

Lesson 1-7

Example 1 Identify Hypothesis and Conclusion

Identify the hypothesis and conclusion of each statement.

- a. **If it is raining outside, then you will need an umbrella.**

Recall that the hypothesis is the part of the conditional following the word *if* and the conclusion is the part of the conditional following the word *then*.

Hypothesis: it is raining

Conclusion: you need an umbrella

- b. **If $2(2a - 3) = 10$, then $a = 4$.**

Hypothesis: $2(2a - 3) = 10$

Conclusion: $a = 4$

Example 2 Write a Conditional in if-then form

Identify the hypothesis and conclusion of each statement. Then write each statement in if-then form.

- a. **Kellan eats hotdogs at baseball games.**

Hypothesis: Kellan is at a baseball game

Conclusion: Kellan eats hotdogs

If Kellan is at a baseball game, then he will eat hotdogs.

- b. **For any square that has an area of 16 square inches, each side has a length of 4 inches.**

Hypothesis: a square with an area of 16 square inches

Conclusion: each side has a length of 4 inches

Example 3 Deductive Reasoning

Determine a valid conclusion that follows from the statement “If it is Saturday, then Sarah is wearing red shoes” for the given conditions. If a valid conclusion does not follow, write *no valid conclusion* and explain why.

- a. **Sarah is wearing red shoes.**

The conclusion is true. If it is Saturday then the hypothesis is true also. However, if Sarah is wearing red shoes on Sunday then the hypothesis is false. Therefore, there is no valid conclusion.

- b. **It is Saturday.**

It is Saturday, so the hypothesis is true.

Conclusion: Sara is wearing red shoes.

Example 4 Find Counterexamples

Find a counterexample for each conditional statement.

- a. **If you play a musical instrument then you are in the school band.**

You could know how to play a musical instrument without being enrolled in the school band.

- b. **If you were born in 1990, then on July 1 2003, you are 13 years old.**

You could have been born after July 1, 1990, thus your age would be 12 on that date.

Example 5 Find a Counterexample**Multiple-Choice Test Item**

Which numbers are counterexamples for the statement below?

If $6x - 3 > 1$, then $x > 2$.

A $x = 1$

B $x = 3$

C $x = \frac{13}{20}$

D $x = \frac{-5}{3}$

Read the Test Item

Find the value for x that makes the statement false.

Solve the Test Item

Replace x in the inequality $6x - 3 > 1$ with the given values.

A $x = 1$

$$6(1) - 3 > 1$$

$$6 - 3 > 1$$

$$3 > 1$$

The hypothesis is true, but 1 is not greater than 2. Thus, the statement is false.

B $x = 3$

$$6(3) - 3 > 1$$

$$18 - 3 > 1$$

$$15 > 1$$

The hypothesis is true, and 3 is greater than 2. The statement is true.

C $x = \frac{13}{20}$

$$6x - 3 > 1$$

$$6\left(\frac{13}{20}\right) - 3 > 1$$

$$3\frac{9}{10} - 3 > 1$$

$$\frac{9}{10} > 1$$

The hypothesis is false, and the conclusion is false. However This is not a counterexample. A counterexample is a case where the hypothesis is true and the conclusion is false.

D $x = \frac{-5}{3}$

$$6x - 3 > 1$$

$$6\left(\frac{-5}{3}\right) - 3 > 1$$

$$-10 - 3 > 1$$

$$-13 > 1$$

The hypothesis is false, and the conclusion is false.

The only value that causes the hypothesis to be true and the conclusion false is $x = 1$. So this is a counterexample. The answer is A.