CASIO Education Workbook Series

STATISTICS

with the

CASIO fx-9750GII

WHAT’S INSIDE:
- Data Analysis & Probability
- Permutations
- 1 & 2-Variable Statistical Calculations
- Linear & Non-Linear Bivariate Data
- Random Sampling & Categorical Data
- Normal Distribution
- Hypothesis Testing
- Confidence Intervals
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- One-Way Analysis of Variance
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ED-WKBK-STATS
The Cost of Car Insurance

Topic: Data Analysis and Probability

NCTM Standard(s)
- For univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics.

Objective:
Given a set of data, the student will be able to enter data into the statistics menu of the Casio 9750 GII, graph the data using a median box-and-whisker graph, and calculate the measures of central tendency.

Getting Started
Have the students work in pairs or small groups and come up with examples of using one-variable data, what kind of information can be obtained from one-variable data and what types of graphs can be used to represent one-variable data.

Prior to using this activity:
- The student should be able to calculate basic statistics.
- The students should be familiar with interquartile values.

Ways students can provide evidence of learning:
- Given a set of data, the student should be able to create a box and whisker plot.
- The student should be able to answer questions about the range of a set of data.

Common mistakes to be on the lookout for:
- Students may pick a measure of central tendency that does not best describe the situation.
- Students may not understand the effect that outliers have on the set of data.

Definitions:
- Mean
- Median
- Mode
- Standard Deviation
- Interquartile Range
- Central tendency
The following will demonstrate how to enter a set of data into the Casio fx-9750GII, graph the data using a Box and Whisker Plot and find important information from the graph.

### Scores on the First Math Test
| 55 | 60 | 75 | 80 | 90 | 65 | 75 | 60 | 50 | 80 |

### Scores on the Second Math Test
| 75 | 90 | 85 | 60 | 95 | 85 | 80 | 70 | 95 | 100 |

To enter the data from the table in the problem:

2. To clear previous data lists press: `[F6] (△)` `[F4] (DEL-A)` `[F1] (Yes)`.
3. Enter the data by typing each number, pressing `[EXE]` after each entry.
4. The display should look like the screen shot on the right when completed.

To select the type of graph for this data:

1. Press `[F1] (GRPH)` and `[F6] (SET)` to set the type of graph for StatGraph1.
2. Press `[▼]` to highlight Graph Type.
3. There are five choices: Scat, XY, NPP, Pie, and (△). Selecting `[F6] (△)` will provide more graph choices.
4. Press **F2** (Box) for a box-and-whisker plot.

5. Make sure that the XList is List 1 and a Frequency of 1. If not, scroll down and press **F1** to select a frequency of 1.

6. Press **EXIT**, then **F1** (GPH1) to view the graph.

7. Pressing **F1** will display the statistical data from the list.

To graph multiple sets of data:

1. Press **EXIT** to go back one screen.

2. Press **F6** (SET) and **F2** (GPH2) to set the type of graph for StatGraph 2.

3. Press **F2** (Box) for a box-and-whisker plot, then press ▼ to change the XList to List 2.

4. Press **F4** (SEL) to select the graphs to be displayed.

5. Arrow down to the graphs that you would like to see drawn and press **F1** (On). Then, press **F6** (DRAW).
To perform a 2 variable statistic analysis of the data:

1. Exit twice until you are at the main stat screen.

2. Press F2 (CALC), then F2 (2VAR) for a two-variable analysis.

3. Scroll down to see the data.
The Cost of Car Insurance

For many years, actuaries have kept track of the driving records of car insurance policy holders. These statistics compare males and females and those under or above 21 years old. This data is used to determine the amount paid for car insurance premiums. In this activity, you will compare the cost of car insurance premiums that resulted from the analysis of this data.

<table>
<thead>
<tr>
<th>Insurance Co.</th>
<th>Female &lt; 21</th>
<th>Female ≥ 21</th>
<th>Male &lt; 21</th>
<th>Male ≥ 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>$2,046</td>
<td>$1,520</td>
<td>$3,041</td>
<td>$2,108</td>
</tr>
<tr>
<td>Company B</td>
<td>$1,825</td>
<td>$1,239</td>
<td>$2,617</td>
<td>$1,514</td>
</tr>
<tr>
<td>Company C</td>
<td>$2,152</td>
<td>$1,637</td>
<td>$2,946</td>
<td>$1,701</td>
</tr>
<tr>
<td>Company D</td>
<td>$1,773</td>
<td>$1,129</td>
<td>$2,459</td>
<td>$1,477</td>
</tr>
<tr>
<td>Company E</td>
<td>$2,381</td>
<td>$1,748</td>
<td>$3,291</td>
<td>$2,439</td>
</tr>
</tbody>
</table>

Questions

1. What is the range of costs for car insurance for a female under 21?
   ___________________________________________________________________

   What is the mean cost?
   ___________________________________________________________________

2. What is the range of costs for car insurance for a male under 21?
   ___________________________________________________________________

   What is the mean cost?
   ___________________________________________________________________

3. What is the difference between the mean costs of a female and male driver under 21?
   ___________________________________________________________________

4. Can you think of some reasons why the cost is so different for male and female drivers under the age of 21?
   ___________________________________________________________________
   ___________________________________________________________________
5. Use your Casio 9750GII to graph a box and whisker for each of the age and gender groups. Draw a sketch of each graph. Be sure to label the interquartile values for each age and gender group.

Female < 21

Female ≥ 21

Male < 21

Male ≥ 21

6. What is the range of costs for car insurance for females over 21 years old?

What is the mean cost?

7. What is the range of costs for car insurance for males over 21 years old?

What is the mean cost?

8. What is the difference between a male driver over 21, and a female driver over 21 years old?

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
9. Looking at the data overall, compare the mean and median costs for all the data sets, and find the best insurance company and the yearly rate each would pay for the following:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Amount paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male, 17 years old</td>
<td>_______</td>
<td></td>
</tr>
<tr>
<td>Female, 18 years old</td>
<td>_______</td>
<td></td>
</tr>
<tr>
<td>Male, 76 years old</td>
<td>_______</td>
<td></td>
</tr>
<tr>
<td>Female, 35 years old</td>
<td>_______</td>
<td></td>
</tr>
</tbody>
</table>

10. Do you think that this is fair? Why or why not?

   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

Extensions

Speak with some of your local insurance companies and get rate quotes for someone your age, but for different types of vehicles, like a sports car, a truck, a compact car or an old Caprice.
Solutions

1. Range = $2381 - $1773 = $608

\[
\begin{align*}
\text{Range} &= 2381 - 1773 = 608 \\
\text{Mean} &= \frac{2035.40}{5} \\
\text{Median} &= 2035.40
\end{align*}
\]

2. Range = $3291 - $2459 = $8732

\[
\begin{align*}
\text{Range} &= 3291 - 2459 = 8732 \\
\text{Mean} &= \frac{2870.80}{5} \\
\text{Median} &= 2870.80
\end{align*}
\]

3. $2870.80 - $2035.40 = $835.40

\[
\begin{align*}
\text{Difference} &= 2870.80 - 2035.40 = 835.40
\end{align*}
\]

4. Answers will vary

5. Female < 21

\[
\begin{align*}
\text{Female < 21} &= \text{Boxplot}
\end{align*}
\]

Female ≥ 21

\[
\begin{align*}
\text{Female ≥ 21} &= \text{Boxplot}
\end{align*}
\]

Male < 21

\[
\begin{align*}
\text{Male < 21} &= \text{Boxplot}
\end{align*}
\]

Male ≥ 21

\[
\begin{align*}
\text{Male ≥ 21} &= \text{Boxplot}
\end{align*}
\]
6. Range = $1748 - $1129 = $619

7. Range = $2439 - $1477 = $962

8. $1847.80 - $1456.60 = $391.20

9. Male, 17 years old: Company D Amount paid: $2,459
   Female, 18 years old: Company D Amount paid: $1,773
   Male, 76 years old: Company D Amount paid: $1,477
   Female, 35 years old: Company D Amount paid: $1,129

10. Answers will vary