Isosceles and Equilateral Triangles

Isosceles triangles are common in the real world. We can find them in structures such as bridges and buildings. The congruent sides of an isosceles triangle are its legs. The third side is the base. The two congruent sides from the vertex angle. The other two angles are the base angles.



Isosceles Triangle Theorem

If two sides of a triangle are congruent, then the angles opposite those sides are congruent.



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	Steps	Reasons	
	Isosceles triangle ABC with legs AB and BC.	Gíven	
	$\overline{AB} \cong \overline{BC}$		
	Construct ray BD, the angle bisector of angle ABC		
3	$\angle ABD \cong \angle CBD$		
-	$\overline{BD} \cong \overline{BD}$		
5	$\triangle ABD \cong \triangle CBD$		Carly
	$\angle A \cong \angle C$		
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	Steps	Reasons	
	Isosceles triangle ABC with legs AB and BC.	Gíven	
	$\overline{AB} \cong \overline{BC}$	Def of isosceles triangle	
	Construct ray BD, the angle bisector of angle ABC	Construction	6 1 (CON
	∠ABD ≅ ∠CBD	Def. Of angle bisector	
	$\overline{BD} \simeq \overline{BD}$	Reflexíve Prop.	
	$\Delta ABD \cong \Delta CBD$	SAS Post.	in the
	$\angle A \cong \angle C$	СРСТС	
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Isosceles Triangle Theorem

If two angles of a triangle are congruent, then the sides opposite the angles are congruent



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	Steps	Reasons	
	Triangle ABC with	Gíven	N.
100	congruent angles A and C		200
	Construct ray BD, the angle bisector of angle ABC		
	∠ABD ≅ ∠CBD		
1.2	$\overline{\mathrm{BD}} \cong \overline{\mathrm{BD}}$		(25)
	$\triangle ABD \cong \triangle CBD$		
	$\overline{AB} \cong \overline{BC}$	CPCTC	S.
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StepsReasonsTriangle ABC with congruent angles A and CGivenConstruct ray BD, the angle bisector of angle ABCConstructionDef. Of angle	X			Not
Triangle ABC with congruent angles A and CGivenConstruct ray BD, the angle bisector of angle ABCConstructionDef. Of angle		Steps	Reasons	
Construct ray BD, the angle bisector of angle ABC Def. Of angle		Tríangle ABC wíth congruent angles A and C	Gíven	
Def. Of angle		Construct ray BD, the angle bisector of angle ABC	Construction	
		∠ABD ≅ ∠CBD	Def. Of angle bísector	
$\mathbf{BD} \cong \mathbf{BD}$ $\mathbf{Reflexive Prop.}$	-	$\overline{BD} \cong \overline{BD}$	Reflexíve Prop.	125
$ \Delta ABD \cong \Delta CBD $		$\triangle ABD \cong \triangle CBD$	AAS Post.	
$\overrightarrow{AB} \cong \overrightarrow{BC} \qquad \qquad CPCTC \qquad $		$\overline{AB} \cong \overline{BC}$	СРСТС	

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Theorem:

The bisector of the vertex angle of an isosceles triangle is the perpendicular bisector of the base.







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	Steps	Reasons	
	Isosceles triangle ABC with legs AB and BC.		
	$\overline{AB} \cong \overline{BC}$		
	Construct ray BD, the angle bisector of angle ABC		
13	$\angle ABD \cong \angle CBD$		0
0	$BD \cong BD$		6
	$\triangle ABD \cong \triangle CBD$		Sel.
	$\angle ADB \cong \angle CDB; AD \cong CD$	CPCTC	1
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Steps

Reasons

∠ADB and ∠CDB are both right angles

BD is the perpendicular bisector of **AC**

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If two angles are congruent supplementary then each of them is a right angle

Def of a perpendícular bísector





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	Steps	Reasons	
	Isosceles triangle ABC with legs AB and BC.	Given	
	$\overline{AB} \cong \overline{BC}$	Def of ísosceles tríangle	
	Construct ray BD, the angle bisector of angle ABC	Construction	
	$\angle ABD \cong \angle CBD$	Def. Of angle bísector	6
	$\overline{\text{BD}} \simeq \overline{\text{BD}}$	Reflexíve Prop.	A
	$\Delta ABD \cong \Delta CBD$	SAS Post.	10 m
Aller .	$\angle ADB \cong \angle CDB; \overline{AD} \cong \overline{CD}$	СРСТС	7.00
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Steps

Reasons

∠ADB and ∠CDB are If two angles are both right angles congruent

BD is the perpendicular bisector of **AC** If two angles are congruent supplementary then each of them is a right angle

Def of a perpendícular bísector A corollary is a statement that follows immediately from a theorem.

Corollary:

If a triangle is equilateral, then the triangle is equiangular.





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	Steps	Reasons	
	Equílateral tríangle ABC	Gíven	
	$\overline{AB} \cong \overline{BC} \cong \overline{AC}$		
	$\angle C \cong \angle A \cong \angle B$	Isosceles Tríangle Theorem	
	Tríangle ABC ís equíangular	Def. Of an equíangular tríangle	

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	Steps	Reasons
	Equílateral tríangle ABC	Given
	$\overline{AB} \cong \overline{BC} \cong \overline{AC}$	Def of an equilateral triangle
	$\angle C \cong \angle A \cong \angle B$	Isosceles Tríangle Theorem
3	Tríangle ABC ís equíangular	Def. Of an equíangular tríangle

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Corollary:

If a triangle is equiangular, then the triangle is equilateral

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-	Steps	Reasons	
	Equíangular tríangle ABC	Given	
	$\angle C \cong \angle A \cong \angle B$	Def. Of an equíangular tríangle	
	$\overline{AB} \cong \overline{BC} \cong \overline{AC}$	Converse of Isosceles Tríangle Theorem	
	Tríangle ABC ís equíangular	Def of an equilateral triangle	

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	Steps	Reasons	
	Equíangular tríangle ABC	Gíven	
	$\angle C \cong \angle A \cong \angle B$	Def. Of an equíangular tríangle	
	$\overline{AB} \cong \overline{BC} \cong \overline{AC}$	Converse of Isosceles Tríangle Theorem	
	Tríangle ABC ís equíangular	Def of an equílateral tríangle	

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