RSA Encryption Example

p = 11
q = 13
n = p x q = 143
The totient of n, $\phi(n) = (p - 1).(q - 1) = 120$

For the public key, a random prime number that has a greatest common divisor (gcd) of 1 with $\phi(n)$ and is less than $\phi(n)$ is chosen. Let's choose 7.
e = 7
d = the secret key

To find d, we need to find the inverse of 7 with $\phi(n)$:
$e \cdot d = 1 \text{ . mod . } \phi(n)$

d = 103

**(where m is the message, e is the public key and c is the cipher.)
Encryption formula: F(m,e) = m**e mod n = c
Decryption formula: F(c,d) = c**d mod n = m

Example use:
Let's choose our plaintext message, m to be 9.

Encryption:
m**e mod n = 9**7 mod 143 = 48 = c

Decryption:
c**d mod n = 48**103 mod 143 = 9 = m