

- Branch & Bound (with gurobi & without)

①

- More applications.

Illustrate some bad ideas in Branch & Bound

Don't do the following --

$$\max x_1 + 1000x_2 \quad \text{s.t.}$$

$$x_1 + 100x_2 \leq 750.5$$

$$x_1, x_2 \geq 0$$

} imagine
we
don't
this


① What happens if we restrict x_1, x_2 to be integers?

Roughly speaking: this very simple but
useful to learn about Branch & Bound

- Step 1: Solve LP! so x_1, x_2 don't have to be integers! we get

$$x_2 = 750.5 / 100, \quad x_1 = 0$$

LP: $x_1 = 0, x_2 = 7.505,$
Obj 7505

No solution
 x_1, x_2 integers


$x_2 \leq 6$
We want to eliminate

LP add
 $x_2 \leq 6$

$x_2 = 6, x_1 = 150.5$
Obj 6150.5

eliminate

$x_2 = 7,$
 $x_1 = ?$

LP and
add $x_2 = 7$

$x_2 = 7$
 $x_1 = 50.5$
Obj 7050.5

$x_2 \geq 8$
Want to eliminate

LP and
add $x_2 \geq 8$

Infeasible!

Eliminated

added
 $x_1 \leq 50$

$x_2 = 7$
 $x_1 = 50$
Obj = 7050

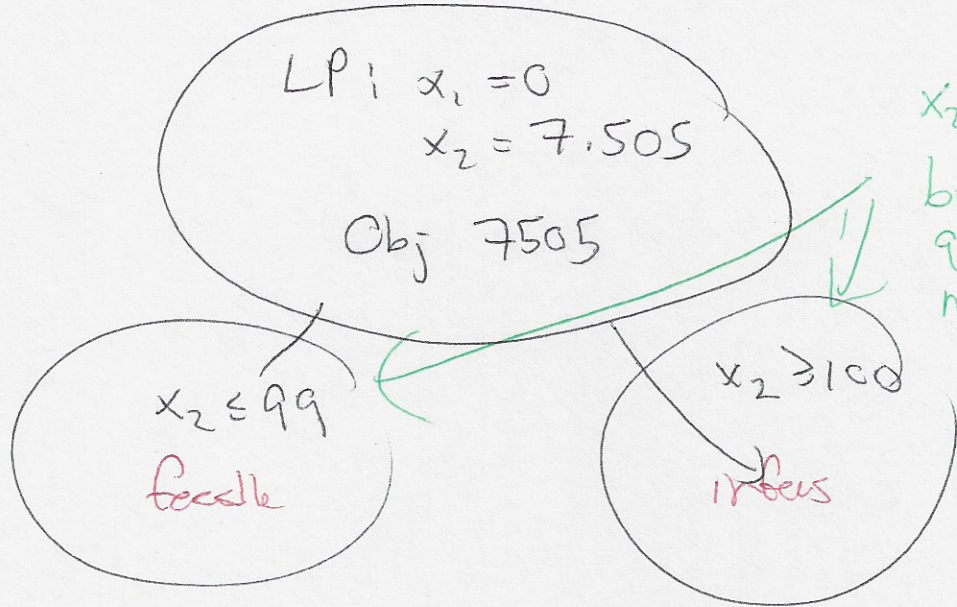
integer!!!!

LP
 $x_1 \geq 51$

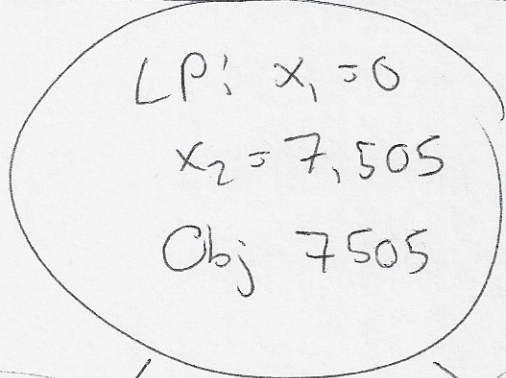
Infeasible

Feasible Integer Solution

This doesn't work well:



x_2 is significant,
but this question is
not so good



Say we suspect
 $x_1 = 50, x_2 = 7$
 is best

x_1 is much
less significant

