

A Linear Program

A linear program is defined by:

Real-valued **variables**

Subject to satisfying **everything** in a list of **linear constraints**

A linear constraint is a statement of the form: $\sum a_i x_i \leq c_i$
where a_i are constants, the x_i are variables and c_i is a constant.

Maximizing or minimizing a linear objective function

A linear objective function is a function of the form: $\sum b_i x_i$
where b_i are constants and the x_i are variables.

Linear constraints

[Pollev.com/robbie](https://pollev.com/robbie)

Can you write each of these requirements as linear constraint(s)?

Some of these are tricks...

x_i times x_j is at least 5

$5x_i$ is equal to 1

$x_i \leq 5$ OR $x_i \geq 7$

x_i is non-negative.

x_i is an integer.

Vertex Cover LP

Pollev.com/robbie

Write an LP for finding the minimum weight vertex cover

A set S of vertices is a vertex cover if for every edge (u, v) , u is in S , v is in S or both are in S .

What are your variables, then how do you constrain them?

Let $w(u)$ be the weight for a vertex u . You can treat $w(u)$ as a constant.

What do we do

Let's try an example first

Suppose your LP gave you this solution on this graph. How would you round it (i.e. convert to a valid vertex cover)?

