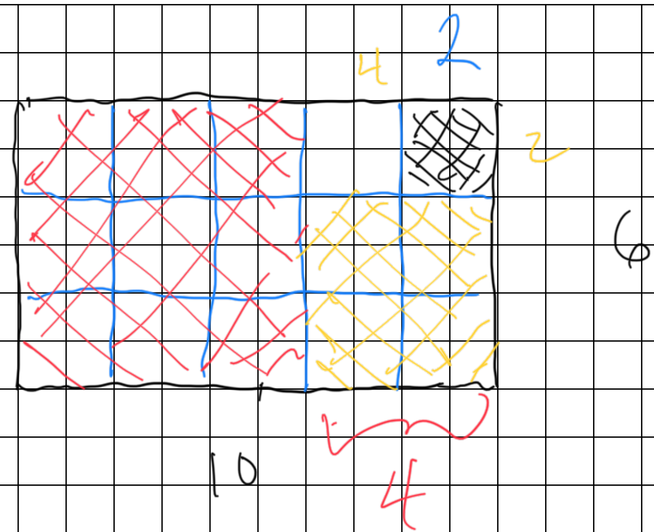


$\gcd(10, 6) = 2$

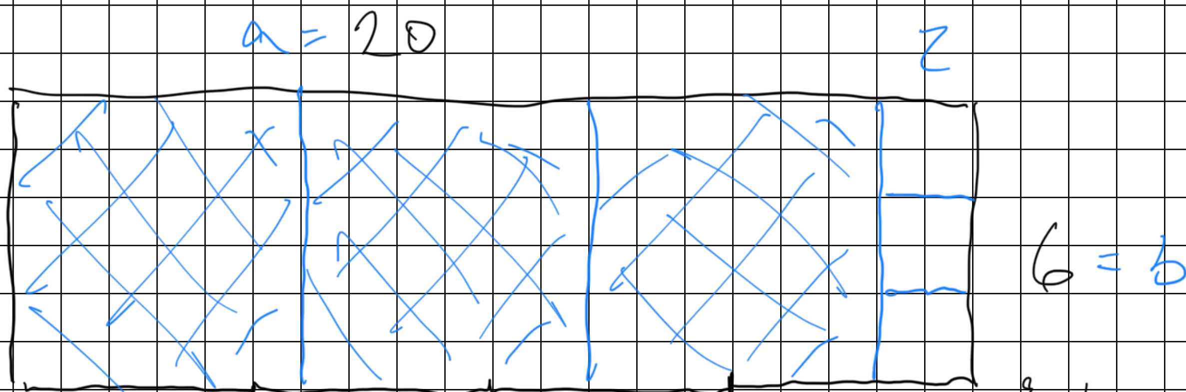
$= \gcd(6, 4)$

$= \gcd(4, 2)$

The trick: "casting out squares"

$= \gcd(2, 2)$

$= 2$



casting out multiple squares is better!!

What's the algorithm?

$a = q_1 b + r_1$

$b = q_2 r_1 + r_2$

$r_1 = q_3 r_2 + r_3$

$\overset{a}{20} = \overset{q}{3} \cdot \overset{b}{6} + \overset{r}{2}$

$6 = 3\boxed{2} + \boxed{0}$

gcd

when is r_i 0?

Do it again!

(Recurse)

$$r_3 = -q_3 r_2 + r_1$$

$$r_3 = -\underbrace{\left\lfloor \frac{r_1}{r_2} \right\rfloor} r_2 + r_1$$

2^{nd} order, but non-linear

$$\boxed{\begin{array}{l} r_n = -\left\lfloor \frac{r_{n-2}}{r_{n-1}} \right\rfloor r_2 + r_1 \\ r_1 = a \\ r_2 = b \end{array}}$$

r_n decreases to 0, because we're casting out squares (positive stuff) at each step.