Indirect Proof

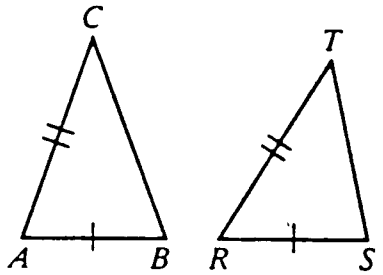
How to Write an Indirect Proof

1. Assume temporarily that the conclusion is not true.
2. Reason logically until you reach a contradiction of a known fact.
3. Point out that the temporary assumption must be false, and that the conclusion must then be true.

Example 2

Given: $AC = RT$; $AB = RS$; $\angle A \ncong \angle R$

Prove: $BC \neq ST$



Solution

Assume temporarily that $BC = ST$. Then $\triangle ABC \cong \triangle RST$ by SSS, and $\angle A \cong \angle R$ since corr. parts of $\cong$ $\triangle$ are $\cong$. But this contradicts the given information that $\angle A \ncong \angle R$. Therefore the temporary assumption that $BC = ST$ must be false. It follows that $BC \neq ST$.

Number the sentences in an order that completes an indirect proof.

1. Given: $\triangle ABC$; $\overline{AB} \cong \overline{BC}$

   Prove: $m\angle A \neq 90$

   (___) Then $m\angle C = 90$, and $m\angle A + m\angle B + m\angle C = 90 + m\angle B + 90 > 180$.

   (___) But this contradicts the fact that the sum of the measures of the angles of a triangle is 180.

   (___) Assume temporarily that $m\angle A = 90$.

   (___) It follows that $m\angle A \neq 90$.

   (___) Therefore the temporary assumption that $m\angle A = 90$ must be false.

2. If $n^2 > 6n$, then $n \neq 4$.

   (___) Therefore the temporary assumption that $n = 4$ must be false.

   (___) Then $n^2 = 16$ and $6n = 24$.

   (___) It follows that $n \neq 4$.

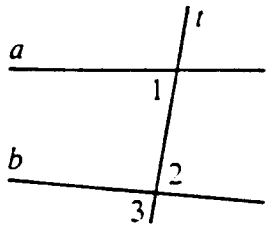
   (___) Assume temporarily that $n = 4$.

   (___) But this contradicts the given fact that $n^2 > 6n$, since $16 \not> 24$.

Write an indirect proof in paragraph form.

3. Given: Transversal t cuts lines a and b; $m\angle 1 \neq m\angle 2$

   Prove: $m\angle 1 \neq m\angle 3$



4. Given: Scalene $\triangle REN$

   Prove: $\angle R \ncong \angle N$