2-3/2-4

BICONDITIONALS AND DEDUCTIVE REASONING

- To write biconditionals and recognize good definitions
- To use both the Law of Detachment and the Law of Syllogism

OBJECTIVES

Vocabulary

Deductive Reasoning – the process of reasoning logically from given statements or facts to a conclusion

Key Concepts

Statement		Example	Symbols
Law of Detachment	If the hypothesis of a true conditional is true, then the conclusion is true.	If an angle is a right angle, then it is not acute. $m\angle c = 90$. $m\angle c$ is not acute.	If $p \rightarrow q$ is true and p is true then q is true

If possible, use the Law of Detachment to make a conclusion.

1) If you pass a road test, you will get your driver's license.
   Tamara passed her road test.

2) If you arrive at the theater by 2:00PM, you can see the movie.
   You see the movie.

If possible, use the Law of Detachment to make a conclusion.

1) If you pass a road test, you will get your driver's license.
   p Tamara passed her road test.

   Tamara gets her driver's license.

2) If you arrive at the theater by 2:00PM, you can see the movie.
   q ~X̶You see the movie.

   No conclusion

Key Concepts

Statement		Example	Symbols
Law of Syllogism	Allows you to combine two true conditionals.	If it is snowing, then school will be canceled. If school is canceled, then the test will be postponed. If it is snowing, then the test will be postponed.	If p→q is true and q→r is true then p→r is true

If possible, use the Law of Syllogism to make a conclusion.

3) If the sum of the digits in a number is 9, then the number is divisible by 9.

If a number is divisible by 9, then it is divisible by 3.

If possible, use the Law of Syllogism to make a conclusion.

3) If the sum of the digits in a number is 9, ~~then the number is divisible by 9.~~

~~If a number is divisible by 9~~, then it is divisible by 3.

If the sum of the digits in a number is 9, then it is divisible by 3.

Key Concepts

Statement	Definition	Example	Symbols
Biconditional	A single true statement that combines a true conditional and its true converse.	A closed figure is a pentagon if and only if it has exactly five sides.	$p \leftrightarrow q$ "p if and only if q"

> Being able to write a biconditional is a way to identify a good definition.

The following conditional is true. Write the converse. If the converse is also true, combine the statement as a biconditional.

4) If two angles have the same measure, then the angles are congruent.

CLASS WORK

The following conditional is true. Write the converse. If the converse is also true, combine the statement as a biconditional.

4) If two angles have the same measure, then the angles are congruent.

Converse: If two angles are $\cong$, then they have the same measures.

Biconditional:

Two $\angle$s have the same measure if and only if they are $\cong$.

Write the two statements that form the biconditional.

5) Two lines are perpendicular if and only if they intersect to form four right angles.

Write the two statements that form the biconditional.

P

5) Two lines are perpendicular if and only if they intersect to form four right angles.

Conditional :
 If two lines are perpendicular, then they intersect to form
 four right angles.

Converse:
 If two lines intersect to form four right ∠s, then
 they are perpendicular.

Test the statements below to see if they are reversible. If so, write as a true biconditional. If not, write *not reversible.*

6) An isosceles triangle is a triangle with exactly two congruent sides.

7) A circle is a figure with no sides.

Test the statements below to see if they are reversible. If so, write as a true biconditional. If not, write *not reversible*.

6) <u>An isosceles triangle</u> is <u>a triangle with exactly two congruent sides.</u>

reversible

A △ is isosceles if and only if it has exactly two ≅ sides.

7) A circle is a figure with no sides.

If a figure has no sides, then it is a circle. False - oval

Not reversible

➢A biconditional combines a true condition and its true converse using "if and only if"

➢A biconditional is a good definition

➢The Law of Detachment uses deductive reasoning to make a conclusion about a specific example

➢The Law of Syllogism uses deductive reasoning to combine two true conditionals

Summary

ANSWER SLIDE

1. Tamara received her driver's license.
2. No conclusion.
3. If the sum of the digits in a number is 9, then it is divisible by 3.
4. Two angles have the same measure if and only if they are congruent.
5. If two lines are perpendicular, then they intersect to form four right angles.

   If two lines intersect to form four right angles, then they are perpendicular.
6. A triangle is isosceles if and only if it has two congruent sides.
7. Not reversible; oval

LEARNING RUBRIC

- Got It: Apply Laws to multi-step reasoning
- Almost There: Evaluate whether a biconditional can be written and write it
- Moving Forward: Write the original conditional and converse from a biconditonal
- Getting Started: Apply Laws of Detachment and Syllogism to specific cases

HOMEWORK

- 2-3 Pages 91-93: 9-13 all; 16, 18, 24

- 2-4 Pages 99-101: 10, 14, 16, 18, 22, 32