

# Logical Equivalence of Statements

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# What are Logically Equivalent Statements?

Logically equivalent statements are statements that have the same logical content or truth value.

# What is a Counterexample?

A counterexample is any example that shows the statement is false.

# Example 1

Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

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**Inverse:** If two lines do not intersect, then they are not perpendicular.

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**Conditional:** If a shape is a triangle, then it is a polygon.

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**Conditional:** If a number is divisible by 2, then it is divisible by 4.

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**Converse:** If a number is divisible by 4, then it is divisible by 2.

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<b>Inverse:</b> If a number is not divisible by 2, then it is not divisible by 4.	<b>True</b>
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<b>Converse:</b> If a number is divisible by 4, then it is divisible by 2.	<b>True</b>
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**Contrapositive:** If a number is not divisible by 4, then it is not divisible by 2.

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**Conditional:** If a number is divisible by 2, then it is divisible by 4. **False**

**Inverse:** If a number is not divisible by 2, then it is not divisible by 4. **True**

**Converse:** If a number is divisible by 4, then it is divisible by 2. **True**

**Contrapositive:** If a number is not divisible by 4, then it is not divisible by 2. **False**

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Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

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**Conditional:** If a bird is an ostrich, then it cannot fly.



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**Conditional:** If a bird is an ostrich, then it cannot fly.

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**Inverse:** If a bird is not an ostrich, then it can fly.

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**Converse:** If a bird cannot fly, then it is an ostrich.

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Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

**Conditional:** If a bird is an ostrich, then it cannot fly.

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Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

<b>Conditional:</b> If a bird is an ostrich, then it cannot fly.	<b>True</b>
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<b>Contrapositive:</b> If a bird can fly, then it is not an ostrich.	<b>True</b>

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**Conditional:** If two angles are right, then they are congruent.

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**Conditional:** If two angles are right, then they are congruent.

**True**

# Example 5

Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

**Conditional:** If two angles are right, then they are congruent.

**True**

**Inverse:** If two angles are not right, then they are not congruent.

# Example 5

Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

**Conditional:** If two angles are right, then they are congruent.

**True**

**Inverse:** If two angles are not right, then they are not congruent.

**False**

# Example 5

Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

**Conditional:** If two angles are right, then they are congruent.

**True**

**Inverse:** If two angles are not right, then they are not congruent.

**False**

**Converse:** If two angles are congruent, then they are right.

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Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

**Conditional:** If two angles are right, then they are congruent.

**True**

**Inverse:** If two angles are not right, then they are not congruent.

**False**

**Converse:** If two angles are congruent, then they are right.

**False**

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Illustrate the equivalence of the given conditional statement and its contrapositive, and the equivalence of the converse and inverse of the statement.

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**Converse:** If two angles are congruent, then they are right.

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**Contrapositive:** If two angles are not congruent, then they are not right.

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<b>Conditional:</b> If two angles are right, then they are congruent.	<b>True</b>
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<b>Converse:</b> If two angles are congruent, then they are right.	<b>False</b>
<b>Contrapositive:</b> If two angles are not congruent, then they are not right.	<b>True</b>



# Conclusion

The conditional statement and its contrapositive always have the same logical content or truth value, therefore they are logically equivalent.

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The inverse and the converse also have the same logical content or truth value, therefore they are logically equivalent.

**Thank you for watching.**