Triangle Sum Theorem Part 1

Given: The information provided in the problem or within any images from the problem.	Triangle Sum Theorem: The three angles of a triangle will always add to equal 180°.	Simplify: Property used when basic math is done on one side of the equal sign (example: combining like terms).
Substitution: Property used to replace something with a number, variable or object that it equals or is congruent to.		Subtraction Property of Equality: The resulting step after a number, variable or object is subtracted from both sides of the equal sign.

For each triangle, determine the measure of the missing angle, showing and explaining every step of the solution. Use the properties described above in your explanations. Write the angle measures in the provided table, in order from smallest to largest, identifying their opposite sides (use the other two letters), as well.

Example:
On $\triangle ABC$, $m\angle A = 27°$ & $m\angle C = 79°$. Determine the measure of $\angle B$, and use your solution and the given information to fill in the table on the right.

	Angles	Opposite Sides
Small	$m\angle A = 27°$	$\overline{BC}$
Medium	$m\angle B = 74°$	$\overline{AC}$
Large	$m\angle C = 79°$	$\overline{AB}$

The **GIVEN** information is:

On $\triangle ABC$, $m\angle A = 27°$ & $m\angle C = 79°$.

By the **TRIANGLE SUM** theorem, the three angles of a triangle will always add to equal **180**°:

$m\angle A + m\angle B + m\angle C = 180$

Use **SUBSTITUTION** to replace the angle names with the measures that they equal:

$27 + m\angle B + 79 = 180$

SIMPLIFY the equation by combining the like terms (adding the numbers) on the left side of the equation:

$106 + m\angle B = 180$

$-106 \qquad\quad -106$

Use the **SUBTRACTION** Property of **EQUALITY** to subtract a number from both sides of the equal sign:

$m\angle B = 74°$

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1. On $\triangle DEF$, $m\angle E = 89°$ & $m\angle F = 81°$. Determine the measure of $\angle D$, and use your solution and the given information to fill in the table on the right.

	Angles	Opposite Sides
Small	$m\angle \quad =$	
Medium	$m\angle \quad =$	
Large	$m\angle \quad =$	

The _____ information is:

By the _____ theorem, the three angles of a triangle will always add to equal _____:

Use _____ to replace the angle names with the measures that they equal:

_____ the equation by combining the like terms (adding the numbers) on the left side of the equation:

Use the _____ Property of _____ to subtract a number from both sides of the equal sign:

2. On △GHI, m∠G = 96° & m∠I = 13°. Determine the measure of ∠H, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$	=	
Medium	$m\angle$	=	
Large	$m\angle$	=	

The _____ information is:

By the _____ theorem, the three angles of a triangle will always add to equal _____:

Use _____ to replace the angle names with the measures that they equal:

_____ the equation by combining the like terms (adding the numbers) on the left side of the equation:

Use the _____ Property of _____ to subtract a number from both sides of the equal sign:

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3. On △KLM, m∠L = 142° & m∠M = 25°. Determine the measure of ∠K, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$	=	
Medium	$m\angle$	=	
Large	$m\angle$	=	

The _____ information is:

By the _____ theorem, the three angles of a triangle will always add to equal _____:

Use _____ to replace the angle names with the measures that they equal:

_____ the equation by combining the like terms (adding the numbers) on the left side of the equation:

Use the _____ Property of _____ to subtract a number from both sides of the equal sign:

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4. On △NPQ, m∠N = 56° & m∠Q = 56°. Determine the measure of ∠P, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$	=	
Medium	$m\angle$	=	
Large	$m\angle$	=	

_____ :

_____ :

_____ :

_____ :

_____ :

_____ :

5. On $\triangle RST$, $m\angle R = 122°$ & $m\angle T = 17°$. Determine the measure of $\angle S$, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$ =		
Medium	$m\angle$ =		
Large	$m\angle$ =		

_____ :
_____ :
_____ :
_____ :
_____ :
_____ :

A shorter way to explain your work is using something called a "Two-column Proof," where you write the names (instead of long definitions) what you did to reach each step.

6. On $\triangle VWY$, $m\angle V = 60°$ & $m\angle W = 90°$. Determine the measure of $\angle Y$, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$ =		
Medium	$m\angle$ =		
Large	$m\angle$ =		

Statements (the steps to solve)	Reasons (the explanations for each step)
	Given
	Triangle Sum Theorem
	Substitution
	Simplify
	Subtraction Property of Equality

7. On $\triangle BCD$, $m\angle C = 100°$ & $m\angle B = 35°$. Determine the measure of $\angle D$, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$ =		
Medium	$m\angle$ =		
Large	$m\angle$ =		

Statements (the steps to solve)	Reasons (the explanations for each step)

8. On $\triangle EFG$, $m\angle E = 63°$ & $m\angle F = 41°$. Determine the measure of $\angle G$, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$	=	
Medium	$m\angle$	=	
Large	$m\angle$	=	

Statements (the steps to solve)	Reasons (the explanations for each step)

9. On $\triangle HJK$, $m\angle H = 43°$ & $m\angle K = 99°$. Determine the measure of $\angle J$, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$	=	
Medium	$m\angle$	=	
Large	$m\angle$	=	

Statements (the steps to solve)	Reasons (the explanations for each step)

10. On $\triangle LMN$, $m\angle M = 45°$ & $m\angle N = 45°$. Determine the measure of $\angle L$, and use your solution and the given information to fill in the table on the right.

	Angles		Opposite Sides
Small	$m\angle$	=	
Medium	$m\angle$	=	
Large	$m\angle$	=	

Statements (the steps to solve)	Reasons (the explanations for each step)

Triangle Sum Theorem Part 1 Answers

1.		2.		3.		4.		5.	
$m\angle D = 10°$	$\overline{EF}$	$m\angle I = 13°$	$\overline{GH}$	$m\angle K = 13°$	$\overline{LM}$	$m\angle N = 56°$	$\overline{QP}$	$m\angle T = 17°$	$\overline{RS}$
$m\angle F = 81°$	$\overline{DE}$	$m\angle H = 71°$	$\overline{GI}$	$m\angle M = 25°$	$\overline{KM}$	$m\angle Q = 56°$	$\overline{NP}$	$m\angle S = 41°$	$\overline{RT}$
$m\angle E = 89°$	$\overline{DF}$	$m\angle G = 96°$	$\overline{HI}$	$m\angle L = 142°$	$\overline{KL}$	$m\angle P = 68°$	$\overline{PQ}$	$m\angle R = 122°$	$\overline{ST}$
6.		7.		8.		9.		10.	
$m\angle Y = 30°$	$\overline{VW}$	$m\angle B = 35°$	$\overline{CD}$	$m\angle F = 41°$	$\overline{EG}$	$m\angle J = 38°$	$\overline{HK}$	$m\angle M = 45°$	$\overline{LN}$
$m\angle V = 60°$	$\overline{WY}$	$m\angle D = 45°$	$\overline{BC}$	$m\angle E = 63°$	$\overline{FG}$	$m\angle H = 43°$	$\overline{JK}$	$m\angle N = 45°$	$\overline{LM}$
$m\angle W = 90°$	$\overline{VY}$	$m\angle C = 100°$	$\overline{CD}$	$m\angle G = 76°$	$\overline{EF}$	$m\angle K = 99°$	$\overline{HJ}$	$m\angle L = 90°$	$\overline{MN}$