

4.3 Analyze Conditional Statements

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VOCABULARY

Conditional statement **A logical statement that has two parts, a hypothesis and a conclusion.**

If-then form **A form of a conditional statement in which the “if” part contains the hypothesis and the “then” part contains the conclusion.**

Hypothesis **The part AFTER the “if” in a conditional statement.**

Conclusion

The part AFTER the “then” in a conditional statement.

Negation **The opposite of the original statement.**



Converse **The converse of a conditional statement is formed by switching the hypothesis and conclusion.**

Inverse **The inverse of a conditional statement is formed by negating both the hypothesis and conclusion.**

Contrapositive **The contrapositive of a conditional statement is formed by writing the converse and then negating both the hypothesis and conclusion.**

Equivalent statements **Two statements that are both true or both false.**

Perpendicular lines **Two lines that intersect to form right angles.**

Biconditional statement **A statement that contains the phrase “if and only if”.**



Example 1***Rewrite a statement in if-then form***

Rewrite the conditional statement in if-then form.

All vertebrates have a backbone.

Solution

First, identify the hypothesis and the conclusion. When you rewrite the statement in if-then form, you may need to reword the hypothesis or conclusion.

All vertebrates have a backbone.

If _____, then _____.



1. All triangles have
3 sides.

2. When $x = 2$, $x^2 = 4$.



Example 2**Write four related conditional statements**

Write the if-then form, the converse, the inverse, and the contrapositive of the statement “Olympians are athletes.” Decide whether each statement is *true* or *false*.

Solution

If-then form

Converse

Inverse

Contrapositive



3. Write the if-then form, the converse, the inverse, and the contrapositive of the statement “Squares are rectangles.” Decide whether each statement is *true* or *false*.

If-then:

Converse:

Inverse:

Contrapositive:

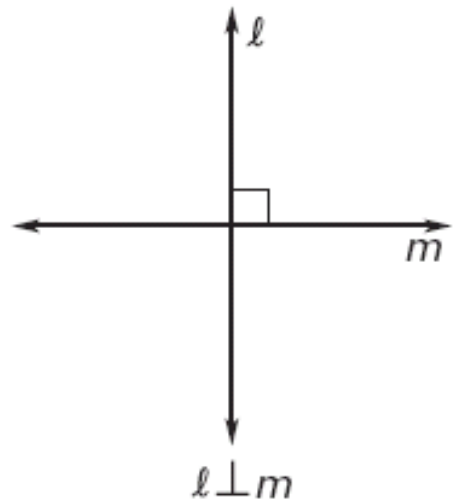


PERPENDICULAR LINES

Definition If two lines intersect to form a _____ angle, then they are perpendicular lines.

The definition can also be written using the converse: If any two lines are perpendicular lines, then they intersect to form a _____ angle.

You can write “line l is perpendicular to line m ” as $l \perp m$.

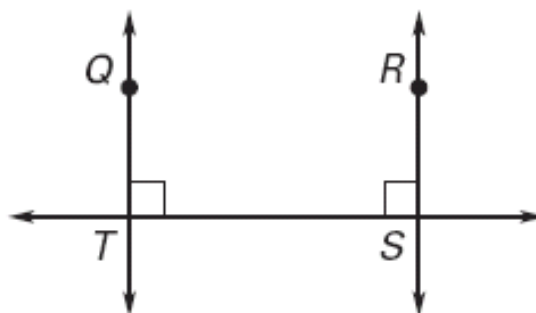


Example 3 Use definitions

Decide whether each statement about the diagram is true. *Explain* your answer using the definitions you have learned.

a. $\overleftrightarrow{QT} \perp \overleftrightarrow{TS}$

b. $\angle QTS$ and $\angle RST$
are supplementary.

**Solution**

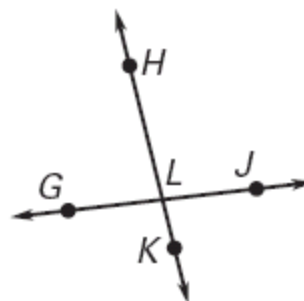
- a. This statement is _____. The right angle symbol in the diagram indicates that the lines intersect to form a _____. So the lines are _____.
- b. This statement is _____. Both angles are right angles, so the sum of their measures is _____.



4. Decide whether each statement about the diagram is true. *Explain* your answer using the definitions you have learned.

a. $m\angle GLJ = 180^\circ$

b. $\overleftrightarrow{GJ} \perp \overleftrightarrow{HK}$



Example 4***Write a biconditional***

Write the definition of parallel lines as a biconditional.

Definition: If two lines lie in the same plane and do not intersect, then they are parallel.

Solution

Converse: _____

Biconditional: _____



5. Write the statement below as a biconditional.

Statement: If a student is a boy, he will be in group A.
If a student is in group A, the student must be a boy.

