In 2011 Facebook launched Messenger as a stand alone app for mobile devices (it used to only be part of the Facebook App). How would you track the performance of this new application? What metrics would you use?

- DAU and MAU
  - Daily and Monthly Active Users is a very common metric.
  - In this case we can use the before and after of DAU and MAU to compare if users have moved on to the new app.

- Total Time Spent
  - Another common metric is total time spent on app.
  - This allows you to compare engagement before and after the launch of the stand alone app.

- Time spent on app, DAU, and MAU are common metrics you can use for any sort of application or website analysis.
- Let's now focus on metrics that may be more specific to the Messenger App itself.

- Number of messages being sent before and after change.
- Response time to messages received.
- Keep in mind increased metrics can sometimes be deceiving!

- Is it possible more time is being spent on the app because it is harder to use?
- Could this possibly affect advertising revenue changes?
- How is the previous Facebook App effected by the change?

Google has released a new version of their search algorithm, for which they used A/B testing. During the testing process, engineers realized that the new algorithm was not implemented correctly and returned less relevant results.

- 2 things happened during testing:
  - People in the treatment group performed more queries than the control group.
  - Advertising revenue was higher in the treatment group as well.

- Here is your first question for this situation:
  - What may be the cause of people in the treatment group performing more searches than the control group?

- We know the new algorithm produced less relevant search results.
- This means that users may have to make additional searches in order to clarify what they are searching for using the new algorithm.

- In order to test this hypothesis, we could study how close searches are to each other.
- If we notice additional searches are done very soon after, we could classify as them clarifying searches.

- Here is your second question for this situation:
  - What do you think caused the new algorithm to generate more advertising revenue, even though the results were less relevant?

- We know that more searches are being conducted, since advertisements are served along with every new search, there are more opportunities for users to click on the advertisement.

- Another possibility is that the search algorithm is different than the algorithm used to display ads.
- In this case, the ads themselves may be more relevant than the search results, causing more ad clicks.

- Here is your second question for this situation:
  - Since the less relevant algorithm resulted in higher advertising revenue, should it be implemented anyways?

- This is a bit of an opinion question, but we should probably **not** implement this new algorithm.
- The effects described are probably only short-term effects due to the problems with the algorithm.

- We shouldn't sacrifice the long term potential of the site for a temporary increase in revenue and searches.
- Google is probably best positioned to win in the long term when it has the most relevant search algorithm.

A car company produces all the cars for a country, we'll call them **Car X** and **Car Y**. 50% of the population drives Car X, the other 50% drives Car Y. Two potential technologies have just been discovered that help reduce gasoline usage!

Technology A: Increases the MPG of **Car X** from 50 MPG to 75 MPG

Technology B: Increases the MPG of **Car Y** from 10 MPG to 11 MPG

Which technology should be implemented to save the most gasoline for the country?

Let us assume that the average commute distance for a car is **D**.

Then we define total gas used (G) as
G=D/MPG

Let's examine what each policy would do...

Total Gas Used Change with Policy A:

(D/50)-(D/75) = D / 150

Total Gas Used Change with Policy B:

(D/10)-(D/11) = D / 110

Since we know that for any average commute distance D/150 will always be smaller than D/110 , then Policy B results in the biggest gas change/savings.

So Policy B is the correct choice.