How Random is the iPod's Shuffle?
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What are the key design features of this learning activity?

***Context/hook**:* The context is randomly generated songs using an iPod Shuffle function, introduced with a background article about the iPod Shuffle's randomness.

Key concepts/ideas: This activity introduces the ideas of randomness, and the fact that each outcome is uncertain, but that predictable patterns emerge based on sets of outcomes in the long run.

***Key observables/teachables**:* This activity teaches students to recognize characteristics of randomly sampled or randomly generated data.

Problem	**Model building**	**Model testing**	**Model using**	**Communicating findings**
The activity begins with a claim that songs are not randomly generated using this Shuffle function.	Students are given a set of 25 randomly generated playlists for students to use as a basis to describe characteristics of a random sample, in this case, a randomly generated playlist.	After students come up with their ideas of what characteristics to look for, they are given a set of five additional playlists (also randomly generated) on which to test their rules.	Once they feel confident that their rules can be used to determine if a set of songs have NOT been randomly generated, they are then given three disputed playlists, which students are asked to judge based on their rules.	Students work in groups to examine the data, come up with rules, and finally, write a report about their finding and whether or not they believe the three disputed playlists were not randomly generated.

Learning Targets	**Checking understanding**
After completing this activity students will be able to: • understand that there are some recognizable characteristics of randomly sampled or randomly generated data • provide solutions to a real-world problem by analyzing data • explore what "random" means • work in a group and communicate their results by writing and presenting a report • connect ideas of data and probability to a real world problem of interest • understand the logic of statistical inference at a beginner level • experience elements of statistical thinking.	*Through discussion:* What would we expect to see in random playlists? Can you prove that something is random? How might your rules change if there weren't an equal number of songs for each artist? What is the probability of a song being selected next in the shuffle? *Through assessment:* Have the students paid attention to all the data (playlists) in making their analysis and conclusions? Have the students clearly described the rules they came up with to determine if a playlist is not random? Have the students clearly state a conclusion about the three disputed playlists submitted by Mr. Hoffman? Do the students have an understanding of what is meant by a random sequence?

Curriculum links: This activity could be linked to many of the New Zealand curriculum achievement objectives (across different levels). Aspects of the task could be differentiated to suit the level of the curriculum, by adjusting the statistical content knowledge and thinking required to complete the activity. For example, the claim could be that small boxes of smarties are biased towards a certain colour even though a machine is supposed to mix up all the colours based on equal starting amounts of each colour. This would reduce the variables explored to one (colour of each smartie). Students could be given randomly generated boxes of smarties through simulation, and develop rules for "random mixes" etc. To focus more on simulation, students could generate the sequences under investigation themselves, and use this simulated data to form their model (e.g. estimates for run length of the same artist). This could be further extended to exploration randomisation variation visually through the iNZight VIT module, leading to the use of the randomisation test.

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***Context/hook**:*

Key concepts/ideas:

***Key observables/teachables**:*

Problem	Model building	Model testing	Model using	Communicating findings

Learning Targets	Checking understanding
After completing this activity students will be able to: • • • • provide solutions to a real-world problem by analyzing data • work in a group and communicate their results by writing and presenting a report • connect ideas of data and probability to a real world problem of interest • experience elements of statistical thinking.	*Through discussion:* *Through assessment:*

Curriculum links: