Finding all integer solutions of a Linear Diophantine Equation

$$ax + by = c$$

▷ Extended Euclidean Algo.

find $d = \gcd(a, b)$

can write $ax + by = d$ multiplied by q

▷ Bezout's Lemma

Does $d \mid c$? Does $c = dq$?

Does $a(qx) + b(qy) = dq = c$?

Does an integer solution even exist?

All asking the same thing

▷ $$x = x_0 + k\frac{b}{\gcd(a,b)} \qquad y = y_0 - k\frac{a}{\gcd(a,b)}$$

Once you find one solution (x_0, y_0)

You can generate <u>all</u> the solutions