

# Deductive Reasoning

MATH 1001

Quantitative Skills and Reasoning



COLUMBUS STATE  
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# Deductive Reasoning

- **Deductive reasoning** is the process of reaching a conclusion by applying general assumptions, procedures, or principles.



# Deductive Reasoning

- Consider these examples of Deductive Reasoning:
  - Forget-me-not flowers bloom every other year. The forget-me-nots in my garden bloomed this year, therefore they will not bloom next year.
  - All triangles have three sides. A right triangle is a triangle, therefore it has three sides.
  - Multiplying two negative numbers yields a positive number. Since  $-1$  and  $-5$  are both negative numbers,  $-1$  times  $-5$  must be positive.

# Deductive Reasoning

Use deductive reasoning to show that the procedure we worked with in the Inductive Reasoning Video produces a number that is two times the original number.

- Pick a number
- Subtract 3 from this number
- Multiply this difference by 4
- Add 12 to this product
- Divide this sum by 2

• **Solution:** Let  $n$  represent the original number.

*Subtract 3 from the number:*

*Multiply difference by 4:*

*Add 12 to this product:*

*Divide by 2:*

$$\begin{aligned} n - 3 & \\ 4(n - 3) &= 4n - 12 \\ 4n - 12 + 12 &= 4n \\ \frac{4n}{2} &= 2n \end{aligned}$$

- We started with  $n$  and ended with  $2n$ . The procedure given produces a number that is two times the original number.



# Counterexamples

- A statement is a *true statement* if it is true in every case.
- If you can find *one case* for which a statement is not true, called a *counterexample*, then the statement is a *false statement*.
- In order to verify that a statement is false, we must find a counterexample.

# Counterexamples

- Verify that both of the following statements are false by finding a counterexample:
- For all real numbers  $x$ :

- $|x| > 0$   
 $|0| = 0$

$$x = 0$$

- ~~$x^2 \geq x$~~   
 ~~$\frac{1}{4} \rightarrow \frac{1}{2}$~~

$$x = \frac{1}{2}$$

$$x^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$