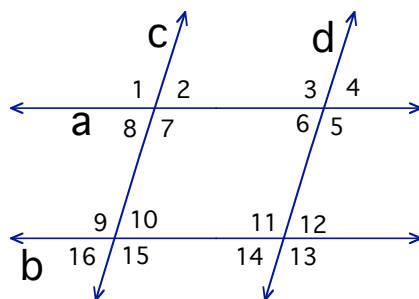


Chapter 3- Lesson 2

Proving Lines Parallel

In previous lessons we have often been given the fact that two lines are parallel and then have used this fact to make further deductions. The focus of this lesson is the *converse*. In other words, we will be given some facts about a diagram and then have to show that these facts imply that the lines are parallel.



Converse of an Implication

The “converse” of an implication, $p \rightarrow q$, is formed by switching the position of the hypothesis and conclusion, $q \rightarrow p$.

1. Now assume that you are **not** given the information that $\vec{a} \parallel \vec{b}$. Would you *have to* conclude that \vec{a} really is parallel to \vec{b} from the following? If yes, why. If no, draw a counter example.

a. $m\angle 2 = m\angle 10$

f. $m\angle 5 + m\angle 12 = 180^\circ$

b. $m\angle 6 = m\angle 16$

g. $m\angle 3 = m\angle 13$

c. $m\angle 7 = m\angle 11$

h. $m\angle 3 + m\angle 12 = 180^\circ$

d. $m\angle 6 = m\angle 12$

i. $m\angle 4 = m\angle 16$

e. $m\angle 9 = m\angle 11$

j. $m\angle 1 = m\angle 7$

Not all converses are true!

Consider the following implications:

If a number is divisible by two, then the number is even.

If a quadrilateral is a square, then it is a rectangle.

Only one of these implications has a converse that is true. Can you figure out which one? Can you come up with another pair of implications like these?

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A New Postulate and Some New Theorems

Corresponding Angles Converse

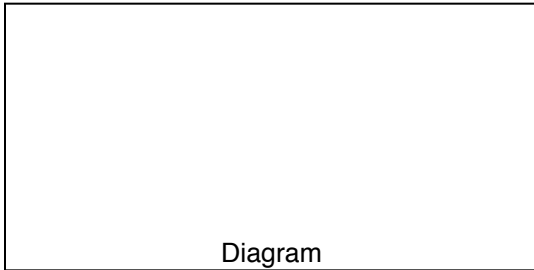
If two lines are cut by a transversal such that corresponding angles are congruent, then the two lines are parallel.

2. Alternate Interior Angles Converse

- a. Write the converse of the Alternate Interior Angles postulate.
- b. Write a proof of this statement.

Given:

Prove:



Plan:

Postulates, Axioms, Conjectures, and Theorems

A “postulate” or “axiom” is a statement that is taken to be true *without* proof. A “theorem” on the other hand is a statement that *has been proved*. A statement is *believed* to be true, but has not yet been proved, is referred to as a “conjecture”.

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3. Same Side Interior Angles Converse

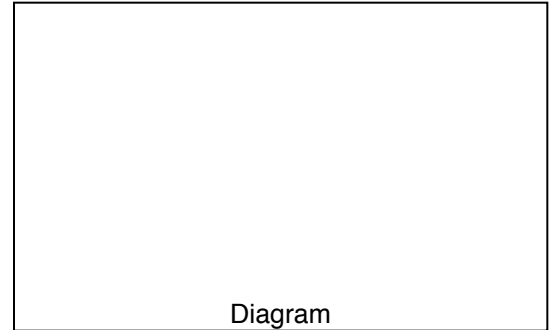
a. Write the converse of the Same Side Interior Angles theorem.

b. Write a proof of this statement.

Given:

Prove:

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4. Alternate Exterior Angles Converse

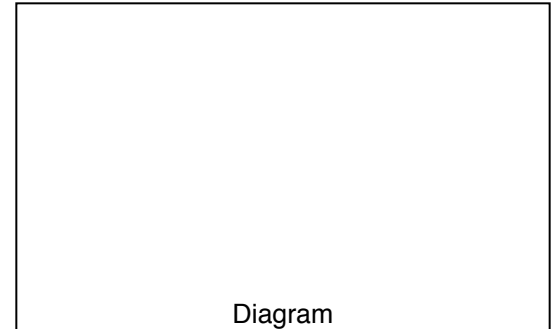
a. Write the converse of the Alternate Exterior Angles theorem.

b. Write a proof of this statement.

Given:

Prove:

Plan:

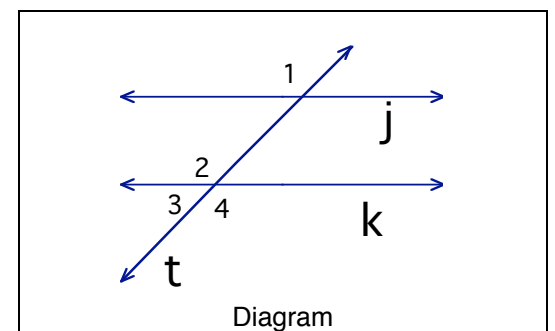


5. Practice proof 1

Given: $m\angle 1 + m\angle 3 = 180^\circ$

Prove: $\vec{j} \parallel \vec{k}$

Plan:



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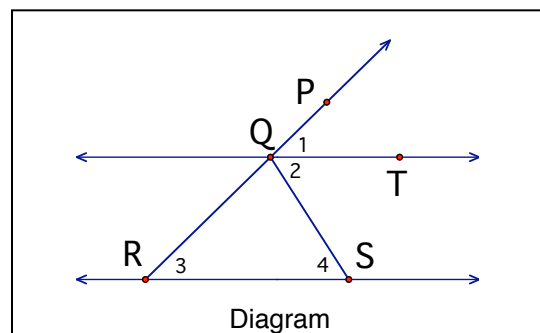
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6. Practice proof 2

Given: \overline{QT} bisects $\angle PQS$; $m\angle 1 = m\angle 4$

Prove: $\overline{QT} \parallel \overline{RS}$

Plan:

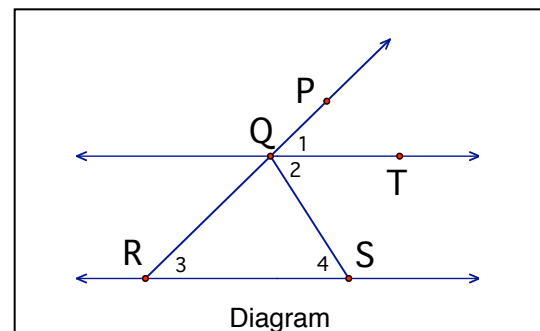


7. Practice proof 3

Given: \overline{QT} bisects $\angle PQS$; $m\angle 2 = m\angle 3$;

Prove: $\overline{QT} \parallel \overline{RS}$

Plan:



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8. Please complete the following problems from your textbook: Txt. p.153 #10-18, 20-28