Chapter 1 Page 2

FOM 11

1.4 Proving Conjectures: Deductive Reasoning

When we make a conclusion based on statements that we accept as true, we are using **deductive reasoning**.

**Example 1:** Use deductive reasoning to prove that the product of an odd integer and an even integer is even.

Let the even integer be $2x$ (where $x$ is an integer.)

+ the odd integer be $2y+1$ (where $y$ is an integer.)

$\Rightarrow$ odd $\times$ even $= 2x(2y+1)$

$= 4xy + 2x$

$= 2(2xy + x)$

$= 2$ (some number)

$\Rightarrow$ 2 times any number will always be even.

**Example 2:** Use deductive reasoning to prove that opposite angles of intersecting lines are equal.

\[ x+y = 180^\circ \] straight line

\[ z+y = 180^\circ \] straight line

\[ x+y = z+y \] both $= 180^\circ$

\[ x = z \] subtract \('y'\) from both sides

$:\therefore x$ and $z$ are opposite angles and they will always be equal.
Example 3: Use deductive reasoning to prove that the difference between consecutive perfect squares is always an odd number.

Let \( x \) and \( x+1 \) be the consecutive numbers.

Prove \((x+1)^2 - x^2\) will always be odd.

\[
\begin{align*}
(x+1)^2 - x^2 &= (x+1)(x+1) - x^2 \\
&= x^2 + x + x + 1 - x^2 \\
&= 2x + 1
\end{align*}
\]

This will always be odd because \( 2x \) is always even and adding 1 makes it odd.

Example 4: Weight-lifting builds muscle. Muscle makes you strong. Strength improves balance. Inez lifts weights. What can be deduced about Inez?

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