Reaction time

Resource - The nrich website has an excellent reaction timer *https://nrich.maths.org/reactiontimer*

The applet is set up to allow students to vary aspects of the reaction time test.

Getting started – A good starting point would be to show the applet to the class. Start with the default settings and demonstrate how the applet works. I would suggest using the "open animation in a new window" option. In this window, look at the data that gets recorded in the table below the applet.

It is possible to copy and paste the measurements (excluding the column headings) from the table below the applet, into a spreadsheet.

Next consider one or more questions, like the ones at the bottom of the initial webpage, but adapted for Core Maths students.

For example:

1. Do you think people's reactions improve with practice? How would this be demonstrated in the results?
2. If we tested a group of people and recorded their reaction time with their right and then left hand, would there be a noticeable difference in the distributions?
3. Suppose we ordered a sample of people based on their performance on the applet with the default settings, then asked the same people to do the test again using the "click on star required" option, ordering their performance in the same way, would the names on both lists be in the same order?

   Would we expect the two lists to be significantly different? How could we test this?

4. What other questions might you ask? *Allow the students some time to think about this.*

Ask the students to:

- Work in pairs or threes
- Decide on a question they wish to investigate using the app (either one of the above or something of their own)
- Think about how they will make the data representative and avoid bias. *For example, should they take a person's best, worst, or an average time, for the ordering question. How might their results be biased, what measures will they take to avoid this?*
- Consider what diagrams and statistics would be helpful in investigating their hypothesis

Links to specification content

S7.1 recognising when pairs of data are uncorrelated, correlated, strongly correlated, positively correlated and negatively correlated

S7.2 appreciating that correlation does not necessarily imply causation

S8.1 understanding that the strength of correlation is given by the pmcc

S8.2 understanding that pmcc always has a value in the range from – 1 to + 1

S8.3 appreciating the significance of a positive, zero or negative value of pmcc in terms of correlation of data

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S9.1 the plotting of data pairs on scatter diagrams and the drawing, by eye, of a line of best fit through the mean point *(the idea of residuals will not be required)*

S9.2 understanding the concept of a regression line.

S10.1 where raw data is given, students will be expected to use a calculator to calculate the pmcc and the equation of the regression line.

Possible outcomes from the investigation

1. Do you think people's reactions improve with practice? How would this be demonstrated in the results?
   This may involve plotting a graph of reaction time against attempt number. A visual inspection of the graph should give an initial indication of any relationship. The students may wish to take it further by calculating a product moment correlation, using a spreadsheet or calculator.

2. If we tested a group of people and recorded their reaction time with their right and then left hand, would there be a noticeable difference in the distributions?

   The students could plot a frequency diagram for both sets of results, calculate their respective means and standard deviations and use these to compare the performances on both tests. Alternatively, the students could draw box plots and compare the two tests using these and the Q_1 - Q_4 measures.

   Some students may choose to produce a scatter plot using paired data from the left and right-hand test. A visual inspection of the graph should give an initial indication of any relationship. The students may wish to take it further by calculating a product moment correlation using a spreadsheet or calculator.

3. Suppose we ordered a sample of people based on their performance on the applet with the default settings, then asked the same people to do the test again using the "click on star required" option, ordering their performance in the same way, would the names on both lists be in the same order?

   Initially the students will need to produce two ordered lists, and plot the paired variables onto a graph. A visual inspection of the graph should give an initial indication of any relationship.

   The students could plot a frequency diagram for both sets of results, calculate their respective means and standard deviations and use these to compare the performances on both tests. Alternatively, the students could draw box plots and compare the two tests using these and the Q_1 - Q_4 measures.

4. What other questions might you ask? *Allow the students some time to think about this.*

   The applet records the time the star is hidden between clicks. It may be interesting to see if there is association between this and the reaction time.

   The students could also consider whether the hidden time is random, by looking at the distribution of the times.