Statistics Unit Lesson Plan

Submitted by: Brittany McCarter, Statistics
Short Pump Middle School, Glen Allen, Virginia

Target Grade: 7th grade Math

Time Required: 90 minutes (four periods)

Standards:

- Virginia SOL 7.11
  - The student, given data for a practical situation, will a) construct and analyze histograms; and b) compare and contrast histograms with other types of graphs presenting information from the same data set.
- CCSS.MATH.CONTENT.7.SP.C.7.B
  - Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.

Lesson Objectives:

Students will:

- **construct** a histogram from data with 70% accuracy.
- **calculate** mean, median, mode, and range from data with 70% accuracy.
- **construct** a circle graph from the data in a histogram with 70% accuracy.

Central Focus:

This lesson melds the engineering design process with statistics. Students will build a zipline car to fulfill an engineering challenge. Data will be taken from the zipline runs. Using the data from the zipline runs, students will work with measures of central tendency, histograms, and circle graphs.

Background Information:

Teachers will need to give background information on mean, median, mode, and range in the idea of math. They also need to give background information on how to create histograms and circle graphs. These are needed to perform the lesson.

Materials

- Fishing line for zip line
- Dolls for crafts (Barbie dolls)
- Paper Towel Rolls

- Empty Water Bottles
- Cereal Boxes to build crafts
- Tape
- Scissors
- Yarn
- Copy of design worksheet for each student
- Copy of notes for direct instruction
- Copy of directions and rubric for each student

Instruction

Day 1- Engineering Design Challenge

1. Introduce the Engineer Design Challenge by showing this video
2. Class discussion of each step and what they look like and how to follow the process to solve a problem.
3. Introduce design challenge
4. Students will work in groups of four to create a craft to send down a zipline in the library (or anywhere there is room to use the zipline). There will be three ziplines already set up and ready to go for the students to use. A craft will be considered successful if it can travel the entire zipline without losing the doll sitting in the craft.
5. Groups can only use the materials provided to their group. Each group will get the same materials but will need to use them differently. Each group will get one fishing line, one doll, one paper towel roll, two empty water bottles, one cereal box, tape, scissors, a yard of yarn, and copies of design worksheets, notes, directions, and rubrics to follow along.
6. Students must complete the worksheet as they work. This will help facilitate them going through the engineering design process.
7. Students will have one hour to work on their prototype and build a craft. They can test their craft on each zipline as many times as needed so that they can have a successful run on the zipline with a fastest time. The group with the fastest time will be the "winners"
8. After one hour, each group will present their craft to the class and send it down the zipline for their official run. Since they practiced before, one last run is their final run to show the class. One student will be a timekeeper and one student will record the times for all students in a google spreadsheet.

Day 2- Direct Instruction on Measures of Central Tendency, Histograms, and Circle Graphs

1. Using the data from the zipline challenge, complete the notes for direct instruction calculating measures of central tendency (review from 6th grade) and creating histograms and circle graphs.

Day 3 and 4- Student selected project to show mastery of concepts

1. Students will generate their own question/topic to research. Students will need a minimum of 10 data points. From this data, they will calculate measures of central tendency and create a histogram and circle graph. Students will have a choice on how they present the information. They will present the information the next day and each for 10 minutes. This project will replace a traditional multiple choice test for this unit.
2. Directions and Rubric for Project
3. Homework during the unit will focus on reading the graphs for understanding. Homework will be given both days to do both worksheets (one a day). There is a Histogram WS and Circle Graph WS.
4. At the end of the unit, the students will complete an exit ticket to check master of SOL style questions. The exit ticket will be 10 minutes maximum and it will be based on the work about graphs discussed in class.

Differentiation

This lesson should be able to reach all different kinds of learners. There will be worksheets for those who need to work out the math on paper. Building the craft will help teach those students that learn best from hands-on experiences. The crafts are also good for visual learners because they can observe others in a group as they work.

Assessment

Formative: The teacher will use homework answers to see if the students are really understanding what is being taught. The teacher should work with the students one-on-one as they need help with the project. After helping the students, use their final craft as a judgement to see if they made it and understood it correctly. Also use the graphs and histograms as a way to recognize information. At the end, use a exit ticket.

Summative: The teacher will use collection of data and craft as a way to assess them. Another summative assessment could be the project as a whole.

Design Challenge

<u>Problem Statement</u>:

Barbie needs to travel from 1 end of the zipline to the other end using _____ materials.

STEP 1: Individually SKETCH a radical solution that uses the material at your station. (5 minutes)

STEP 2: Group Share and Feedback

SHARE

- **Each person in your group will take 1 minute to share their idea. While they share you need to fill out Chart:**

1 thing you liked about the design	1 thing that could be changed to improve	1 Aspect you would like to include in group design

FEEDBACK

- **Then <u>EACH</u> teammate will share their feedback (what they wrote in the chart) to that person.**

STEP 3: GROUP DESIGN and Testing (35 minutes)

- **Take everything put in their last column and brainstorm on a design that uses those aspects to create a NEW design that represents the groups ideas**
- **Once you are done, you can test it once.**

STEP 4: Test in front of Class to Input your Time

STEP 5: Reflection. How did your carrier do? What did you like about your design? What would you change about your design? How could you make your carrier better?

Statistics Notes

Use the data from the Zip Line Data Table to complete the following

Calculate the mean

Calculate the median

Calculate the mode

Calculate the range

Create a Histogram of the data

- Bars with no space between
- Shows how many data points fall in an interval
- Intervals must be the same
- The height of the bar is how many data points are in that specific interval

Histogram for Zip Line Data

Create a Circle Graph from the Histogram

- Circle Graphs show percentages of the intervals

Directions and Rubric for Statistic Unit Project

Instead of a traditional test for this unit, you will be completing the following project in class. It will count as a test grade for the 4th nine weeks. You will be collecting data points and recording them in a frequency table. You must have a minimum of 10 data points. Once you have compiled your data, you will calculate the mean, median, mode, and range for your data set. You will then create a histogram and a circle graph for the data.

You will have a choice in how you collect and present your project. You will come up with a topic for your data. You can ask your classmates a question. You can research statistics for your favorite sport or hobby. You can create an experiment and record your results. Just make sure that your topic includes numbers for answers. I can't ask the class their favorite ice cream flavor - the answers are not numbers. I can't calculate measures of central tendency or create a histogram and circle graph. I could ask the class how long it takes to drive from their house to SPMS. The answers provided would be numbers that I can use to complete the project. (Sorry - you can't use that question!!)

You will present your results in the format you think will best represent your data. You can create everything digitally, create a poster, make a slideshow, paint pictures of it, create a video in class of your results, or write it all down on paper. The choice is yours - as long as it fits in my classroom (reasonably) and I can grade it.

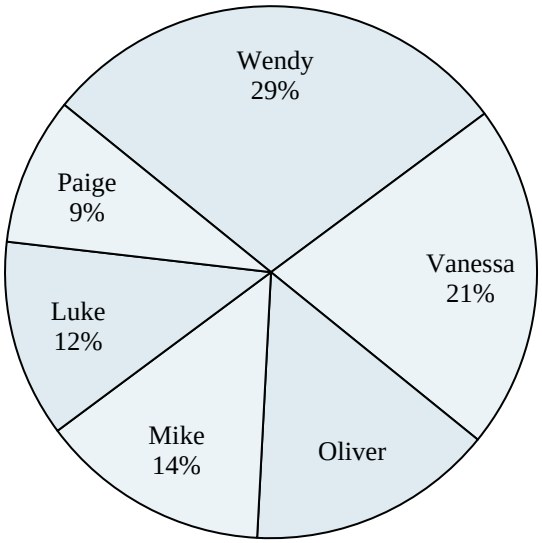
At any point, if you can't remember how to complete a component of the assignment - refer to the Statistics folder in Schoology. I have filled the notes section with copies of notes, videos, and tutorials on how to complete each part of the project. We will call this the Statistics "Play List." If you still need help, then ask me (your teacher)! I will gladly help :)

Below is the rubric for how you will be graded.

Appropriate Topic that will allow for data to be collected and analyzed - 10 points
Complete frequency with a minimum of 10 data entries - 15 points
Correctly calculated mean, median, mode, and range - 20 points
Correct Histogram of data - 25 points
Correct Circle Graph of data - 25 points
Creativity - 5 points

Use the graph to solve.

Class Election Results



1) Who won the election?

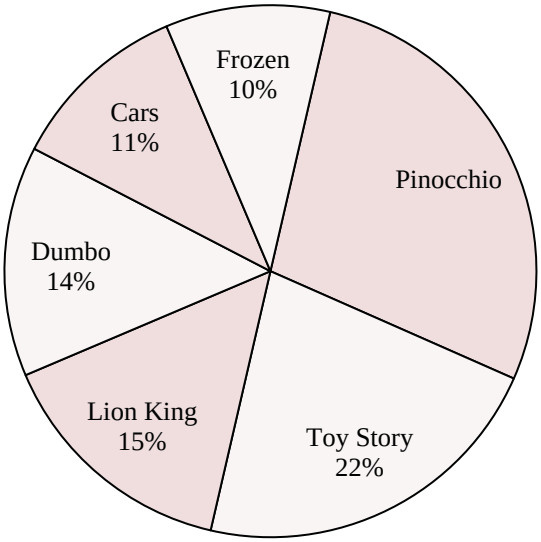
2) Who got the least number of votes?

3) What percent of people voted for Oliver?

4) What percent of people voted for either Luke or Oliver?

5) Which two candidates had about half the votes?

Favorite Disney Movie



6) Which movie was the most popular?

7) Which movie was the least popular?

8) What percent of people said Pinocchio was their favorite?

9) What percent of people said either Pinocchio or Cars was their favorite?

10) Which two movies did about half the people say was their favorite?

Answers

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

1-10	90	80	70	60	50	40	30	20	10	0

Statistics Notes

Use the data from the Zip Line Data Table to complete the following

Calculate the *mean*

Calculate the *median*

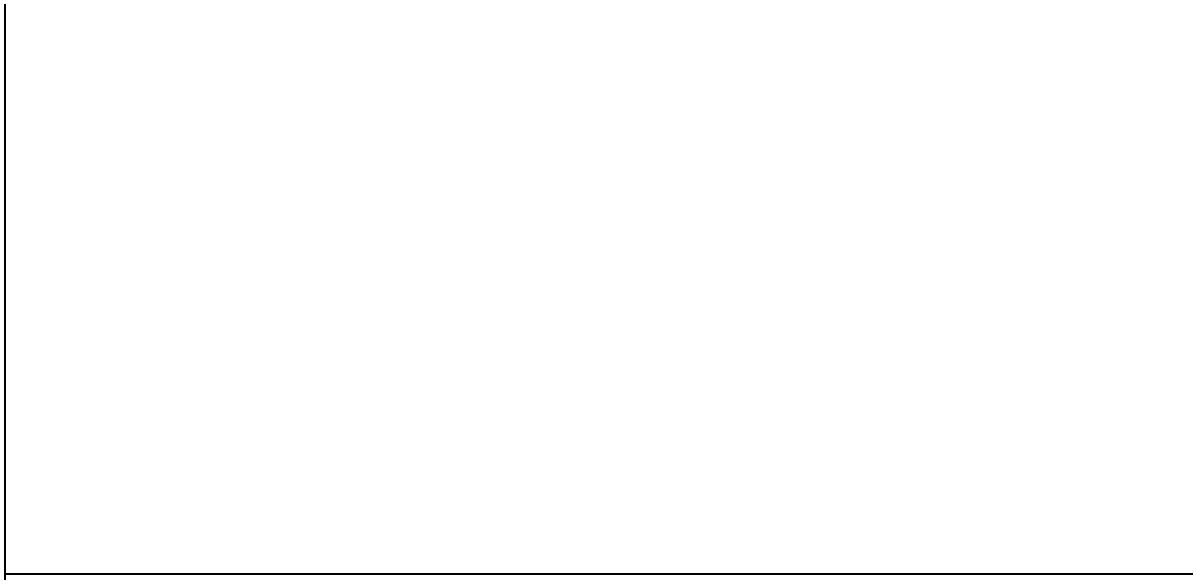
Calculate the *mode*

Calculate the *range*

Create a *Histogram* of the data

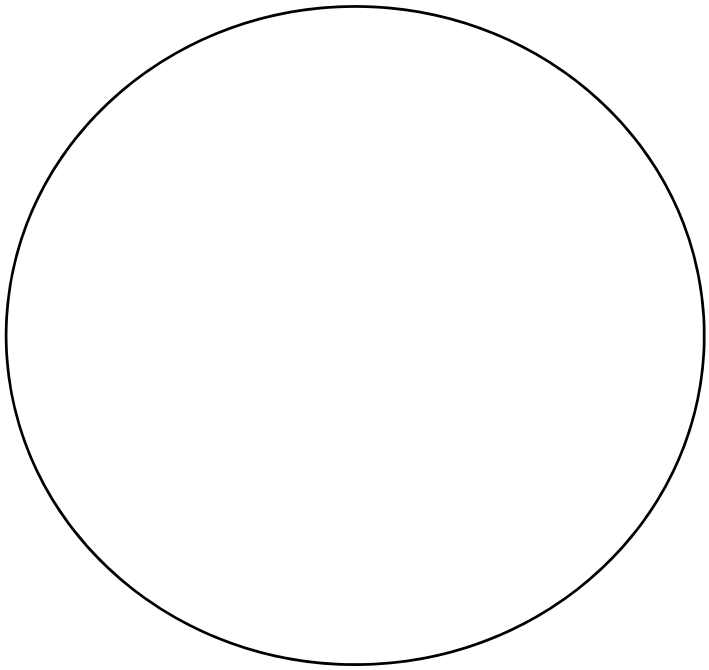
- Bars with no space between
- Shows how many data points fall in an interval
- Intervals must be the same
- The height of the bar is how many data points are in that specific interval

Histogram for Zip Line Data



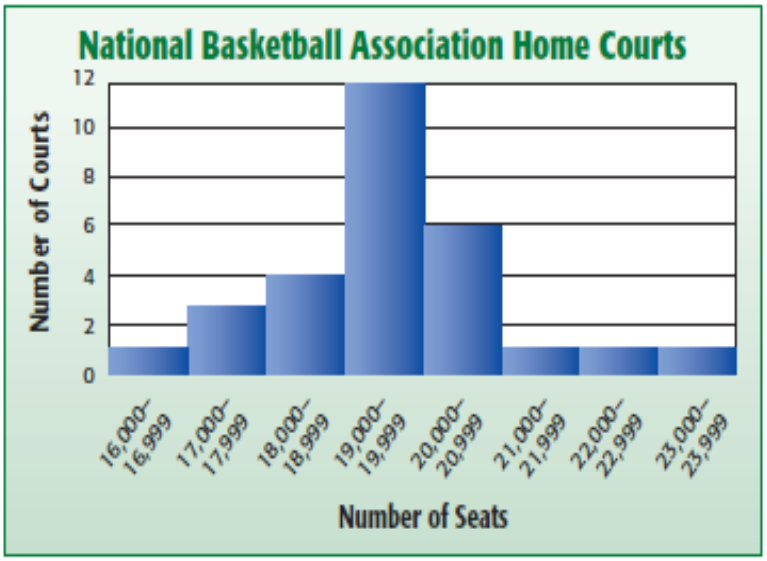
Create a *Circle Graph* from the Histogram

- Circle Graphs show percentages of the intervals



Name _____ Date _____

SOL 7.11 Graphical Methods



1. What interval represents the most number of courts?
2. How many courts have less than 20,000 seats?
3. How many courts have between 17,000 and 19,000 seats?
4. How many courts have at most 20,000 seats?
5. How many courts have at least 21,000 seats?

6. How big is each interval?
7. What is the percentage of winning super bowl games is interval 10-19.
8. How many winning teams score less than 30 points.

12-16	**20-25**	**1-5**	**37-41**

9. Identify the interval above that is not equal to the other three. EXPLAIN your answer choice.

Short Pump Middle School

MS MATH COURSE 2: 1(A)

Statistics Exit Ticket

Instructors: Brittany McCarter, Ms. Meredith

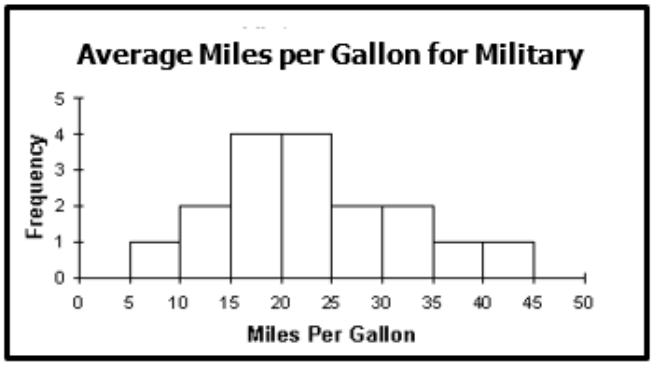
ID: 8325

Name: _____ Score: / 100

Question 1 /1

About what percent of the cars have an average of 25 to 45 miles per gallon?

A) 6%
B) 10%
C) 35%
D) 50%



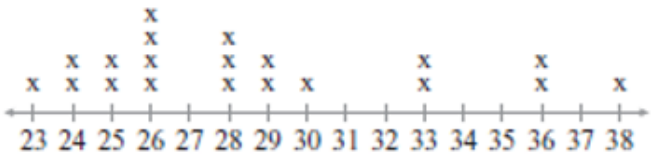
- [ ] A
- [ ] B
- [ ] C
- [ ] D

ID: 8325

Name: _____

Question 2 /1

Charlene made a line plot to graph the ages of employees in an outdoor advertising company



Age of Employees

Suppose Charlene wants to display this data in a histogram with the bars labeled in the following ages: 20–24, 25–29, 30–34, and 35–39. How tall will the 25–29 bar be?

A) 10 C) 12
B) 11 D) 14

- [ ] A
- [ ] B
- [ ] C
- [ ] D

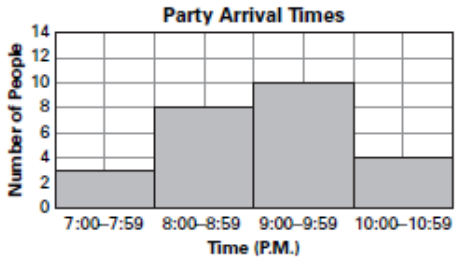
ID: 8325

Name: _____

Question 3

/ 1

Elliot says almost everyone arrived at the party after 10:00 P.M., but Nancy thinks most people came earlier. When did a majority of the people arrive?



A) 7:00 – 7:59 P.M.
B) 8:00 – 8:59 P.M.
C) 9:00 – 9:59 P.M.
D) 10:00 – 10:59 P.M.

- [ ] A
- [ ] B
- [ ] C
- [ ] D

ID: 8325

Name: _____

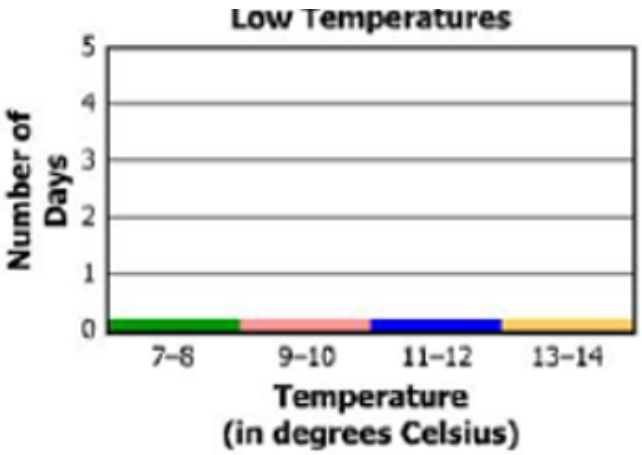
Question 4

/1

Scott recorded the low temperatures for Richmond. Using the data below, what would be the frequency of the 11- 12 interval?

9°, 7°, 10°, 8°, 12°, 11°, 7°, 14°, 13°, 12°

Create a histogram of this set of data.



- [ ] 1
- [ ] 2
- [ ] 4
- [ ] 3

ID: 8325

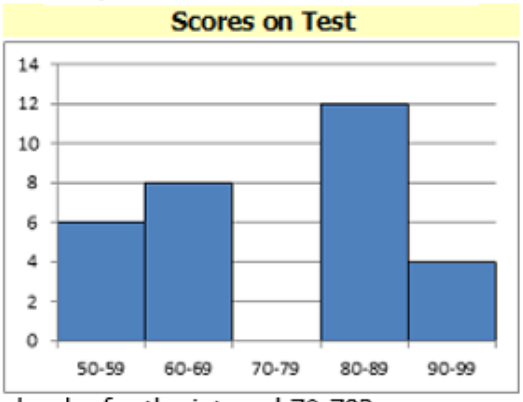
Name: _____

Question 5

/1

Mr. Semo is making a histogram to show the scores on the last science test. He first lists the scores in a stem-and-leaf plot.

5	0 5 5 5 5 5
6	0 0 0 0 0 5 5 5
7	0 0 5 5 5 5 5 5 5
8	0 0 0 5 5 5 5 5 5 5 5 5
9	0 0 0 5



How many units tall should the bar be for the interval 70-79?

A) 2
B) 5
C) 9
D) 11

- [ ] A
- [ ] B
- [ ] C
- [ ] D

ID: 8325

Name: _____

Question 6

/ 1

In Lisa's math class, 6 students received test scores in the 91–100% range, 12 students received scores in the 81–90% range, and the other 2 students received scores in the 71–80% range. Which type of display would BEST represent the data?

A) histogram B) pictograph C) line graph D) Venn diagram

- ☐ A
- ☐ B
- ☐ C
- ☐ D

ID: 8325

Answer Key

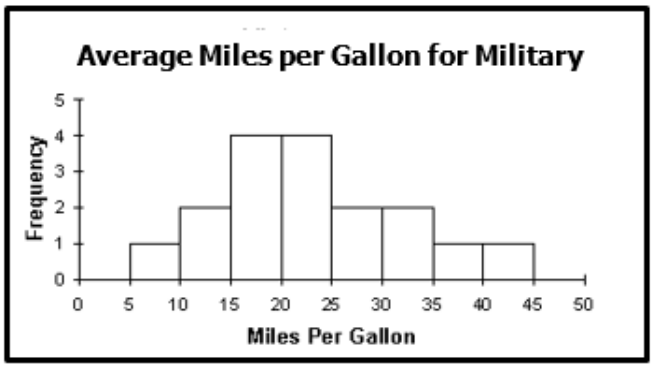
Possible Points: 6 Factor: x16.67 Test Value: 100

Instructions for grading: Grade each question and tally the score to obtain the total test points. If the factor does not equal 1, multiply the total points by the factor to obtain the student's final score.

Question 1

About what percent of the cars have an average of 25 to 45 miles per gallon?

A) 6%
B) 10%
C) 35%
D) 50%



☐ C

1 possible pts.

ID: 8325

Page 1 of 6

Answer Key

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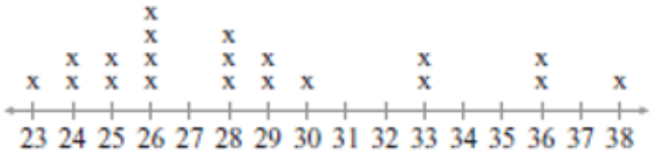
Question 2

Charlene made a line plot to graph the ages of employees in an outdoor advertising company



Age of Employees

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A) 10 C) 12
B) 11 D) 14

☐ B

1 possible pts.

Answer Key

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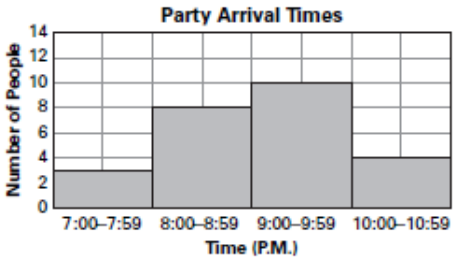
Question 3

Elliot says almost everyone arrived at the party after 10:00 P.M., but Nancy thinks most people came earlier. When did a majority of the people arrive?



A) 7:00 – 7:59 P.M.
B) 8:00 – 8:59 P.M.
C) 9:00 – 9:59 P.M.
D) 10:00 – 10:59 P.M.

☐ C

1 possible pts.

Answer Key

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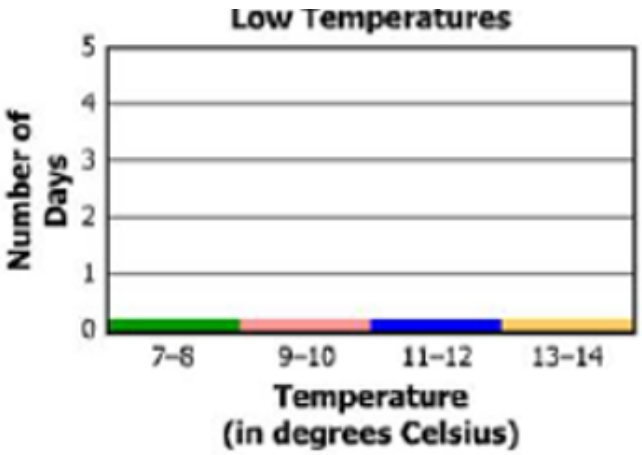
Question 4

Scott recorded the low temperatures for Richmond. Using the data below, what would be the frequency of the 11–12 interval?

9°, 7°, 10°, 8°, 12°, 11°, 7°, 14°, 13°, 12°

Create a histogram of this set of data.



☐ 3

1 possible pts.

ID: 8325

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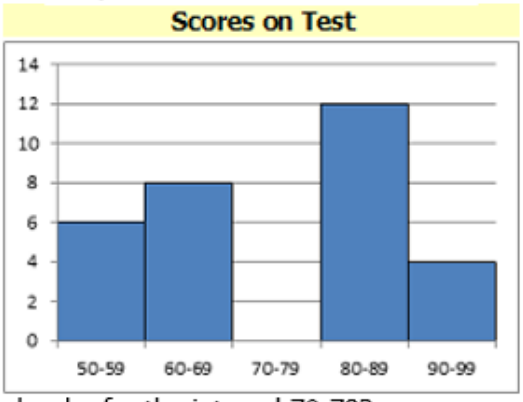
Answer Key

Possible Points: 6 Factor: x16.67 Test Value: 100

Question 5

Mr. Semo is making a histogram to show the scores on the last science test. He first lists the scores in a stem-and-leaf plot.

5	0 5 5 5 5 5
6	0 0 0 0 0 5 5 5
7	0 0 5 5 5 5 5 5 5
8	0 0 0 5 5 5 5 5 5 5 5 5
9	0 0 0 5



How many units tall should the bar be for the interval 70-79?

A) 2
B) 5
C) 9
D) 11

C

1 possible pts.

ID: 8325

Page 5 of 6

Answer Key

Possible Points: 6 Factor: x16.67 Test Value: 100

Question 6

In Lisa's math class, 6 students received test scores in the 91–100% range, 12 students received scores in the 81–90% range, and the other 2 students received scores in the 71–80% range. Which type of display would BEST represent the data?

A) histogram B) pictograph C) line graph D) Venn diagram

☐ A

1 possible pts.