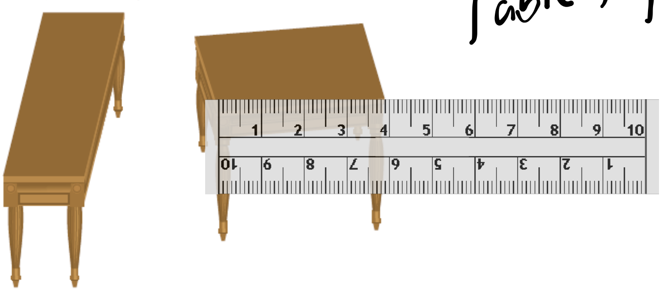
# HOMEWORK QUESTIONS???

p. 17: #1 & 2
p. 22: #1, 3, 5, 8, 12, 17

**1.** Make a conjecture about the dimensions of the two tabletops. How can you determine if your conjecture is valid?

Table tops are different

X Same size measured




**2.** Examine the number pattern. Make a conjecture about this pattern. What steps can you take to determine if your conjecture is valid?

$$1^2 = 1$$
$$11^2 = 121$$
$$111^2 = 12321$$
$$1111^2 = 1234321$$
$$11111^2 = 123454321$$

**1.** Show that each statement is false by finding a counterexample.

**a)** A number that is not negative is positive. a) 0

**b)** All prime numbers are odd. b) 2

**c)** All basketball players are tall.

**d)** The height of a triangle lies inside the triangle.

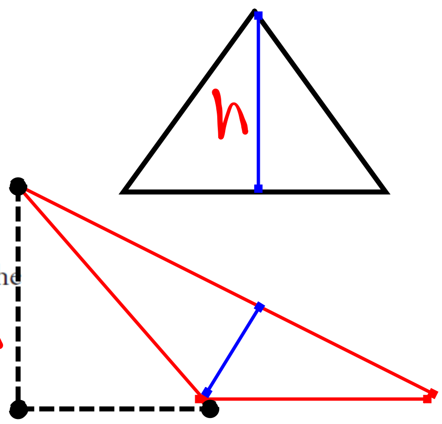
**e)** On maps, the north arrow always points up.

**f)** The square root of a number is always less than the number.

**g)** The sum of two numbers is always greater than the greater of the two numbers.

**h)** As you travel north, the climate gets colder.

d)




**5.** Hannah examined these multiples of 9: 18, 45, 63, 27, 81, 108, 216. She claimed that the sum of the digits in any multiple of 9 will add to 9. Do you agree or disagree? Justify your decision.

↳ 99

**8.** George noted a pattern that was similar to Matt's pattern in Example 3. George conjectured that the products would follow the pattern of ending with the digit 5 or 0. Gather evidence about George's conjecture. Does your evidence strengthen or disprove George's conjecture? Explain.

$$1 \cdot 4 + 1 = 5$$
$$12 \cdot 4 + 2 = 50$$
$$123 \cdot 4 + 3 = 495$$
$$1234 \cdot 4 + 4 = 4940$$

**8.** e.g., My evidence strengthens George's conjecture. For example,
$123456789 \cdot 4 + 9 = 493827165$
$1234567891011 \cdot 4 + 11 = 4938271564055$

**12.** Amy made the following conjecture: When any number greater than 1 is multiplied by itself, the product will be greater than this starting number. For example, in $2 \cdot 2 = 4$, the product 4 is greater than the starting number 2. Meagan disagreed with Amy's conjecture, however, because $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ and $\frac{1}{4}$ is less than $\frac{1}{2}$. How could Amy's conjecture be improved? Explain the change(s) you would make.

**17.** Jarrod discovered a number trick in a book he was reading: Choose a number. Double it. Add 6. Double again. Subtract 4. Divide by 4. Subtract 2.

**a)** Try the trick several times. Make a conjecture about the relation between the number picked and the final result.

**b)** Can you find a counterexample to your conjecture? What does this imply?

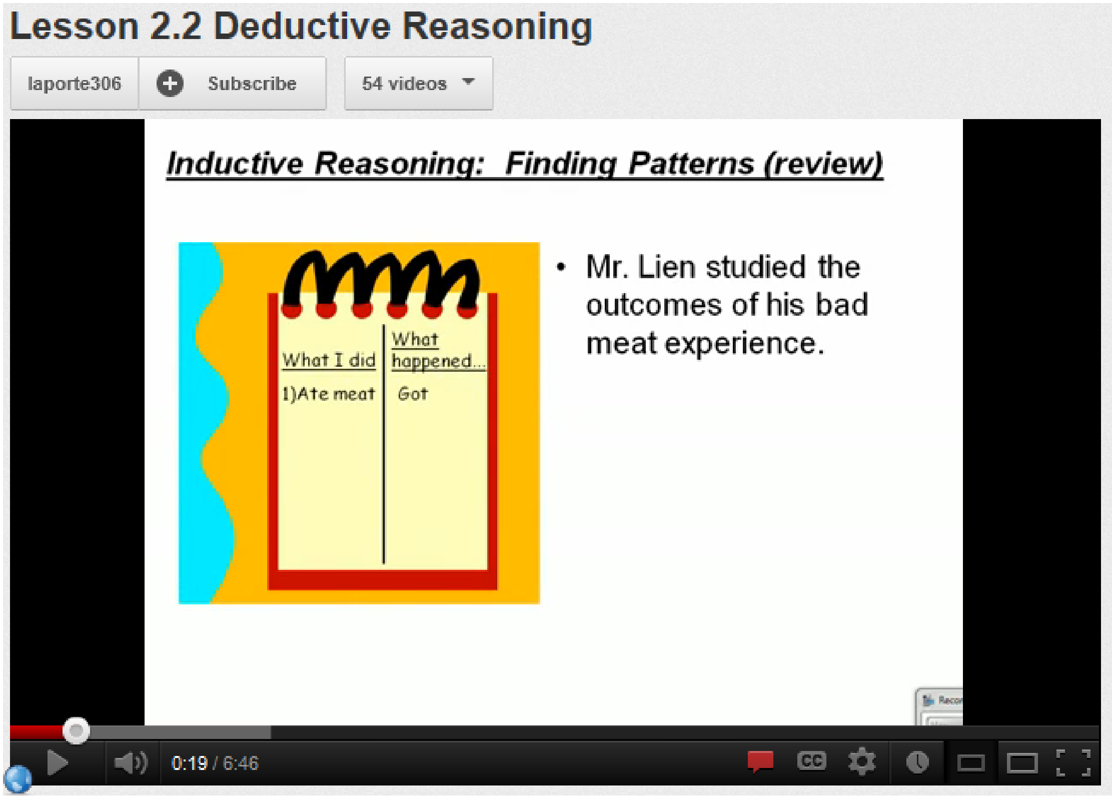
$x$
$2x$
$2(2x+6)$
$4x+12-4$
$\frac{4x+8}{4}$
$x+\cancel{2}-\cancel{2}$
$x$

deductively

11
22
28
56
52
13
11

inductively

Your answer will be your original #


Lesson 2.2 Deductive Reasoning
laporte306
Subscribe
54 videos
Inductive Reasoning: Finding Patterns (review)
What I did
What happened...
1)Ate meat
Got
• Mr. Lien studied the outcomes of his bad meat experience.
0:19 / 6:46

# 1.4 Proving Conjectures: Deductive Reasoning

GOAL

Prove mathematical statements using a logical argument.

Every day, you use **deductive thinking** to **deduce** new information.

In this course, you will use this method to deduce the properties of geometric figures and many geometric relationships. For example:

| **Step A General Statement** | **And** | **Step B Particular Statement** | Thus | **Step C Conclusion** |
|---|---|---|---|---|
| During a game, five players are used on a basketball team. | And | UNB is playing basketball. | Thus | UNB uses five players on the basketball team. |
| All isosceles triangles have two equal sides. | And | Triangle ABC is isosceles. | Thus | Two sides of Triangle ABC are equal. |

In Step A, based on your earlier knowledge (your experience, what you have learned in life) you accept certain general statements to be true. In Step B you are confronted with a particular case that is related to a general statement. Lastly, in Step C, you deduce a conclusion based upon Step A and B.

# KEY TERMS...

**deductive reasoning**
Drawing a specific conclusion through logical reasoning by starting with general assumptions that are known to be valid.

**proof**
A mathematical argument showing that a statement is valid in all cases, or that no counterexample exists.

**two-column proof**
A presentation of a logical argument involving deductive reasoning in which the statements of the argument are written in one column and the justifications for the statements are written in the other column.

**generalization**
A principle, statement, or idea that has general application.

We can often use the **transitive property** in deductive reasoning. According to this property, **if two things are equal to the same thing, then they are equal to one another**. We can express this property mathematically:

If $a = b$ and $b = c$, then $a = c$.

## LEARN ABOUT *the Math*

Jon discovered a pattern when adding integers:

$$1 + 2 + 3 + 4 + 5 = 15$$
$$(-15) + (-14) + (-13) + (-12) + (-11) = -65$$
$$(-3) + (-2) + (-1) + 0 + 1 = -5$$

x5

$11 + 10 + 9 + 8 + 7 = 45$

middle

$(x+2)+(x+1)+x+(x-1)+(x-2)$

$5x$

5 times middle #

He claims that whenever you add five consecutive integers, the sum is always 5 times the median of the numbers.

**?** How can you prove that Jon's conjecture is true for all integers?

p. 27

### EXAMPLE 1 Connecting conjectures with reasoning

Prove that Jon's conjecture is true for all integers.

#### Pat's Solution

$$5(3) = 15$$
$$5(-13) = -65$$
$$5(-1) = -5$$

The median is the middle number in a set of integers when the integers are arranged in consecutive order. I observed that Jon's conjecture was true in each of his examples.

$$210 + 211 + 212 + 213 + 214 = 1060$$
$$5(212) = 1060$$

I tried a sample with greater integers, and the conjecture still worked.

Let $x$ represent any integer.
Let $S$ represent the sum of five consecutive integers.
$S = (x - 2) + (x - 1) + x + (x + 1) + (x + 2)$

I decided to start my **proof** by representing the sum of five consecutive integers. I chose $x$ as the median and then wrote a **generalization** for the sum.

**proof**
A mathematical argument showing that a statement is valid in all cases, or that no counterexample exists.

**generalization**
A principle, statement, or idea that has general application.

$$S = (x + x + x + x + x) + (-2 + (-1) + 0 + 1 + 2)$$
$$S = 5x + 0$$

I simplified by gathering like terms.

$$S = 5x$$

Jon's conjecture is true for all integers.

Since $x$ represents the median of five consecutive integers, $5x$ will always represent the sum.

# Let's do one together...


2 digit #

1. $10a + b$
2. $-(a+b)$
3. $\boxed{9a}$ multiple of 9

## In Summary p. 31

### Key Idea

- Deductive reasoning involves starting with general assumptions that are known to be true and, through logical reasoning, arriving at a specific conclusion.

### Need to Know

- A conjecture has been proved only when it has been shown to be true for every possible case or example. This is accomplished by creating a proof that involves general cases.
- When you apply the principles of deductive reasoning correctly, you can be sure that the conclusion you draw is valid.
- The transitive property is often useful in deductive reasoning. It can be stated as follows: Things that are equal to the same thing are equal to each other. If $a = b$ and $b = c$, then $a = c$.
- A demonstration using an example is *not* a proof.

**HOMEWORK...**

p. 31: #1, 2
#4, 5
#7, 8
#10, 11
#15, 17