

## 9.4.2: Normal Distribution- Lap Times (Worksheet)

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Student ID#: \_\_\_\_\_

*Work in groups on these problems. You should try to answer the questions without referring to your textbook. If you get stuck, try asking another group for help.*

### 9.4.2.1 - Student Learning Outcome

- The student will compare and contrast empirical data and a theoretical distribution to determine if Terry Vogel's lap times fit a continuous distribution.

### 9.4.2.2 - Directions

Round the relative frequencies and probabilities to four decimal places. Carry all other decimal answers to two places.

### 9.4.2.3 - Collect the Data

- Use the data from [Appendix C](#). Use a stratified sampling method by lap (races 1 to 20) and a random number generator to pick six lap times from each stratum. Record the lap times below for laps two to seven.

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

- Construct a histogram. Make five to six intervals. Sketch the graph using a ruler and pencil. Scale the axes.

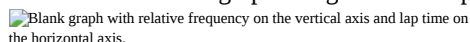
Blank graph with relative frequency on the vertical axis and lap time on the horizontal axis.

Figure 6.4.1.

- Calculate the following:

a.  $\bar{x}$  = \_\_\_\_\_

b.  $s$  = \_\_\_\_\_

- Draw a smooth curve through the tops of the bars of the histogram. Write one to two complete sentences to describe the general shape of the curve. (Keep it simple. Does the graph go straight across, does it have a v-shape, does it have a hump in the middle or at either end, and so on?)

### 9.4.2.4 - Analyze the Distribution

Using your sample mean, sample standard deviation, and histogram to help, what is the approximate theoretical distribution of the data?

- $X \sim$  \_\_\_\_\_ (\_\_\_\_\_, \_\_\_\_\_)
- How does the histogram help you arrive at the approximate distribution?

### 9.4.2.5 - Describe the Data

Use the data you collected to complete the following statements.

- The IQR goes from \_\_\_\_\_ to \_\_\_\_\_.
- $IQR =$  \_\_\_\_\_. ( $IQR = Q_3 - Q_1$ )
- The 15<sup>th</sup> percentile is \_\_\_\_\_.

- The 85<sup>th</sup> percentile is \_\_\_\_\_.
- The median is \_\_\_\_\_.
- The empirical probability that a randomly chosen lap time is more than 130 seconds is \_\_\_\_\_.
- Explain the meaning of the 85<sup>th</sup> percentile of this data.

#### 9.4.2.6 - Theoretical Distribution

Using the theoretical distribution, complete the following statements. You should use a normal approximation based on your sample data.

- The *IQR* goes from \_\_\_\_\_ to \_\_\_\_\_.
- *IQR* = \_\_\_\_\_.
- The 15<sup>th</sup> percentile is \_\_\_\_\_.
- The 85<sup>th</sup> percentile is \_\_\_\_\_.
- The median is \_\_\_\_\_.
- The probability that a randomly chosen lap time is more than 130 seconds is \_\_\_\_\_.
- Explain the meaning of the 85<sup>th</sup> percentile of this distribution.

#### 9.4.2.7 - Discussion Questions

Do the data from the section titled [Collect the Data](#) give a close approximation to the theoretical distribution in the section titled [Analyze the Distribution](#)? In complete sentences and comparing the result in the sections titled [Describe the Data](#) and [Theoretical Distribution](#), explain why or why not.

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