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# PRACTICE WORKSHEET – 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*.

If you buy this cell phone, then you will receive 10 free ringtone downloads.

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.

**Identify the hypothesis and conclusion of each conditional.**

1. If you can see the stars, then it is night.

   Hypothesis: _____

   Conclusion: _____

2. If $x$ is an even number, then $x$ is divisible by 2.

   Hypothesis: _____

   Conclusion: _____

**Write a conditional statement from each of the following.**

3. Three noncollinear points determine a plane.

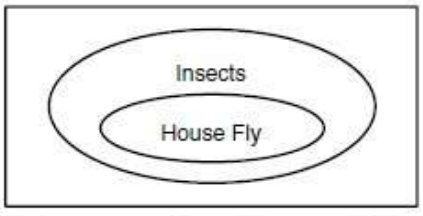
   _____

4. Congruent segments have equal measures.

   _____

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

   _____

6. 


   _____

**Use the following conditional statement for Exercises 7- 8.**
If it is a bicycle, then it has two wheels.

7. Give the hypothesis of the conditional statement. _____

8. Give the conclusion of the conditional statement. _____

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# Conditional Statements

| Statement | Example |
|---|---|
| **Conditional** | H: If a figure is a square, then C: it has four right angles. |
| **Converse:** Switch H and C. | If a figure has four right angles, then it is a square. |

**Show that each conditional is false by finding a counterexample.**

1. If it is 12:00 noon, then the sun is shining. _____

2. If a number is divisible by 3, then it is odd. _____

**Write the converse of each conditional.**

3. If you drink milk, then you will be strong. _____

_____

4. If a rectangle has four sides the same length, then it is a square. _____

_____

5. If a rectangle has four sides the same length, then it is a square. _____

_____

6. If you do not sleep, you will be tired. _____

_____

Write the converse and decide whether the converse is *true* or *false*.
If the converse is false, give a *counterexample.*

7. If the sun is shining, then it is 12:00 noon. _____

_____

_____

8. If the number is divisible by 3, then the number is odd. _____

_____

_____

9. If an angle is 90°, then it is a right angle. _____

_____

_____

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# Biconditionals and Definitions

A **biconditional statement** combines a conditional statement, "if *p*, then *q*," with its converse, "if *q*, then *p*."

**Conditional:** If the sides of a triangle are congruent (*p*), then the angles are congruent (*q*).

**Converse:** If the angles of a triangle are congruent (*q*), then the sides are congruent (*p*).

**Biconditional:** The sides of a triangle are congruent (*p*) if and only if the angles are congruent (*q*).

…where ***p*** **=** hypothesis and ***q*** **=** conclusion

**For each conditional, write the converse and a biconditional statement.**

1. Conditional: If the date is July 4th, then it is Independence Day.

   Converse: _____

   Biconditional: _____

2. Conditional: If a figure has 10 sides, then it is a decagon.

   Converse: _____

   Biconditional: _____

**Write each definition as a biconditional.**

3. An isosceles triangle has at least two congruent sides.

   _____

   _____

4. A cube is a three-dimensional solid with six square faces.

   _____

   _____

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# Biconditionals and Definitions

1. A biconditional statement combines a conditional and its _____.
2. A biconditional statement can be written in the form "*p* if and only if *q*," which means "if *p*, then *q*, and if _____, then _____."

**Write the converse from each given biconditional.**

3. Biconditional: A cat is happy if and only if it is purring.

   Conditional: If a cat is happy, then it is purring.

   Converse: _____

4. Biconditional: A figure is a segment if and only if it is straight and has two endpoints.

   Conditional: If a figure is a segment, then it is straight and has two endpoints.

   Converse: _____

**Write a biconditional from each given conditional and converse.**

5. Conditional: If two angles share a side, then they are adjacent.

   Converse: If two angles are adjacent, then they share a side.

   Biconditional: _____

6. Conditional: If your temperature is normal, then your temperature is 98.6°F.

   Converse: If your temperature is 98.6°F, then your temperature is normal.

   Biconditional: _____

**Write the conditional statement and converse within each biconditional.**

7. The tea kettle is whistling if and only if the water is boiling.

   Conditional: _____

   Converse: _____

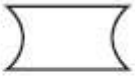
**Some figures that are *piggles* are shown below, as are some *nonpiggles*.**

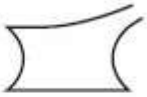
piggles

nonpiggles

8. Definition of *piggle:* _____

**Tell whether each of the following is a *piggle*.**

9. 

10. 

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# Deductive Reasoning

With inductive reasoning, you use examples to make a conjecture. With **deductive reasoning**, you use facts, definitions, and properties to draw conclusions and prove that conjectures are true.

One form of deductive reasoning that draws conclusions from a true conditional $p \rightarrow q$ and a true statement $p$ is called the **Law of Detachment**.

| **Law of Detachment** | If $p \rightarrow q$ is true and $p$ is true, then $q$ is true. |
|---|---|

- Tom knows that if he misses the practice the day before a game, then he will not be a starting player in the game.
- Tom misses practice on Tuesday.
- *Conclusion:* He will not be able to start in the game on Wednesday.

Another way to make a valid conclusion is to use the **Law of Syllogism**.

| **Law of Syllogism** | If $p \rightarrow q$ is true and $q \rightarrow r$ is true, then $p \rightarrow r$ is also true. |
|---|---|

- Given: If you have a horse, then you have to feed it. If you have to feed a horse, then you have to get up early every morning.
- Conclusion: If you have a horse, then you have to get up early every morning.

***Determine if a valid conclusion can be reached from the two true statements using the Law of Detachment or the Law of Syllogism. If a valid conclusion is possible, state it and the law that is used. If a valid conclusion does not follow, write*** **no valid conclusion.**

**1.** If Jim is a Texan, then he is an American.
Jim is a Texan.

_____

**2.** If Spot is a dog, then he has four legs.
Spot has four legs.

_____

**3.** If Rachel lives in Tampa, than Rachel lives in Florida.
If Rachel lives in Florida, then Rachel lives in the United States.

_____

**4.** If October 12 is a Monday, then October 13 is a Tuesday.
October 12 is a Monday.

_____

**5.** If Henry studies his algebra, then he passes the test.
If Henry passes the test, then he will get a good grade.

_____

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# Deductive Reasoning

**Use the Law of Detachment to draw a conclusion.**

1. If the football team wins on Friday night, then practice is canceled for Monday.
   The football team won by 7 points on Friday night.

   _____

2. If a triangle has one 90° angle, then the triangle is a right triangle.
   In $\triangle DEF$, $m\angle E = 90$.

   _____

**Use the Law of Syllogism to draw a conclusion.**

3. If two lines are not parallel, then they intersect.
   If two lines intersect, then they intersect at a point.

   _____

4. If you vacation at the beach, then you must like the ocean.
   If you like the ocean, then you will like Florida.

   _____

**If possible, use the Law of Detachment to draw a conclusion. If not possible, write *not possible.***

5. If a person lives in Omaha, then he or she lives in Nebraska.
   Tamika lives in Omaha.

   _____

6. If Robbie wants to save money to buy a car, he must get a part-time job.
   Robbie started a new job yesterday at a grocery store.

   _____

**Use the Law of Detachment and the Law of Syllogism to draw conclusions from the following statements.**

7. If it is raining, the temperature is greater than 32°F.
   If the temperature is greater than 32°F, then it is not freezing outside.
   It is raining.

   _____

8. If you live in Providence, then you live in Rhode Island.
   If you live in Rhode Island, then you live in the smallest state in the United States.
   Shannon lives in Providence.

   _____