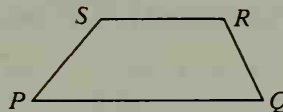


Example 2

Prove that the bases of a trapezoid have unequal lengths.

Given: Trap. $PQRS$ with bases \overline{PQ} and \overline{SR}

Prove: $PQ \neq SR$

**Proof:**

Assume temporarily that $PQ = SR$. We know that $\overline{PQ} \parallel \overline{SR}$ by the definition of a trapezoid. Since quadrilateral $PQRS$ has two sides that are both congruent and parallel, it must be a parallelogram, and \overline{PS} must be parallel to \overline{QR} . But this contradicts the fact that, by definition, trapezoid $PQRS$ can have only one pair of parallel sides. The temporary assumption that $PQ = SR$ must be false. It follows that $PQ \neq SR$.

Can you see how proving a statement by proving its contrapositive is related to *indirect proof*? If you want to prove the statement “If p , then q ,” you could prove the contrapositive “If not q , then not p .” Or you could write an indirect proof—assume that q is false and show that this assumption implies that p is false.

Classroom Exercises

1. An indirect proof is to be used to prove the following:

If $AB = AC$, then $\triangle ABD \cong \triangle ACD$.

Which one of the following is the correct way to begin?

- Assume temporarily that $AB \neq AC$.
- Assume temporarily that $\triangle ABD \not\cong \triangle ACD$.

What is the first sentence of an indirect proof of the statement shown?

- $\triangle ABC$ is equilateral.
- $a \geq b$
- $m\angle X > m\angle Y$
- Doug is a Canadian.
- Kim isn't a violinist.
- \overline{CX} isn't a median of $\triangle ABC$.
- Planning to write an indirect proof that $\angle A$ is an obtuse angle, Becky began by saying “Assume temporarily that $\angle A$ is an acute angle.” What has Becky overlooked?
- Wishing to prove that l and m are skew lines, John began an indirect proof by supposing that l and m are intersecting lines. What possibility has John overlooked?