If x is a prime number then x is not a square number.

Proof. Suppose n is a square number. Since n is a square number, there is a positive integer m such that $n = m^2$. Then m is a divisor of n. If $m=1$ then $n=1$, so n isn't prime. If $m>1$ then $1<m<m^2=n$, ~~so~~ So n is not a prime number. $\square$

Definition. If n is a positive integer and d is a ~~number~~ integer positive integer, then d <u>divides</u> n if there is an integer k such that ~~$n=km$~~ $n = k \cdot d$.

If x is a prime number then x is not a square number.

Proof. Suppose x is a prime number. Then $x \neq 1$. If $1 < k < x$ then $x \neq k^2$ since otherwise k would be a divisor of x that is not 1 or x. So x is not a square number. $\square$

$\overbrace{\text{If } x \text{ is odd and } y \text{ is odd}}^{p}$ then $\underbrace{x+y \text{ is even.}}_{q}$

(an implication.)

$$p \to q$$

What if q is false?

$\neg q \to \neg p$ ← contrapositive of $p \to q$

$$\neg q \to \neg p$$

~~If $x+y$ is not even~~

If $x+y$ is odd then x is even or y is even. } contrapositive ~~negation~~

The ball is red and the
marble is green.

The ball is not red
<u>or</u> the marble is not green.

Quantifiers

For each

There exists

Every marble in the urn is green.

There is a marble in the urn that's not green.

There is a dog that doesn't bark.

All dogs bark.

p	q	$p \to q$
T	T	T
T	F	F
F	T	T
F	F	T

For every pair of integers x and y, if x and y are both odd then $x+y$ is even.

"For every"

"there exists"