

Geometry  
Notes Lesson 5-5

Writing an indirect proof:

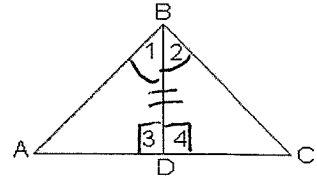
1. Identify the conjecture to be proven.
2. Assume the opposite (the negation) of the conclusion is true.
3. Use direct reasoning to show that the assumption leads to a contradiction.
4. Conclude that since the assumption is false, the original conjecture must be true.



Example:

1. Given:  $\overline{BD} \perp \overline{AC}$   
 $\overline{AB}$  is not  $\cong \overline{CB}$

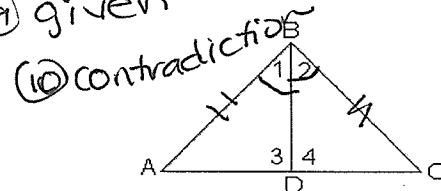
Prove:  $\overline{BD}$  does not bisect  $\angle ABC$  *4 assume opposite*



Statements	Reasons
① $\overline{AC} \perp \overline{BD}$ ; $\overline{AB}$ is not $\cong \overline{CB}$	① given
② $\overline{BD}$ bisects $\angle ABC$	② Assumption
③ $\angle 1 \cong \angle 2$	③ if bisects $\rightarrow \angle$ 's $\cong$
④ $\angle 3$ & $\angle 4$ are right $\angle$ 's	④ if $\perp \rightarrow$ right $\angle$ 's
⑤ $\angle 3 \cong \angle 4$	⑤ right $\angle$ 's always $\cong$
⑥ $\overline{BD} \cong \overline{BD}$	⑥ Reflex. PC
⑦ $\triangle ABD \cong \triangle CBD$	⑦ ASA $\cong$ (3, 6, 5)
⑧ $\overline{AB} \cong \overline{CB}$	⑧ CPCTC
⑨ <b>BUT</b> $\overline{AB}$ is not $\cong \overline{CB}$	⑨ given

5. Given:  $\triangle ABC$  is isosceles  
D is not the midpoint of  $\overline{AC}$   
Prove:  $\overline{BD}$  does not bisect  $\angle ABC$

⑩  $\overline{BD}$  does not bisect  $\angle ABC$

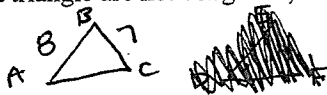


*assume opposite*

Statements	Reasons
① $\triangle ABC$ is ISOS. D is not mdpt. of $\overline{AC}$	① given
② $\overline{BD}$ bisects $\angle ABC$	② Assumption
③ $\angle 1 \cong \angle 2$	③ if bisect $\rightarrow \angle$ 's $\cong$
④ $\overline{AB} \cong \overline{CB}$	

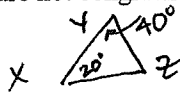
Theorems:

If two sides of a triangle are not congruent, then the larger angle is opposite the longer side.



$$m\angle C > m\angle A$$

If two angles of a triangle are not congruent, then the longer side is opposite the larger angle.

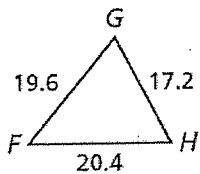


$$XZ > YZ$$

Triangle Inequality Theorem: The sum of any two side lengths of a triangle is greater than the 3rd side length.

Examples:

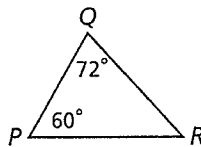
1. Write the angles in order from smallest to largest.



$$17.2 < 19.6 < 20.4$$

$$m\angle F < m\angle H < m\angle G$$

2. Write the sides in order from shortest to longest.



$$* m\angle R = 180 - (72 + 60) = 48^\circ$$

$$m\angle R < m\angle P < m\angle Q$$

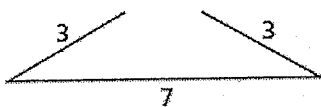
$$PQ < QR < PR$$

3. Tell whether a triangle can have sides with the given lengths. Explain.

a. 3, 3, 7

$$3 + 7 > 10 \checkmark$$

$$3 + 3 > 7 \text{ X}$$



NO  $\Delta$  is formed

b. 2.3, 3.1, 4.6

$$2.3 + 3.1 > 4.6$$

$$5.4 > 4.6 \checkmark$$

$$2.3 + 4.6 > 3.1$$

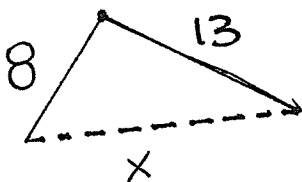
$$6.9 > 3.1 \checkmark$$

$$3.1 + 4.6 > 2.3$$

$$7.7 > 2.3 \checkmark$$

$\Delta$  can be formed

4. The lengths of two sides of a triangle are 8 inches and 13 inches. Find the range of possible lengths of the third side.



Smallest

$$x > 13 - 8$$

$$x > 5 \checkmark$$

largest

$$x < 8 + 13$$

$$\checkmark x < 21$$

$$5 < x < 21$$