

Example 1.23. Calculate $\gcd(11223344556677889900, 221144335566770099)$.

Solution. The Euclidean algorithm (generated by a computer) yields

$$11223344556677889900 = 50 * 221144335566770099 + 166127778339384950$$

$$221144335566770099 = 1 * 166127778339384950 + 55016557227385149$$

$$166127778339384950 = 3 * 55016557227385149 + 1078106657229503$$

$$55016557227385149 = 51 * 1078106657229503 + 33117708680496$$

$$1078106657229503 = 32 * 33117708680496 + 18339979453631$$

$$33117708680496 = 1 * 18339979453631 + 14777729226865$$

$$18339979453631 = 1 * 14777729226865 + 3562250226766$$

$$14777729226865 = 4 * 3562250226766 + 528728319801$$

$$3562250226766 = 6 * 528728319801 + 389880307960$$

$$528728319801 = 1 * 389880307960 + 138848011841$$

$$389880307960 = 2 * 138848011841 + 112184284278$$

$$138848011841 = 1 * 112184284278 + 26663727563$$

$$112184284278 = 4 * 26663727563 + 5529374026$$

$$26663727563 = 4 * 5529374026 + 4546231459$$

$$5529374026 = 1 * 4546231459 + 983142567$$

$$4546231459 = 4 * 983142567 + 613661191$$

$$983142567 = 1 * 613661191 + 369481376$$

$$613661191 = 1 * 369481376 + 244179815$$

$$369481376 = 1 * 244179815 + 125301561$$

$$244179815 = 1 * 125301561 + 118878254$$

$$125301561 = 1 * 118878254 + 6423307$$

$$118878254 = 18 * 6423307 + 3258728$$

$$6423307 = 1 * 3258728 + 3164579$$

$$3258728 = 1 * 3164579 + 94149$$

$$3164579 = 33 * 94149 + 57662$$

$$94149 = 1 * 57662 + 36487$$

$$57662 = 1 * 36487 + 21175$$

$$36487 = 1 * 21175 + 15312$$

$$21175 = 1 * 15312 + 5863$$

$$15312 = 2 * 5863 + 3586$$

$$5863 = 1 * 3586 + 2277$$

$$3586 = 1 * 2277 + 1309$$

$$2277 = 1 * 1309 + 968$$

$$1309 = 1 * 968 + 341$$

$$968 = 2 * 341 + 286$$

$$341 = 1 * 286 + 55$$

$$286 = 5 * 55 + 11$$

$$55 = 5 * 11$$

Thus, $\gcd(11223344556677889900, 221144335566770099) = 11$.