

Basic Statistics Practice #6 (Extension)

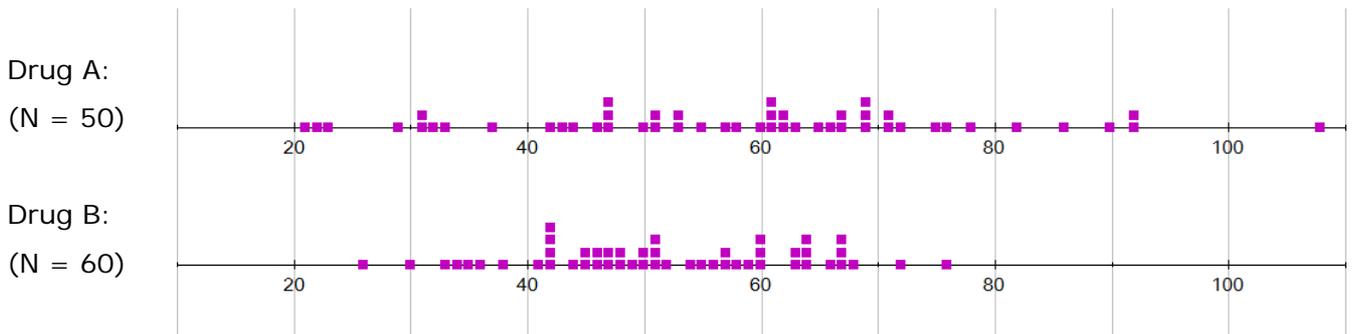
In NCEA assessments it is usual for Statistics questions to give the students some raw data and then leave them to decide what statistics to calculate, what graphs to draw and what features to comment on. The result is that there can be more than one correct way to answer.

A company is looking to market a new dental anaesthetic (drug that removes pain).

The old drug on the market, Drug A, is tested on 50 people.

The new drug, Drug B, is tested on 60 people.

The results are shown below, where the score is the number of minutes the people had before their sense of feeling pain returns.



What do the results suggest we can say about Drug A compared to Drug B?

1. _____

2. _____

3. _____

Show the results in another graphical form to back up your answer.

Answers version 1: Basic Statistics Practice #6 (Extension)

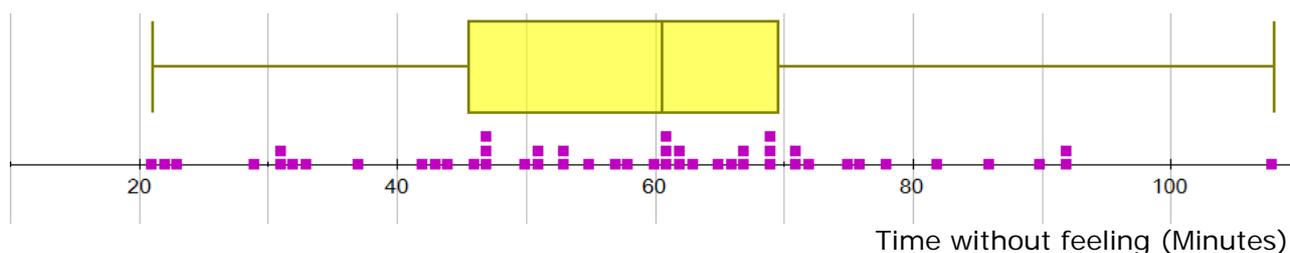
“What do the results suggest we can say about Drug A compared to Drug B?”

The best graph to draw is a comparison box-and-whisker. (Note the scale for the box-and-whisker graphs needs to be the same, so they can be compared properly.)

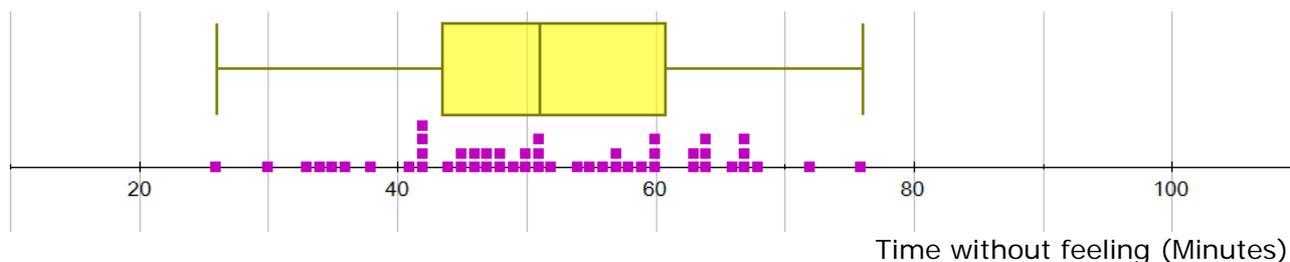
For Drug A, since there are 50 results the five points are the lowest value, the 13th, mid-25th/26th, the 38th and the highest value.

For Drug B, since there are 60 results, the five points are the lowest value, the 15th/16th, the 30th/31st, the 45th/46th and the highest value.

Drug A



Drug B



Potential Comments

(Note that these are only potential comments, and that there are other possible answers. The important thing to remember is that you need to **compare** as much as possible the two data sets, and not just talk about them on their own.)

1. Judging by the points on the box-and-whisker typically the effect of Drug A is to last longer than Drug B. We can see this because the median value and both quartiles are higher in the box-and-whisker graphs.

However, since the medians for Drug B is inside the interquartile range (the middle box) for Drug A, we cannot be sure the difference isn't just due to sample variability. A different sample might give a Drug B median higher than Drug A median.

2. Drug A is much less consistent (more variable) in effect. Not only does Drug A have a much larger range, but also a much larger interquartile range (middle box) in the box-and-whisker compared to Drug B.
3. While in general Drug A will last longer than Drug B neither is very predictable, seen by the very large range for both, but especially Drug A. Note that while Drug A is mostly the longer lasting, it also has the three shortest times.

Note: there is no need to raise the fact that the sample sizes are different (50 compared to 60). Neither the box-and-whisker plots nor the statistics are affected by that.

Answers version 2: Basic Statistics Practice #6 (Extension)

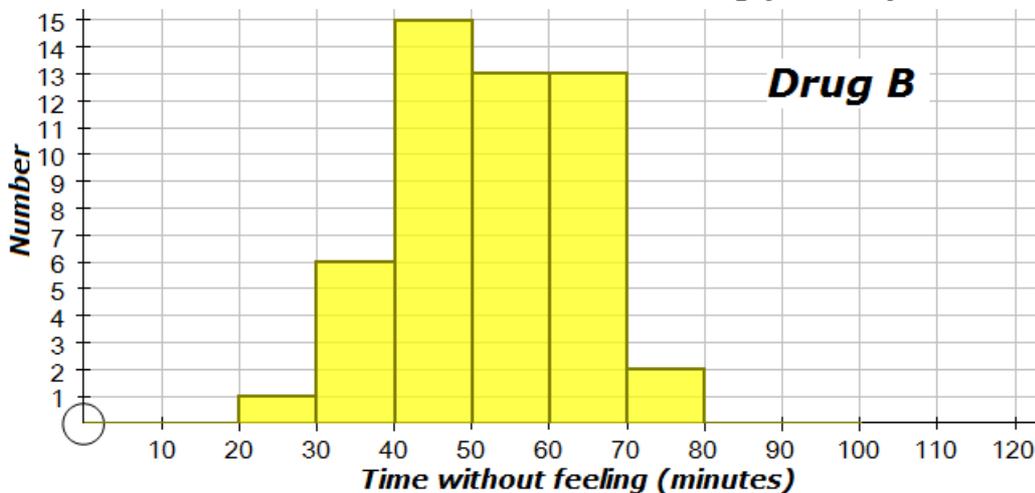
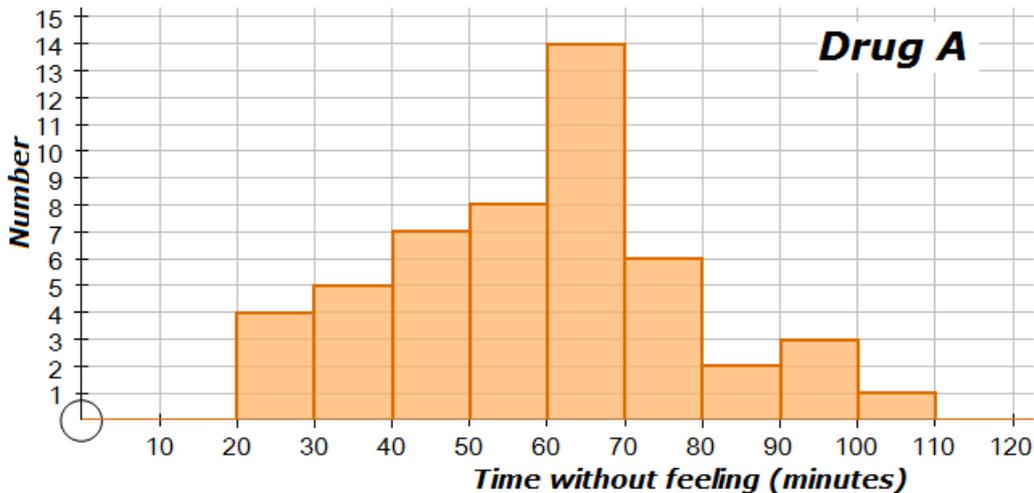
“What do the results suggest we can say about Drug A compared to Drug B?”

The question could also be answered by drawing a histogram as your graph.

This is a less appropriate solution, particularly since the number of tested patients is different. It does not allow you to judge your confidence in the difference in medians, as you can with a box-and-whisker.

You can use a different width of bar along the bottom for the histograms, but whichever one you choose it should be the same for both graphs, in order to allow direct comparisons.

The histograms will look like this:



Potential Comments

Again, these are only possible comments. Other correct statements are possible.

1. Typically the effect of Drug A is to last longer than drug B. The main peak in the histogram is between 60 and 70 for Drug A, but the peak for Drug B is 40 to 50 and the centre of the middle “hump” is 50 to 60.
2. Drug A is much less consistent (more variable) in effect. The histogram for drug A is much more spread out, but almost all the results for Drug B are between 40 and 70 minutes.
3. While in general Drug A will last longer than Drug B neither is very predictable, seen by the very large range for both, but especially Drug A. In particular, while Drug A is mostly the longer lasting, it also has the three shortest times (seen on the dot plot, but not on a histogram).