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In this recitation, we'll be going over the basic steps in building, solving, and analyzing a linear optimization model.

The problem we will use to demonstrate this comes from Google AdWords, which is the advertising system used by Google.

Let's begin by talking a little bit about Google.

As you may know, Google is a major company in the United States that provides products and services related to the internet.

Google's official mission statement is to organize the world's information, and to make it universally accessible and useful.

Although Google today develops a variety of products that includes things such as the Android operating system, the Google Glass wearable computer, and even self-driving cars, Google became famous-- and is still most widely known-- for its search engine, which can be found at www.google.com.

The search engine lets the user enter a query.

Google then searches through the web pages accessible on the internet, to return links to websites that best fit the search query.

Now, how did Google come about?

Well, the idea of Google originated as a research project of two people-- Sergey Brin and Larry Page.

This was in 1996, while they were still graduate students at Stanford University.

Their idea, in a nut shell, was to measure the importance of a web page to a particular query, not just by measuring how much that query occurs in that web page, but also by considering the links to that web page from other web pages.

They quickly found that this idea could form the core of a search engine, and they found that the search engine actually worked quite well.

They eventually named it Google.

And in 1998, they incorporated Google as a company.

In the same year, they received their first funding.

At the time, they had a database of 60 million web pages.

Six years later, Google's initial public offering took place, and Google became a publicly traded company.

After going public, Google has continued to grow at an immense pace, acquiring other internet companies like YouTube in 2007.

In 2013, Google's traffic reached more than a billion unique monthly visitors.

Today, more than two-thirds of all the searches done on the internet are powered by Google's search engine.

Now, you may be rather surprised to hear that Google does not actually make any money directly from its search engine.

In fact, Google's search engine is free for anyone to use.

So then, how does Google make money?

And the answer is -- through online advertising.

Basically, Google sells space on its web pages-- in particular, results of its search queries-- to outside companies.

These companies can then place advertisements, or ads, on these spaces.

Let's take a look at a concrete example.

So here we have a screen shot of the results of a Google search.

The query here was "nine inch nails tickets".

Nine Inch Nails-- if you're not familiar with it-- is a critically acclaimed industrial rock band from the United States, that recently toured North America.

On this page, there are only two search results-- here and here.

The first is a link to Ticketmaster, which is a company that sells concert tickets.

The second is to the tour page of Nine Inch Nails' official website.

All the remaining links on this web page are ads.

In this case, these are mostly links to other third-party companies that resell tickets.

Now, you may be asking, why do companies advertise with Google?

Well, there are several reasons.

As you saw a few slides back, Google receives a lot of internet traffic, as a lot of users conduct searches on Google.

So an ad placed on Google could be seen by a very large number of users.

At the same time, Google's web pages-- and the ads in them-- are formatted in a very clean, visually appealing way.

Lastly, companies that advertise with Google can select which queries their ads will be displayed for.

This is a very useful feature, because a company can then target specific customers that they think are likely to buy their product, or to use their service.

Google's online advertising system is known as AdWords and is responsible for more than 97% percent of Google's revenues.

In the next video, we'll go into more detail about the components of the AdWords system.