Introducing and Investigating Statistics Interactive Screen Experiment

Introduction

Concepts of statistics are widespread in science, from assessing experimental uncertainties in radioactive count rates, to assessing differences between populations of species in different meadows.

The purpose of this Interactive Screen Experiment (ISE) is to provide a resource where the use of statistical methods can be used to investigate questions about a population of coloured sweets. These questions are not pre-defined in the resource, hence a wide range of exercises and experiments can be constructed around it.

The ISE you will be using is a computer resource based on your interactions with a set of real images of samples from a population, rather than a computer generated simulation. The outcomes will therefore be a far closer representation of reality, enabling you to connect this exercise more closely to a real situation.

Getting started

The ISE is a stand-alone executable application on the computer, and requires no additional software (such as Internet Explorer etc.) to run. To activate the ISE, locate the resource named "statistics_OER_1.exe" in the archive, extract it to your desktop and double-click it. The ISE will now run, but please wait until the title screen appears – this may take a short while, due to the large number of images the application needs to load.

If you use an Apple Macintosh, you will need to extract and run the archive file " statistics_OER_1.hqx"

You will be presented with the title screen of the Vernier ISE, as shown in Figure 1

Figure 1. The Vernier scale ISE start-up screen

Clicking the button marked "Click Here to Begin" will take you to the screen shown in Figure 2.
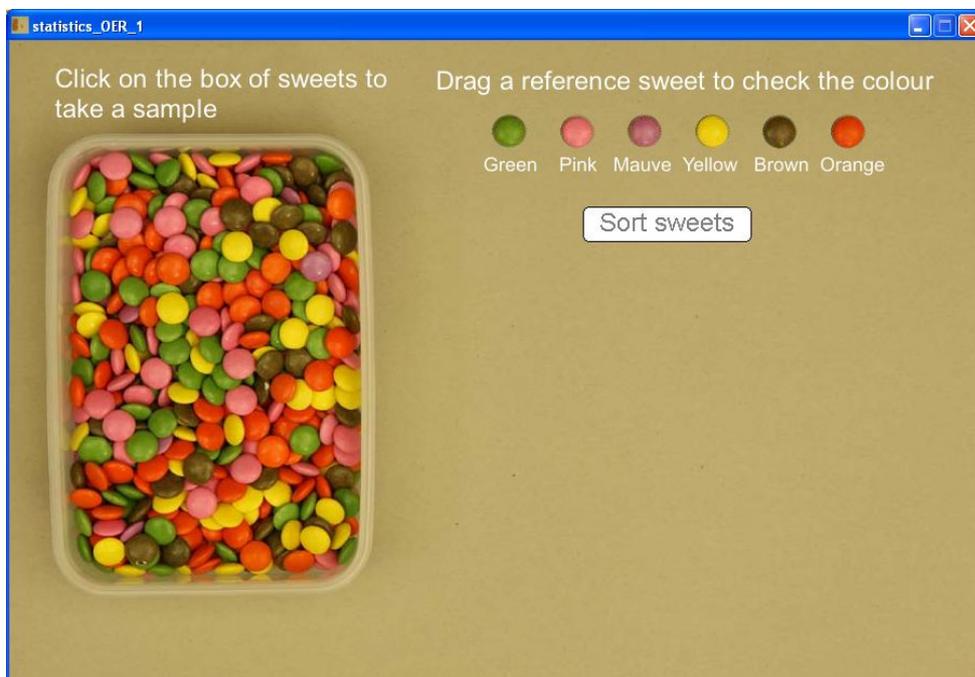

Figure 2. The initial screen of the statistics ISE before the first sample is taken.

Investigating statistics

A key concept in statistics is that of small samples taken from a much larger population, such that conclusions about the whole population can be reached without investigating it. To take a sample from the population of coloured sweets, simply click on the box, whereby the sample appears as in Figure 3.
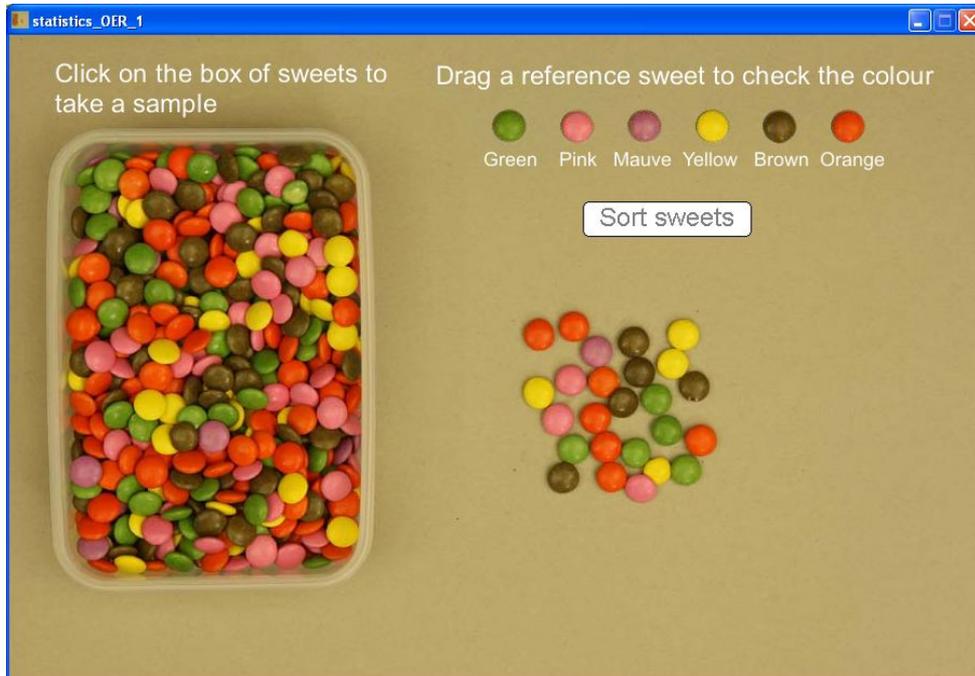
Figure 3. The statistics ISE with a sample of coloured sweets taken. *Note that the sample you get is randomly selected, hence you will probably not see this exact image.*

You may now count the sweets, depending on the nature of your investigation (you may, for example, be investigating whether the number of yellows is greater than greens in the whole population). However, you may find it easier to sort the sweets, clicking the "Sort sweets" button, giving Figure 4.

In addition to the number of sweets in the samples, you may need to know the total number of sweets in the population **There are 624 sweets in the box.**
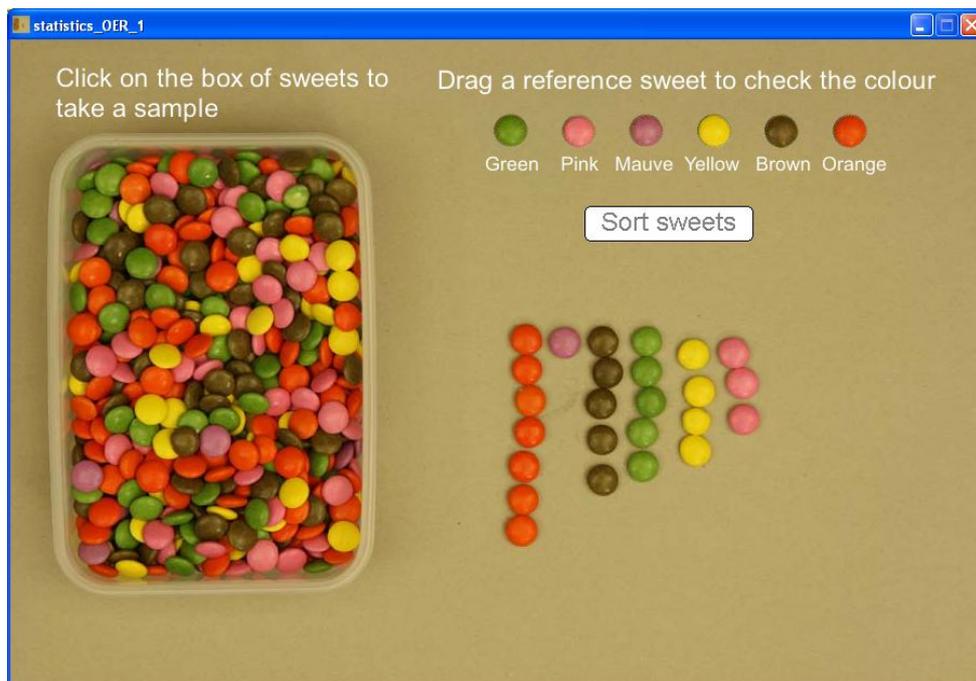
Figure 4. The sample selected in Figure 3 after sorting

Having recorded the necessary data from your first sample, a new sample is taken by again clicking the box.

If, for any reason, you have difficulty identifying a colour, simply drag one of the reference sweets at the top of the screen next to the sweet you are checking. Releasing the reference sweet returns it to the top of the screen.

An important point to note is that the sweets in a sample are returned to the population, and the population randomised (ie, "mixed up") before the next sample is taken.

Some suggested activities using this ISE include:

- Investigating the statistics of the size of randomly selected samples
- Investigating the relative frequencies of different colours
- Counting the total number of each colour, and calculating uncertainties
- Investigating the effect of number of samples on confidence limits
- Investigating the applicability of various statistical methods

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