WARM-UP - Let's do one together...

Deductive Proof

1) 2 digit #

$10a + 1b$

2) Sum the digits

$a + b$

3) Subtraction

$$\begin{array}{r} 10a + b \\ -\quad a + b \\ \hline 9a \end{array}$$

Multiple of 9

http://learnenglishteens.britishcouncil.org/study-break/games/magic-gopher

APPLY the Math p. 28

EXAMPLE 2 Using deductive reasoning to generalize a conjecture

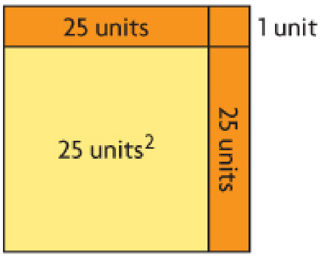
In Lesson 1.3, page 19, Luke found more support for Steffan's conjecture from Lesson 1.1, page 9—that the difference between consecutive perfect squares is always an odd number.

Determine the general case to prove Steffan's conjecture.

Gord's Solution

The difference between consecutive perfect squares is always an odd number.

Steffan's conjecture has worked for consecutive perfect squares with sides of 1 to 7 units.



$$26^2 - 25^2 = 2(25) + 1$$
$$26^2 - 25^2 = 51$$

I tried a sample using even greater squares: 26^2 and 25^2.

The difference is the two sets of 25 unit tiles, plus a single unit tile.

Let x be any natural number.
Let D be the difference between consecutive perfect squares.
$D = (x + 1)^2 - x^2$

Since the conjecture has been supported with specific examples, I decided to express the conjecture as a general statement. I chose x to be the length of the smaller square's sides. The larger square's sides would then be $x + 1$.

$$D = x^2 + x + x + 1 - x^2$$
$$D = x^2 + 2x + 1 - x^2$$
$$D = 2x + 1$$

I expanded and simplified my expression. Since x represents any natural number, $2x$ is an even number, and $2x + 1$ is an odd number.

Steffan's conjecture, that the difference of consecutive perfect squares is always an odd number, has been proved for all natural numbers.

Prove Deductively...

Conjecture: The difference between consecutive perfect squares will always be <u>ODD</u>

Inductively

$3^2 - 2^2$

$9 - 4 = 5$

$10^2 - 9^2$

$100 - 81 = 19$

$27^2 - 26^2$

53

Deductively...

$$\boxed{x^2 - (x-1)^2}$$

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

$$\cancel{x^2 - x^2} + 2x - 1$$

$$\boxed{2x - 1}$$

even

ODD

Squaring a Binomial

$(x-1)^2$

$(x-1)(x-1)$

$x^2 - x - x + 1$

$x^2 - 2x + 1$

3 Step Rule

1. $(1^{st})^2$
2. $1^{st} \times 2^{nd} \times 2$
3. $(2^{nd})^2$

ex: $(5x+4)^2$

$25x^2 + 40x + 16$

ex $(2x-3)^2$

$4x^2 - 12x + 9$

EXAMPLE 4 Using reasoning to determine the validity of a proof

x

$2(x+3)$

$2x+6+4$

$\frac{2x+10}{2}$

$\cancel{x+5}$ x

Hossai is trying to prove the following number trick: p.40
Choose any number. Add 3. Double it. Add 4. Divide by 2. Take away the number you started with.

Each time Hossai tries the trick, she ends up with 5. Her proof, however, does not give the same result.

Hossai's Proof

n	Choose any number.
$n + 3$	Add 3.
$2n + 6$	Double it.
$2n + 10$	Add 4.
$\cancel{2}1n + 5 - n$	Divide by 2.
$\cancel{n+}\ 5$	Take away the number you started with.

Where is the error in Hossai's proof?

Sheri's Solution

$1 \longrightarrow 5$
$10 \longrightarrow 5$

I tried the number trick twice, for the number 1 and the number 10. Both times, I ended up with 5. The math trick worked for Hossai and for me, so the error must be in Hossai's proof.

n ✔ — The variable n can represent any number. This step is valid.

$n + 3$ ✔ — Adding 3 to n is correctly represented.

$2n + 6$ ✔ — Doubling a quantity is multiplying by 2. This step is valid. Its simplification is correct as well.

$2n + 10$ ✔ — Adding 4 to the expression is correctly represented, and the simplification is correct.

$2n + 5$ ✘ — The entire expression should be divided by 2, not just the constant. This step is where the mistake occurred.

I corrected the mistake:

$$\frac{2n + 10}{2} = n + 5$$

$$n + 5 - n = 5$$

I completed Hossai's proof by subtracting n. I showed that the answer will be 5 for any number.

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

Prove Deductively... +3 % on Test!

1. Grab a calculator. (you won't be able to do this one in your head)
2. Key in the first three digits of your phone number (NOT the area code)
3. Multiply by 80
4. Add 1
5. Multiply by 250
6. Add the last 4 digits of your phone number
7. Add the last 4 digits of your phone number again.
8. Subtract 250
9. Divide number by 2

Do you recognize the answer?