Invariant Maintenance:  
At every iteration, gcd⁡(a,b)=gcd⁡(b,amod  b)gcd(a,b)=gcd(b,amodb).

Let d=gcd⁡(a,b)d=gcd(a,b). By definition, d∣ad∣a and d∣bd∣b.

Since amod  b=a−qbamodb=a−qb (where q=⌊a/b⌋q=⌊a/b⌋), d∣(amod  b)d∣(amodb).

Conversely, if d′=gcd⁡(b,amod  b)d′=gcd(b,amodb), then d′∣bd′∣b and d′∣(a−qb)d′∣(a−qb), so d′∣ad′∣a.

Thus, gcd⁡(a,b)=gcd⁡(b,amod  b)gcd(a,b)=gcd(b,amodb).

Termination:  
The sequence b0,b1,b2,…b0​,b1​,b2​,… (where bi+1=aimod  bibi+1​=ai​modbi​) is strictly decreasing and non-negative. Hence, bb eventually reaches 0.

Correctness:  
When b=0b=0, gcd⁡(a,0)=agcd(a,0)=a, which is trivially correct.

Conclusion: Euclid’s algorithm terminates and correctly computes gcd⁡(a,b)gcd(a,b).