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Samples from 4200

1. Prove that $\sqrt{123}$ is irrational.
   Proof: if $\sqrt{123}$ is rational it can be written in the form $\frac{a}{b}$.

$$\frac{a}{b} = \sqrt{123}$$

$$b\sqrt{123} = a$$

$$123b^2 = a^2$$

   Considering the last equation, we know that 123 is not a perfect square. As we have shown before the square root of any number that is not a perfect square will create a discrempancy in the prime factorizations of the two sides. Therefore $\sqrt{123}$ is irrational.

2. Find the truth table for p $\Rightarrow \neg$q.

p	q	p$\Rightarrow \neg$q
T	T	F
T	F	T
F	T	T
F	F	T

3. Negate the following statement:
   $\exists w \in [a, b]$ such that $\forall x \in [a, b], f(x) \leq f(w)$.

   $\forall w \in [a, b], \exists x \in [a, b], f(x) > f(w)$.

4. Let X = $\{x_1, x_2, \ldots, x_n\}$. Supose that $A \subseteq X$ and that A is represented by the binary sequence $a_1, a_2, \ldots, a_n$.
   a) How can the number of elements of A be determined from $a_1, a_2, \ldots, a_n$?

   The number of elements in A is determined by $\sum_{i=1}^{n} a_i$.