1.4.2

Friday, February 3, 2017 5:54 PM

FOM 11 **1.4.2 Deductive Reasoning Part II**

When we make a conclusion based on statements that we accept as true, we are using **deductive reasoning**. The rules we follow when performing algebraic manipulations are things that we accept (and know) as true. So we are using deductive reasoning to prove a statement is always true.

Statements that we know are true:

Any integer multiplied by 2 is an even number. $2x$

- This means that $2x$ or 2(any combination of variables and coefficients) will **always** be even.

If you add 1 to any even integer you will get an odd number. $2x+1$

- This means that $2x + 1$ or 2(any combination of variables and coefficients) + 1 will **always** be odd.

Consecutive Numbers follow each other in numerical order

- This means that x, $x + 1$, $x + 2$, $x + 3$ are 4 numbers that come one after the other numerically.
- $2x$, $2x + 2$, $2x + 4$, $2x + 6$ are 4 consecutive even numbers
- $2x + 1$, $2x + 3$, $2x + 5$, $2x + 7$ are 4 consecutive odd numbers

Example 1: Use deductive reasoning to prove that the sum of an odd number and an even number is always odd.

add $\quad 2x+1 \quad 2y$

$$(2x+1)+2y$$
$$= 2x+1+2y$$
$$= 2x+2y+1$$
$$= 2(x+y)+1$$
$$= 2(\text{some }\#)+1$$

This is even.

by adding 1, this is always odd.

Finishing a Proof:

- If proving an answer is even it should look like this → 2(any combination of variable terms)
- If proving an answer is odd it should look like this → 2(any combination of variable terms) + 1
- If proving an answer is divisible by 3 it should look like this → 3(any combination of variable terms)
- If proving an answer is divisible by 4 it should look like this → 4(any combination of variable terms)
- If proving an answer is divisible by 5 it should look like this → 5(any combination of variable terms)
- etc……

Example 2: Prove that the square of an even integer is always even

$\to 2z$

$(2z)^2$

$= 2^2 z^2$

$= 4z^2 = 2(2z^2)$

multiply by 2
It will be even always.

Example 3: Prove that the result of the number trick below is always the number you start with.

- Choose a number	f	7
- Add 2	$f+2$	9
- Multiply by 3	$3(f+2) = 3f+6$	27
- Subtract 6	$3f+6-6 = 3f$	21
- Subtract your original number	$3f - 1f = 2f$	14
- Divide by 2	$2f \div 2 = f$	7

Example 4: The sum of a two digit number and its reversal is a multiple of 11.

pick $23 + 32$

$20+3+30+2$

$= 55$

$xy \quad + \quad yx$

$= 10x+y \qquad = 10y+x$

Sum $\Rightarrow 10x+y+10y+x$

$= 10x+x+10y+y$

$= 11x+11y$

$= 11(x+y)$

$\therefore$ Being multiplied by 11, so $11(x+y)$ is a multiple of 11.

Assignment: Deductive Reasoning Worksheet