

Lesson 12-6

Example 1

Determine by form whether arguments are *valid* or *invalid*.

- a. If $3x = 12$, then $x = 4$. $3x = 12$. Therefore, $x = 4$.
- b. If a polygon is an isosceles triangle, then the measures of its angles total 180° . This polygon is not an isosceles triangle. Therefore, the measures of its angles do not total 180° .

Solution

- a. Let p represent “ $3x = 12$ ” and q represent “ $x = 4$.” The argument has premises $p \square q$ and p and conclusion q . This is the valid form of the Law of Detachment.
- b. Let p represent “this polygon is an isosceles triangle” and q represent “the measures of its angles total 180° .” The argument has premises $p \square q$ and $\sim p$ and conclusion $\sim q$. This argument form is invalid. Both premises are true, but the conclusion is not necessarily true. The polygon could be any non-isosceles triangle.

Example 2

WEATHER Determine the validity and soundness of the argument.

If it is cloudy outside, then it is raining.

It is cloudy outside.

Therefore, it is raining.

Solution

Let p represent “it is cloudy outside” and q represent “it is raining.” The argument has premises $p \square q$ and p and conclusion q . So the argument form is Law of Detachment, which is valid. However, the first premise is not true. It can be cloudy outside but not be raining.

So the argument is unsound. It is valid because of its form, but it is unsound because its first premise is false.