Example: In RSA, when $p = 7$, $q = 11$, and $e = 13$, find d that is the multiplicative inverse of $e \bmod \phi(n)$, i.e., $ed = 1 \bmod \phi(n)$, where $n = pq = 77$.

$\phi(n) = (p-1)(q-1) = (7-1)\times(11-1) = 60$

Next, we find d by using Euclid's algorithm.

E1: 60/13 = 4······8 (dividend is $\phi(n)$, divisor is e)

E2: 13/8 = 1······5 (In the following steps, dividend is the divisor in previous step and divisor is the reminder in previous step)

E3: 8/5 = 1······3

E4: 5/3 = 1······2

E5: 3/2 = 1······1 (Stop when the reminder is equal to 1)

Then, we need to represent 1 by using $\phi(n)$ and e.

$1 = (3 - 2\times1) \bmod 60$ (Based on E5)

$= (3 - (5 - 3\times1)) \bmod 60$ (Based on E4, we have $2 = 5 - 3\times1$)

$= (3\times2 - 5) \bmod 60$

$= ((8 - 5\times1) \times2 - 5) \bmod 60$ (Based on E3, we have $3 = 8 - 5\times1$)

$= (8\times2 - 5\times3) \bmod 60$

$= (8\times2 - (13 - 8\times1) \times3) \bmod 60$ (Based on E2, we have $5 = 13 - 8\times1$)

$= (8\times5 - 13\times3) \bmod 60$

$= ((60 - 13\times4) \times5 - 13\times3) \bmod 60$ (Based on E1, we have $8 = 60 - 13\times4$)

$= (60\times5 - 13\times23) \bmod 60$

We have $1 = (60\times5 - 13\times23) \bmod 60 = 13 \times (-23) \bmod 60 = 13 \times (-23+60) \bmod 60$

$= 13 \times 37 \bmod 60$

Hence, $d = 37$. (Remember d must be a positive integer number since we consider modular arithmetic here. So $d = -23$ is not correct.)