle C = 3^\circ$	Subst.		
4. Option A:		4. Option B:	
Statements	Reasons	Statements	Reasons
$\Delta ABC \sim \Delta DEF$, $m\angle A = 42^\circ$ & $m\angle C = 82^\circ$	Given	$\Delta ABC \sim \Delta DEF$, $m\angle A = 42^\circ$ & $m\angle C = 82^\circ$	Given
$m\angle A + m\angle B + m\angle C = 180$	Δ Sum Thm	$\angle B \cong \angle E$	CASTC
$42 + m\angle B + 82 = 180$	Subst.	$m\angle B = m\angle E$	Def \cong
$m\angle B + 124 = 180$	Simp.	$m\angle A + m\angle E + m\angle C = 180$	Δ Sum Thm
$m\angle B = 56^\circ$	Subtr. Prop. =	$42 + m\angle E + 82 = 180$	Subst.
$\angle B \cong \angle E$	CASTC	$m\angle E + 124 = 180$	Simp.
$m\angle B = m\angle E$	Def \cong	$m\angle E = 56^\circ$	Subtr. Prop. =
$56^\circ = m\angle E$	Subst.		
$m\angle E = 56^\circ$	Symm. Prop. =		
5. Option A:		5. Option B:	
Statements	Reasons	Statements	Reasons
$\Delta ABC \cong \Delta FDE$, $m\angle D = 54^\circ$ & $m\angle F = 89^\circ$	Given	$\Delta ABC \cong \Delta FDE$, $m\angle D = 54^\circ$ & $m\angle F = 89^\circ$	Given
$m\angle F + m\angle D + m\angle E = 180$	Δ Sum Thm	$\angle C \cong \angle E$	CPCTC
$89 + 54 + m\angle E = 180$	Subst.	$m\angle C = m\angle E$	Def \cong
$143 + m\angle E = 180$	Simp.	$m\angle F + m\angle D + m\angle E = 180$	Δ Sum Thm
$m\angle E = 37^\circ$	Subtr. Prop. =	$89 + 54 + m\angle C = 180$	Subst.
$\angle C \cong \angle E$	CPCTC	$143 + m\angle C = 180$	Simp.
$m\angle C = m\angle E$	Def \cong	$m\angle C = 37^\circ$	Subtr. Prop. =
$m\angle C = 37^\circ$	Subst.		
6. Option A:		6. Option B:	
Statements	Reasons	Statements	Reasons
$\Delta ABC \sim \Delta EFD$, $m\angle E = 64^\circ$ & $m\angle D = 52^\circ$	Given	$\Delta ABC \sim \Delta EFD$, $m\angle E = 64^\circ$ & $m\angle D = 52^\circ$	Given
$m\angle E + m\angle F + m\angle D = 180$	Δ Sum Thm	$\angle B \cong \angle F$	CASTC
$64 + m\angle F + 52 = 180$	Subst.	$m\angle B = m\angle F$	Def \cong
$m\angle F + 116 = 180$	Simp.	$m\angle E + m\angle F + m\angle D = 180$	Δ Sum Thm
$m\angle F = 64^\circ$	Subtr. Prop. =	$64 + m\angle B + 52 = 180$	Subst.
$\angle B \cong \angle F$	CASTC	$m\angle B + 116 = 180$	Simp.
$m\angle B = m\angle F$	Def \cong	$m\angle B = 64^\circ$	Subtr. Prop. =
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7. Option A:		7. Option B:	
Statements	Reasons	Statements	Reasons
$\Delta ABC \sim \Delta DFE$, $m\angle A = 12^\circ$ & $m\angle B = 93^\circ$	Given	$\Delta ABC \sim \Delta DFE$, $m\angle A = 12^\circ$ & $m\angle B = 93^\circ$	Given
$m\angle A + m\angle B + m\angle C = 180$	Δ Sum Thm	$\angle C \cong \angle E$	CASTC
$12 + 93 + m\angle C = 180$	Subst.	$m\angle C = m\angle E$	Def \cong
$105 + m\angle C = 180$	Simp.	$m\angle A + m\angle B + m\angle C = 180$	Δ Sum Thm
$m\angle C = 75^\circ$	Subtr. Prop. =	$12 + 93 + m\angle E = 180$	Subst.
$\angle C \cong \angle E$	CASTC	$105 + m\angle E = 180$	Simp.
$m\angle C = m\angle E$	Def \cong	$m\angle E = 75^\circ$	Subtr. Prop. =
$75^\circ = m\angle E$	Subst.		
$m\angle E = 75^\circ$	Symm. Prop. =		
8. Option A:		8. Option B:	
Statements	Reasons	Statements	Reasons
$\Delta ABC \cong \Delta EFD$, $m\angle B = 30^\circ$ & $m\angle C = 90^\circ$	Given	$\Delta ABC \cong \Delta EFD$, $m\angle B = 30^\circ$ & $m\angle C = 90^\circ$	Given
$m\angle A + m\angle B + m\angle C = 180$	Δ Sum Thm	$\angle A \cong \angle E$	CPCTC
$m\angle A + 30 + 90 = 180$	Subst.	$m\angle A = m\angle E$	Def \cong
$m\angle A + 120 = 180$	Simp.	$m\angle A + m\angle B + m\angle C = 180$	Δ Sum Thm
$m\angle A = 60^\circ$	Subtr. Prop. =	$m\angle E + 30 + 90 = 180$	Subst.
$\angle A \cong \angle E$	CPCTC	$m\angle E + 120 = 180$	Simp.
$m\angle A = m\angle E$	Def \cong	$m\angle E = 60^\circ$	Subtr. Prop. =
$60^\circ = m\angle E$	Subst.		
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