Selection Direction

6975

INTRODUCTION

Do you think you could tell individuals apart in a herd of zebras? To us, individuals in some populations may look the same. However, in most populations, each individual is unique. This is called *biological variation*, and it is critical to the survival of a species. Variation encourages natural selection by ensuring that at least some individuals in a population will be adapted for survival in their environment.

Activity Overview

In this activity we will

- produce histograms using the Data Graphs Wizard

Approximate Total Time: 20 minutes

Science Objective

Students are introduced to the concept of biological variance by collecting and graphing class data on hand width.

PROCEDURE

1

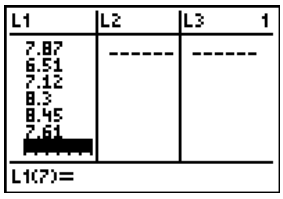
Use a ruler to measure the width of your hand (in cm) from the base of your index finger to the base of your pinky. Report this measurement to your teacher for the class data table.

2

Turn on the calculator by pressing [ON]. Press [STAT], [ENTER] to access the List Editor.

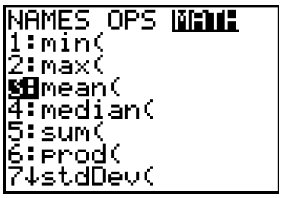
3

Enter all of the data for hand width from the class data table into list L1 .



4

Determine the average for all the data. Press [2nd], [STAT]. Use the right arrow to scroll to MATH. Scroll down to highlight 3:MEAN. Press [ENTER].



5

Press [2nd], [L1], [)] [ENTER]. The mean will appear as the last number in list L1. Record this value as mean hand width on a separate sheet of paper. Then delete it from L1 by highlighting it and pressing [DEL].

6

Use the procedures in steps 4 and 5 to determine the median of the class data, except select 4:MEDIAN instead of 3:MEAN. Record this value as median hand width.

Selection Direction

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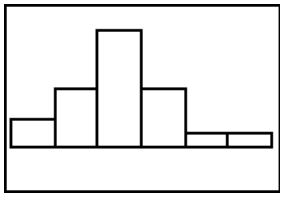
Represent your data using a histogram:

a) Press [APPS]. Use the arrows to scroll to SCI TOOLS. Press [ENTER], [ENTER].

b) Highlight 3:DATA/GRAPHS WIZARD and press [ENTER].

c) Press [WINDOW] to plot the data. Press [TRACE] to select HISTOGRAM. Press [ENTER].

d) On a separate sheet of paper, sketch the histogram that appears on the screen. The histogram shown here is based on sample data. Your histogram may be similar to this one, or it may look different.



8

Clear all lists and repeat steps 2 through 7 for the data for limpets. These data represent different colors of a species of limpet, a marine animal. Members of this species range from white to dark tan. Each limpet has been assigned a color value based on how dark its shell is. The number 1 represents a white shell. The number 10 represents the darkest tan shell. From 1 to 10, each higher number represents a slightly darker shade of tan. Sketch the histogram for limpet shell colors.

Limpet	Color value	Limpet	Color value
1	6	11	10
2	1	12	1
3	1	13	4
4	8	14	5
5	10	15	10
6	10	16	7
7	10	17	1
8	1	18	10
9	2	19	1
10	9	20	3

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Clear all lists and repeat steps 2 through 7 for the data below. These data are for tongue lengths of giant anteaters. Sketch the histogram for giant anteater tongue lengths.

Anteater	Tongue length (cm)	Anteater	Tongue length (cm)
1	59.5	11	60.0
2	60.0	12	59.8
3	59.6	13	60.0
4	58.0	14	58.8
5	60.0	15	60.0
6	59.9	16	59.8
7	60.0	17	59.7
8	60.0	18	59.4
9	58.7	19	59.8
10	59.8	20	60.0

DATA ANALYSIS

1. Describe the general trends for the histograms of hand widths, limpet shell colors, and anteater tongue lengths. How do they differ?
2. What do you think is the reason that you didn't find more extreme values for hand width? If you invited another class to participate in the activity, do you think you would see much difference in the general shape of the histogram? Explain.
3. How does the general shape of the histogram for your class compare to the one made from sample data? Explain reasons for similarities and differences.
4. What do you think is the reason that the limpets did not have more intermediate values for shell color? How do you think shell color influences survival for these organisms?
5. Do you think you would find a giant anteater with a tongue length of 50.0 cm? Explain.
6. Use your textbook or the Internet to research stabilizing selection, disruptive selection, and directional selection. Describe the characteristics of each. Identify the type of selection illustrated by each example in this lab.