2-3 Biconditionals and Definitions

Content Standards
Prepares for G.CO.9 Prove theorems about lines and angles.
Prepares for G.CO.10 Prove theorems about triangles.
Prepares for G.CO.11 Prove theorems about parallelograms.

Objective To write biconditionals and recognize good definitions

A **biconditional** is a single true statement that combines a true conditional and its true converse. You can write a biconditional by joining the two parts of each conditional with the phrase *if and only if*.

iff

Essential Understanding A definition is good if it can be written as a biconditional.

Problem 1 Writing a Biconditional

What is the converse of the following true conditional? If the converse is also true, rewrite the statements as a biconditional.

If the sum of the measures of two angles is 180, then the two angles are supplementary.

Converse: If the two angles are supplementary, then the sum of the measures of the two angles is 180.

TRUE

Biconditional: The sum of the measures of two angles is 180 if and only if the two angles are supplementary.

take note

Key Concept Biconditional Statements

A biconditional combines $p \rightarrow q$ and $q \rightarrow p$ as $p \leftrightarrow q$.

Example	Symbols	How to Read It
A point is a midpoint if and only if it divides a segment into two congruent segments.	$p \leftrightarrow q$	"p if and only if q"

You can write a biconditional as two conditionals that are converses.

Problem 2 Identifying the Conditionals in a Biconditional

What are the two conditional statements that form this biconditional?

A ray is an angle bisector ~~if and only if~~ it divides an angle into two congruent angles.

If a ray is an angle bisector, then it divides an angle into two congruent angles.

If a ray divides an angle into two congruent angles, then it is an angle bisector.

A good definition is a statement that can help you identify or classify an object. A good definition has several important components.

- ✔ A good definition uses clearly understood terms. These terms should be commonly understood or already defined.
- ✔ A good definition is precise. Good definitions avoid words such as *large, sort of,* and *almost*.
- ✔ A good definition is reversible. That means you can write a good definition as a true biconditional.

Problem 3 **Writing a Definition as a Biconditional**

Is this definition of *quadrilateral* reversible? If yes, write it as a true biconditional.
Definition: A quadrilateral is a polygon with four sides.

is reversible

Biconditional: A figure is a quadrilateral if and only if it is a polygon with four sides.

3. Is this definition of *straight angle* reversible? If yes, write it as a true biconditional.
A straight angle is an angle that measures 180.

reversible

An angle is straight if and only if it measures 180.

One way to show that a statement is *not* a good definition is to find a counterexample.

Problem 4 **Identifying Good Definitions**

Multiple Choice Which of the following is a good definition?

(A) A fish is an animal that swims.
(B) Rectangles have four corners.
(C) Giraffes are animals with very long necks.
(D) A penny is a coin worth one cent.

a. whales, turtles, people

b. squares, trapezoid, rhombus

c. long?, flamingo, ostrich

d. good definition