7. Let $n = 2 \times 3^8 \times 7^6 \times 13^2$ and let $m = 2^2 \times 3^4 \times 5 \times 7^{10}$
Find $\gcd(m, n)$

$\gcd(m, n) = 2^{\min(1,2)} \times 3^{\min(8,4)} \times 5^{\min(1,0)} \times 7^{\min(10,6)} \times 13^{\min(0,2)}$

$\gcd(m, n) = 2^1 \times 3^4 \times 5^0 \times 7^6 \times 13^0$

$\gcd(m, n) = 190\,59138$

8. Prove that $\sqrt{7}$ is irrational

Let us assume that $\sqrt{7}$ is rational

Now, since $\sqrt{7}$ is rational, we write it as $\frac{p}{Q}$ where $p, q \in \mathbb{Z}$ and coprime, their Gcd = 1

$\sqrt{7} = \frac{p}{Q}$

$p = \sqrt{7}\, Q$

$p^2 = 7Q^2$

$\frac{p^2}{7} = Q^2$