statements.

- If a parallelogram is a square, then it has all four sides and all four angles congruent.
- If a parallelogram has all four sides and all four angles congruent, then it is a square.

Learn
Biconditionals

Biconditional Statement	
Words	A **biconditional statement** is the conjunction of a conditional and its converse.
Symbols	$(p \rightarrow q) \wedge (q \rightarrow p) \rightarrow (p \leftrightarrow q)$, read *p if and only if q*

So, the biconditional statement for the example above is *A parallelogram is a square if and only if it has all four sides and all four angles congruent.* Later, you will use biconditional statements, as well as conditional statements and their converses, to prove relationships.

Example 6
Write Biconditionals

Write the conditional and converse for each statement, and determine their truth values. If false, find a counterexample. Write a biconditional statement if possible.

a. Rasha listens to music when she is in study hall.

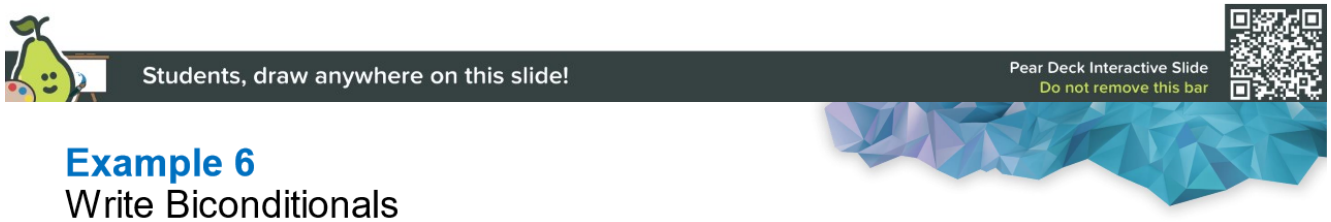
b. If two lines are parallel, then they have the same slope and different *y*-intercepts.

Example 6
Write Biconditionals

a. Rasha listens to music when she is in study hall.

Conditional: If Rasha is in study hall, then she is listening to music.

Is the conditional statement *true* or *false*? If false, provide a counterexample. true



Example 6
Write Biconditionals

a. Rasha listens to music when she is in study hall.

Converse: If Rasha is listening to music, then she is in study hall.

Is the converse *true* or *false*? If false, provide a counterexample.

False; sample answer: Rasha could be listening to music in the cafeteria.

Because the converse is false, a biconditional statement cannot be written.

Example 6
Write Biconditionals

b. If two lines are parallel, then they have the same slope and different *y*-intercepts.

Conditional: If two lines are parallel, then they have the same slope and different *y*-intercepts.

Converse: If two lines have the same slope and different *y*-intercepts, then they are parallel.

The conditional and the converse are true. So, a biconditional can be written.

Biconditional: Two lines are parallel if and only if they have the same

Biconditional: Two lines are parallel if and only if they have the same slope and different *y*-intercepts.

Example 6
Write Biconditionals

Check

Write the conditional and converse for the statement, and determine their truth values. If false, find a counterexample. Write a biconditional statement if possible.

Isosceles triangles have at least two congruent sides.

Example 6
Write Biconditionals

Conditional: If a triangle is isosceles, then it has at least two congruent sides.

Converse: If a triangle has at least two congruent sides, then it is isosceles.

The conditional is true, and the converse is true.

Biconditional: A triangle is isosceles if and only if it has at least two congruent sides.

Example 7
Determine Truth Values of Biconditionals

Write the biconditional as a conditional and its converse. Then determine whether the biconditional is *true* or *false*. If it is false, give a counterexample.

Two angles are complements if and only if their measures have a sum of 90°.

Example 7
Determine Truth Values of Biconditionals

Write the biconditional statement as a conditional.

If two angles are complements, then their measures have a sum of 90°.

Write the converse of your conditional statement.

If the measures of two angles have a sum of 90°, then the two angles are complements.

The conditional and the converse are true, so the biconditional is true.

Example 7
Determine Truth Values of Biconditionals

Check

Write the biconditional as a conditional and its converse. Then, determine whether the biconditional is *true* or *false*. If it is false, give a counterexample.

$x > -2$, if and only if x is positive.

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Example 7

Example 1

Determine Truth Values of Biconditionals

Check

Write the biconditional as a conditional and its converse. Then, determine whether the biconditional is *true* or *false*. If it is false, give a counterexample.

$x > -2$, if and only if x is positive

Conditional: If $x > -2$, then x is positive.

Converse: If x is positive, then $x > -2$.

The biconditional is false, because $x = -1$ is a counterexample.

Counter example

$x = -1$