The Goldbach Conjecture may be stated as follows:

Every even number greater than 4 can be written as the sum of two primes.

Examples:

\[
\begin{align*}
6 &= 3+3 \\
8 &= 3+5 \\
10 &= 3+7; 5+5
\end{align*}
\]

We will call the two primes summing to a particular number a Goldbach Pair (GP) for that number.
Consider the following identity for positive even numbers \(\{N,u,v\}\):

\[
N = (N-u) + (N-v) - (N-u-v) \quad \\{u, v; N>v>u\} \quad (1)
\]

Assume all the even numbers \(\{6, 8, \ldots, N-2\}\) are GP's: we wish to show \(N\) is also a GP.

Thus
\[
N = (A+B) \quad \{(A,B) \text{ prime; } A\geq N/2\geq B\}
\]
\[(N-u), (N-v), (N-u-v) \text{ are GP's } \{(N-u-v)\geq 6\}\]

In (1)
\[
(A+B) = (A+a) + (B+b) - (N-u-v) \quad \{(a,b) \text{ prime; } A>a\geq b\}
\]

Where
\[
(N-u) = (A+a)
\]
\[
(N-v) = (B+b)
\]
\[
(N-u-v) = (N-u) + (N-v) - N = a+b
\]

Using \(N = 12\) as an example the following table displays eligible values

<table>
<thead>
<tr>
<th>(N)</th>
<th>(a+b)</th>
<th>(u)</th>
<th>(v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3+3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>6+2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Therefore (1) occurs in 2 ways:

\[
12 = 10 + 8 - 6
= (7+3) + (5+3) - (3+3) = (7+5)
\]

\[
12 = 10 + 10 - 8
= (7+3) + (5+5) - (5+3) = (7+5)
\]

And 12 is a GP.

This method may be used for any \(N\) apparently.