Frank's Farm

Student Activity

TI-Nspire   Investigation   Student   20 min

Steers & Heifers

Suppose that on Frank's farm the weight, X_i, of a randomly selected steer is a normally distributed random variable with mean 320 kg and standard deviation 90 kg. The weight, Y_i, of a randomly selected heifer is a normally distributed random variable with mean 280 kg and standard deviation 80 kg.

Problem Statement 1

Find the probability that for a random sample of 4 steers and 2 heifers the total weight is less than 2000kg.

Simulating the Problem

Open the TI-Nspire file: **Franks Farm**

Page 1.1 contains a set of instructions. These instructions include setting the variables in the problem. Make sure the variables are all set before starting the simulation.

Note: When modifying a variable press [**Enter**] to ensure the modification has been accepted.

Navigate to page 1.2.

Frank's farm problem can be simulated from this application. Before starting however it is important to seed the random variable generator.

 Menu: **Probability** > **Random** > **Seed**

Enter a four digit number such as the last four digits of your phone number. This will ensure your results are different than everyone else. (Unless of course you share the same phone!)

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TEXAS INSTRUMENTS
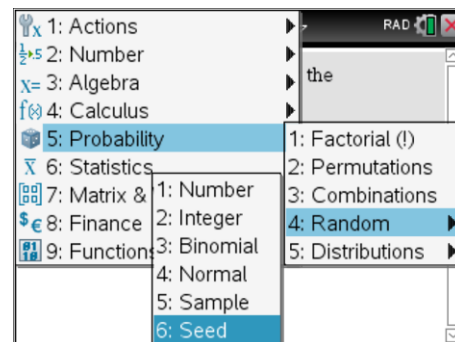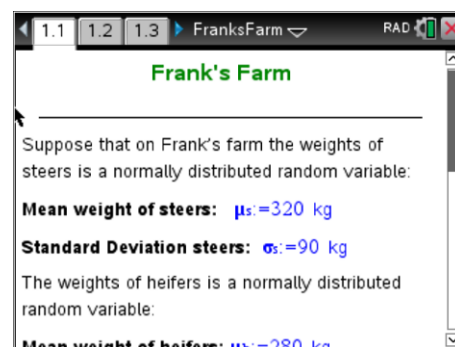
To run the program, press the [**VAR**] key and select "**farm**".

Notice that all the variables for the problem have been automatically included from the introductory page.

farm() will appear on the screen, press [**Enter**] to run the program and enter the number of simulations.
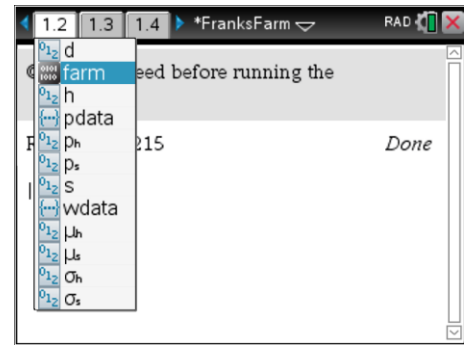
The program produces the following:

- The proportion with a combined weight greater than or equal to the amount specified (w)
- The proportion with a combined value greater than the amount specified (d).
- wdata = Total weight of each sample
- pdata = Price of each sample

Question: 1.

Run a simulation of 100 trials. Record the following:

i.   Proportion of samples that exceed the combined weight and also below the combined weight.

ii.   Mean weight of cattle in the sample.

Question: 2.

Run several more simulations of 100 trials and record the mean, proportion of samples that exceed the required weight and therefore the proportion that do not meet the requirement. Now run several simulations of 400 trials and record the results. Compare the 'consistency' of the two sets of data.

Note: *The program will take a few moments to generate the 1000's of random numbers required for this simulation.*

Question: 3.

Run a simulation of 500 trials and graph the 'weight' results (wdata) in a scatter plot.

i.   From the scatter plot estimate the mean weight of the combined steers and heifers.

ii.   Describe the general shape of the combined weight data.

Question: 4.

Find the probability that for a random sample of 4 steers and 2 heifers, the combined weight is less than 2000kg. Write your answer correct to four decimal places showing all working out.

Problem Statement 2

Suppose that steers are valued at $3.00/kg live-weight and heifers at $2.50/kg live-weight. Find the probability that for a random sample of 4 steers and 2 heifers, the combined value is greater than $5200.

Question: 5.

The simulation data from Question 3 is still stored in the calculator. Navigate back to the scatter plot.
i.   Change the x variable in the scatter plot to the combined value (pdata) and estimate the mean.
ii.   Describe the general shape of the combined value data.

Question: 6.

Find the probability that for a random sample of 4 steers and 2 heifers, the combined value is greater than $5200. Write your answer correct to four decimal places. Show all working out.

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