

LESSON

2-2

Reteach

Conditional Statements

A **conditional statement** is a statement that can be written as an if-then statement, "if p , then q ."

The **hypothesis** comes after the word *if*.

The **conclusion** comes after the word *then*.

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Sometimes it is necessary to rewrite a conditional statement so that it is in if-then form.

Conditional: A person who practices putting will improve her golf game.

If-Then Form: If a person practices putting, then she will improve her golf game.

A conditional statement has a false **truth value** *only* if the hypothesis (H) is true and the conclusion (C) is false.

For each conditional, underline the hypothesis and double-underline the conclusion.

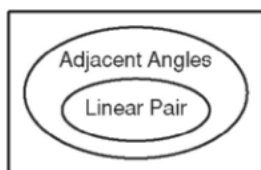
- If x is an even number, then x is divisible by 2.
- The circumference of a circle is 5π inches if the diameter of the circle is 5 inches.
- If a line containing the points J , K , and L lies in plane \mathcal{P} , then J , K , and L are coplanar.

For Exercises 4–6, write a conditional statement from each given statement.

- Congruent segments have equal measures.

- On Tuesday, play practice is at 6:00.

6.



Determine whether the following conditional is true. If false, give a counterexample.

- If two angles are supplementary, then they form a linear pair.

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Conditional Statements *continued*

The **negation** of a statement, “not p ,” has the opposite truth value of the original statement.

If p is true, then *not* p is false.

If p is false, then *not* p is true.

Statement	Example	Truth Value
Conditional	<p>If a figure is a square, then it has four right angles.</p>	True
Converse: Switch H and C.	If a figure has four right angles, then it is a square.	False

Write the converse, ~~inverse, and contrapositive~~ of each conditional statement.
Find the truth value of each.

8. If an animal is an armadillo, then it is nocturnal.

9. If $y = 1$, then $y^2 = 1$.

10. If an angle has a measure less than 90° , then it is acute.

Problem Solving

1. Sample answer: 33 in.
2. Sample answer: The average growth of a green iguana during the first year is about 2 ft.
3. Match 7 lasted 1 hour 3 minutes.
4. Match 4 was 18 minutes long.
5. B
6. H
7. C

Reading Strategies

3. For Conjecture A, students should plot (5, 3) and (6, 2).
For Conjecture B, students should plot (5, 5) and (6, 6).
Student should conclude that Conjecture B is correct.

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Practice A

1. D; D
2. A
3. C
4. E
5. B
6. F; F
7. It is a bicycle.
8. It has two wheels.
9. converse
10. contrapositive
11. inverse
12. original statement and contrapositive
13. If it rains, then I go indoors.
14. If there is no lightning, then I play in the rain.

Practice B

1. Hypothesis: You can see the stars.
Conclusion: It is night.
2. Hypothesis: A pencil is sharp.
Conclusion: The pencil writes well.
3. If three points are noncollinear, then they determine a plane.
4. If a food is a kumquat, then it is a fruit.
5. true
6. true
7. false; sample answer: a frog

8. Converse: If GH is 3, then G is at 4; false
Inverse: If G is not at 4, then GH is not 3; false
Contrapositive: If GH is not 3, then G is not at 4; true
9. If an animal is a primate, then it is a mammal.
10. Sample answer: If an animal is a lemur, then it is not a rodent.
11. Sample answer: If an animal is a rodent, then it is not an ape.
12. If an animal is an ape, then it is a mammal.

Practice C

1. Sample answer: If a thing is a man, then it is not an island.
2. Sample answer: If something happens, then it was first a dream.
3. Sample answer: If you can do it today, then you should not put it off till tomorrow.
4. If something is a house fly, then it is an insect.
5. The contrapositive of a true conditional statement is also true.
6. If q, then p.
7. If not p, then not q.
8. inverse
9. If the converse is true, then the inverse is true, and vice versa.
10. If a number is composite, then it is a whole number with three or more factors. If a whole number has three or more factors, then it is composite.

Reteach

1. x is an even number
x is divisible by 2.
2. The circumference of a circle is 5p inches if the diameter of the circle is 5 inches.
3. If a line containing the points J, K, and L lies in plane P
J, K, and L are coplanar.
4. If segments are congruent, then they have equal measures.

- If it is Tuesday, then play practice is at 6:00.
- If two angles form a linear pair, then they are adjacent angles.
- False; two supplementary angles need not be adjacent.
- Conv.: If an animal is nocturnal, then it is an armadillo; false. Inv.: If an animal is not an armadillo, then it is not nocturnal; false. Contra.: If an animal is not nocturnal, then it is not an armadillo; true.
- Conv.: If $y^2 = 1$, then $y = 1$; false. Inv.: If $y \neq 1$, then $y^2 \neq 1$; false. Contra.: If $y^2 \neq 1$, then $y \neq 1$; true.
- Conv.: If an angle is acute, then it has a measure less than 90° ; true. Inv.: If an angle does not have a measure less than 90° , then it is not acute; true. Contra.: If an angle is not acute, then it does not have a measure less than 90° ; true.

Challenge

- Explanations will vary. Assume that the given statement is true. Then "This statement is false" is false.
- Explanations will vary. If "there are three false statements here" is false, then it is true.
- Explanations will vary. Assume that the only way to know the order is to read the sign. If a person reads the sign, however, then he or she has already violated the order to not read the sign.
- Answers will vary.
- Explanations will vary. No matter where you start on the staircase, it appears that a walk around it takes you continually upward (or downward). However, you eventually return to the place where you started.
- Findings will vary.

Problem Solving

- Conv.: If there are 30 days in the month, then it is April; false. Inv.: If it is not April, then there are not 30 days in the month;

false. Contra.: If there are not 30 days in the month, then it is not April; true.

- Cond.: If a yard has a swimming pool, then the yard is enclosed by a fence. Conv.: If a yard is enclosed by a fence, then it has a swimming pool; false. Inv.: If a yard does not have a swimming pool, then it is not enclosed by a fence; false. Contra.: If a yard is not enclosed by a fence, then it does not have a swimming pool; true.
- If the year is 1777, then the U.S. flag has 30 stars; false.
- If it is after 1818, then the U.S. flag has less than 50 stars; false.
- If the U.S. flag has 30 stars, then it is after 1818; true.
- A
- H

Reading Strategies

- Converse: If $\overline{QR} \cong \overline{RS}$, then R is the midpoint of \overline{QS} ; true
Inverse: If R is not the midpoint of \overline{QS} , then $\overline{QR} \cong \overline{RS}$; true
Contrapositive: If $\overline{QR} \not\cong \overline{RS}$, then R is not the midpoint of \overline{QS} ; true
- Converse: If $\angle A$ is obtuse, then $m\angle A = 140^\circ$; false
Inverse: If $m\angle A \neq 140^\circ$, then $\angle A$ is not obtuse; false
Contrapositive: If $\angle A$ is not obtuse, then $m\angle A \neq 140^\circ$; true

LESSON 2-3

Practice A

- Deductive
- q
- deductive reasoning
- inductive reasoning
- A person sees penguins.
The person is in Antarctica.
valid
- A person sees a polar bear.
The person is in the Arctic.
not valid