Exercise 1.1.16:

Proposition: Let $a, b \in \mathbb{Z}$. If $d \mid a$ and $d \mid b$, then $d \mid au + bv$, where $u, v \in \mathbb{Z}$

When proving an "if ___, then ___" proposition, assume the "if-part" and try to show the "then-part."

Proof: Let $a, b \in \mathbb{Z}$. Assume $d \mid a$ and $d \mid b$.]

* Thus, $a = xd$ and $b = yd$ for some $x, y \in \mathbb{Z}$.

apply the formal definitions! (Knowing all the definitions well will help you so so much!)

Consider some $u, v \in \mathbb{Z}$.] quantifying variables to help us get to what we want to prove

Observe that, $au = xdu$ and $bv = ydv$

Thus, $au + bv = xdu + ydv$

$= (xu + yv)d$

note that this was applying the formal definition, but in reverse!

This means $d \mid au + bv$ ■

↑ Sometimes, people put a box or the acronym "q.e.d" to show that they're done

Yay! Proofs aren't so scary once you get used to them!