1. Prove the following using a direct proof:

Show If $x + 2$ is an even Z, then x is even.

Proof: Since $x+2$ is an even Z is true.

$$x+2 = 2k$$ For some k in the integers

$$\begin{array}{r} x+2 = 2k \\ -2 \quad -2 \\ \hline x = 2k-2 \end{array}$$

$x = 2(k-1)$

$x = 2(k-1)$, $(k-1) \in Z$, $p = k-1$, $\exists p \in Z$

$k = p$

$x = 2k$

$\rightarrow x$ is even

$\therefore$ By the T.T. If $x+2$ is an even Z, then x is even is true.

2. Prove the following using a direct proof:

Show If n is an even integer then n^2 is even

Proof: Since n is an even integer is true.

$n = 2k$ For some k in the integers

$n^2 = n \cdot n$

$n^2 = 2k \cdot 2k$

$n^2 = 4k^2$

$\sqrt{n^2} = \sqrt{4k^2}$ $n^2 = 2(2k^2)$, $2k^2$ is in Z, let $p = 2k^2$ for some p in Z.

$n = 2k$ $n^2 = 2p$

n^2 is even

$n^2 = \sqrt{n^2} = n$

$n^2 = n$ by the transitive property

$\therefore$ By the T.T. If n is an even integer, then n^2 is even is true.

3. Prove the following using a direct proof:
Show If $x^2 = 49$, then $x = \pm 7$

Proof: Since $x^2 = 49$ is true.

$$\sqrt{x^2} = \pm\sqrt{49}$$

$$x = \pm 7$$

$\therefore$ By T.T. If $x^2 = 49$, then $x = \pm 7$ is true.