Chapter 1

1.1 Writing Conditional, Converse, and Inverse Statements and Determining the Truth Value of these Statements

Concepts to Learn

- Write Conditional Statements
- Write Converse
- Write Inverses
- Determine the Truth Value of Conditional Statements, Converse, and Inverses

Definitions Applicable to Exercises 1.1

- square: is a quadrilateral with four equal sides and four equal angles (90 degree angles, or right angles).
- hypotenuse: the side of a right triangle opposite the right angle
- rectangle: a quadrilateral with four right angles
- quadrilateral: a polygon with four sides
- polygon: a closed figure bounded by straight sides
- parallelogram: a quadrilateral whose opposite sides are both parallel and equal in length
- pentagon: a five-sided polygon
- hexagon: a six-sided polygon
- right triangle: a triangle with one right angle
- obtuse triangle: a triangle in which one of the angles is obtuse (more than 90° and less than 180°); it will have one obtuse angle and two acute angles.
Conditional Statements

An if-then statement is also known as a conditional statement. For example,

"If A, then B" says that if A occurs, then B will occur. This can be written as follows: $A \rightarrow B$.

The symbol $\rightarrow$ means implies. Thus, $A \rightarrow B$ reads “If A, then B,” or “A implies B.” This does not mean that B implies A.

For problems 1 and 2, rewrite the following statement as a conditional statement (“If..., then...” form).

1. The sum of the squares of the legs of a right triangle is equal to the square of the hypotenuse.

2. Rectangles are quadrilaterals.

Converses and Inverses

<table>
<thead>
<tr>
<th>Conditional Statement:</th>
<th>$A \rightarrow B$:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Converse of $A \rightarrow B$:</td>
<td>$B \rightarrow A$</td>
</tr>
<tr>
<td>Inverse of $A \rightarrow B$:</td>
<td>not $A \rightarrow$ not $B$</td>
</tr>
</tbody>
</table>
Write the following conditional statement as a converse and as an inverse.
3. If a polygon has five sides, then it is a pentagon.

Converse: _____________________________________________________________
____________________________________________________________________

Inverse: _____________________________________________________________
____________________________________________________________________

Determining the Truth Value of Conditional, Converse, and Inverse Statements

4. Determine the truth value of the conditional statement, its converse, and its inverse.

Conditional: If a polygon is a square, then it is a quadrilateral.
(True or False?) ______________________________________________________

Converse: If a polygon is a quadrilateral, then it is a square.
(True or False?) ______________________________________________________

Inverse: If a polygon is not a quadrilateral, then it is not a square.
(True or False?) ______________________________________________________

5. Determine the truth value of the conditional statement, its converse, and its inverse.

Conditional: If a polygon is a quadrilateral, then it is a parallelogram.

Converse: If a polygon is a parallelogram, then it is a quadrilateral.

Inverse: If a polygon is not a quadrilateral, then it is not a parallelogram.

Conditional (True or False?)_________Converse (True or False?)_________

Inverse (True or False?)___________
6. Determine the truth value of the conditional statement, its converse, and its inverse.

*Conditional*: If a triangle has exactly one obtuse angle, then it is an obtuse triangle.

*Converse*: If a triangle is an obtuse triangle, then it has exactly one obtuse angle.

*Inverse*: If a triangle does not have exactly one obtuse angle, then it is not an obtuse triangle.

Conditional (True or False?) __________ Converse (True or False?) __________

Inverse (True or False?) __________

### Conditional, Converse, and Inverse Statements

In problems 7 through 9, rewrite the following statement as a conditional statement (if..., then...form). Then, write each conditional statement as a converse and as an inverse.

7. Triangles have three sides.

*Conditional Statement:*

*Converse:*

*Inverse:*

__________________________

__________________________

__________________________
8. Hexagons have six sides.

*Conditional Statement:* 

______________________________________________________________________

*Converse:* 

______________________________________________________________________

*Inverse:* 

______________________________________________________________________

9. In a right triangle, the longest side is the hypotenuse.

*Conditional Statement:* 

______________________________________________________________________

*Converse:* 

______________________________________________________________________

*Inverse:* 

______________________________________________________________________

### Selected Answers to Exercises 1.1

1. If a triangle is a right triangle, then the sum of squares of the legs is equal to the square of the hypotenuse.

2. If a polygon is a rectangle, then it is a quadrilateral.

3. *Converse:* If a polygon is a pentagon, then it has five sides.
   *Inverse:* If a polygon does *not* have five sides, then it is *not* a pentagon.

4. *Conditional:* True; *Converse:* False; *Inverse:* True