

Grace's Campaign

Brief Overview:

In this unit students will explore various ways to organize data using bar graphs, and stem and leaf plots, Students will analyze data using median and mode. The students will discuss the electoral process and the characteristics of a good leader.

NCTM Content Standard/National Science Education Standard:

Solve problems by making bar graphs and picture graphs. They apply their understanding of place value to develop and use stem-and-leaf plots.

Collect, Organize, and Display Data

- Collect data by conducting surveys
- Organize and display data to make tables using a variety of categories and sets of data
- Organize and display data to make single bar graphs using a variety of categories and intervals.
- Organize and display data to make stem and leaf plots using two categories.

Data Analysis

- Interpret data contained in tables using a variety of categories and intervals
- Interpret data contained in single bar graphs using a variety of categories and intervals
- Interpret data contained in a single and double stem and leaf plot
- Identify median, mode and range for a given set of data

Grade/Level:

Grades 2-4

Duration/Length:

Three lessons – 60 minutes required for each lesson

Student Outcomes:

Students will:

- Collect, organize, display, analyze, or interpret data to make decisions or predictions. Emphasize the things you think they will be able to do after completing the lesson.
- Organize and display data to make tables using a variety of categories and sets of data

- Organize and display data to make single bar graphs using a variety of categories and intervals
- Interpret data contained in tables using a variety of categories and intervals
- Interpret data contained in single bar graphs using a variety of categories and intervals
- Determine median, mode, and range of a given data set

Materials and Resources:

Day 1

- Pre-assessment regarding bar graphs and stem and leaf plots
- Book Vote! by Eileen Christlow
- Common Character Traits list
- Chart paper
- Graph paper 18" x 24" – 1 for each group of students
- Student Roles and check list
- Exit card for bar graph
- Post-it notes 1" x 1" – 4 per student

Day 2

- Pre-assessment based on bar graph from Day 1
- Book Grace for President by Kelly DiPucchio
- Common Character Traits list
- Bar graph from Day 1
- Letters from Grace and Thomas
- Campaign poster examples
- Directions for assembling posters – 1 per pair of students
- Construction paper – 1 piece of 9" x 12" per student
- Campaign poster components
- Pictures of Grace and Thomas
- Quart size plastic bags
- Visible clock with second hand for students to time partners
- Glue sticks
- Scissors
- Blank stem and leaf plot papers (left) – 1 per student
- High order thinking questions regarding the stem and leaf plot
- Random data for reteaching activity

Day 3

- Teacher created stem and leaf plot using data gathered from Day 2 on overhead
- Pre-assessment with questions about single stem and leaf plot

- Poster assembly directions
- Construction paper – 4 piece of 9” x 12”
- Campaign poster components including pictures of Thomas and Grace
- Quart size plastic bags
- Visible clock with second hand for students to time groups
- Glue sticks
- Scissors
- Blank stem and leaf plot papers (right) – 1 per student
- Tape
- Stem and Leaf plots created in Day 2
- Brief Constructed Response about double stem and leaf plot

Development/Procedures:

Lesson 1

Pre-Assessment

Distribute the pre-assessment that includes a completed bar graph and stem and leaf plot Student Resource 1 and Teacher Resource 1. The students will be required to name the two different types of data organizers and answer questions about each type of graph.

Launch

- Read the book Vote! By Eileen Christlow to the students.
- Distinguish character traits that are important to have in order to be a good leader.
- Create a list of the character traits the students identify on a piece of chart paper
- Refer to Character Trait list, Teacher Resource 2 to guide students in making appropriate choices.
- Review mode with students.

Teacher Facilitation

- Distribute four (4) post-it notes to each child
- Explain that each student must choose the four different character traits from the generated list that they feel are most important for a good leader
- Students will write one character trait on each post-it note, for a total of four character traits per child.

Student Application

- Assemble students into groups of four.

- Students will sort character traits.
- Distribute large graph paper to each group.
- Each group will assemble a bar graph using the post-it notes that they completed.
- Assign roles to group participants – Scribe, Facilitator, Speaker and Resources, see Teacher Resource 3 for description of roles.
- Included in each bar graph should be: title, labeled x and y axis, scale starting at zero, data placed correctly, labeled data sets. Students should refer to the checklist, Student Resource 2.

Embedded Assessment

Students will complete an exit card based on the graph that their group created about Traits of a Good Leader, (Student Resource 3 and Teacher Resource 4.)

Reteaching

Work with students in small groups who are struggling with the concept of creating and interpreting data in bar graphs in order to reinforce ideas presented. Work on further developing understanding through creating and reading bar graphs similar to those found in the lesson.

Extension

Students who have mastered the skills taught during the lesson will work with partners on creating survey questions and collecting data. These students will then take collected data and create bar graphs.

Lesson 2

Pre-assessment

This pre-assessment will use the data that was collected in the Day 1 lesson. The teacher will compile the group data into a single bar graph. Adjusted scale may be necessary. If changes to scale are made, make students aware of changes prior to giving the pre-assessment, Student Resource 4.

Launch

- Read Grace for President by Kelly DiPucchio.
- While reading the story, use modeled thinking to establish character traits for both Grace and Thomas.
- Refer to trait list created in Day 1 lesson and bar graph that was used in pre-assessment, Teacher Resource 2.
- Stop reading the story before Sam reveals who he voted for.

Teacher Facilitation

- Read letter from Grace and Thomas to the students, Teacher Resource 5
- Show prototypes of each campaign poster to the students, Student Resource 5 and 6 and Teacher Resources 6 and 7.
- Explain that the students will be creating posters for one of the candidates, Grace or Thomas, and in order for the election to be fair each poster must be standardized.
- Explain that because both candidates need as many posters as possible in the shortest amount of time. They will be timed on how long it takes for them to assemble one poster.
- Review the directions for poster assembly with the students using Student Resource 7.
- Teacher will assemble bags with necessary pieces needed to complete one poster, Student Resources 8, 9, 10 and 11. Each bag will include: 6 character traits (3 that match Grace and 3 that match Thomas), an American flag, and both candidates names.

Student Application

- Students will work in pairs.
- Distribute one bag of poster materials to each student, Student Resources 8, 9, 10 and 11 (the picture of the candidate will not be included in the bag) and a piece of construction paper 9 x 12.
- Distribute one (1) copy of assembly direction to each pair of students, Student Resource 7.
- Review the instructions for the poster assembly with the students.
- Give the students time to look at the materials in their bags.
- One student will construct the poster as set by the guidelines.
- The other student will time how long it takes for his/her partner to make the poster, and then record the time in seconds.
- Distribute picture of a candidate to one student in each pair and place it face down, (Student Resources 12 and 13.)
- Tell students when to begin. This will aid in time keeping. Allow higher able students to start timing on their own.
- Student will turn picture over and choose appropriate character traits and name from bag for their candidate.
- Student will assemble their poster.
- When the poster is assembled, the partner will note the time in seconds.
- Record times from first group on the board.
- Distribute candidate pictures face down to second member of the group.
- Tell students when to begin. This will aid in time keeping. Allow higher able students to start timing on their own.

- Student will turn picture over and choose appropriate character traits and name for their candidate from the bag.
- Student will assemble their poster.
- When the poster is assembled, the partner will note time in seconds.
- Record times from second round on the board.
- Distribute blank left oriented stem and leaf plots, Student Resource 14
- Students will create a single stem and leaf plot using data collected from time trial.
- Have students label the mode on their stem and leaf plot.
- Collect stem and leaf plot for use in Day 3 lesson.

Embedded Assessment

As students are working on their stem and leaf plots, circulate throughout the room. Observe whether students are correctly plotting their data. Take note of mathematics vocabulary that is being used such as clusters and gaps. Ask students to tell you the mode of the plot. How is it found? What can affect the length of time it takes to produce a campaign poster? (Teacher Resource 8)

Reteaching

Struggling students will work with the teacher in small groups placing data in stem and leaf plots. Data will be provided to the students, (Teacher Resource 9) along with a blank left oriented stem and leaf plot, Student Resource 14. Practice in ordering numbers from smallest to largest and place value may also be necessary for students to fully grasp the key concepts in the lesson.

Extension

Students that demonstrate mastery of the skill will work with partners in order to determine the median of the class data.

Lesson 3

Pre-Assessment

Display stem and leaf plot about Poster Completion Times on the overhead, Teacher Resource 10. Distribute Student Resource 15 and have students answer questions using data that is displayed.

Launch

- Review the task from Day 2 , assembling campaign posters
- Discuss things that went well when making the posters and things that the students found challenging.

- Ask students to brainstorm ways to cut down on the amount of time it takes to create one poster.

Teacher Facilitation

- Read the letters from Grace and Thomas, Teacher Resource 5
- Review the steps needed to create a campaign poster, Student Resource 7
- Discuss with the children the idea of mechanization increasing productivity and the installation of assembly lines into production to increase productivity and to reduce time spent on each poster.
- Place students into groups of four.

Student Application

- Students will work in groups of four in order to assemble campaign posters for Grace or Thomas.
- Provide students time to organize themselves and decide what portion of the poster they will be responsible for.
- One student will work as a time keeper
- Distribute bags of materials, enough for each group to make a total of four completed posters, Student Resource 8, 9, 10, 11, 12, and 13.
- Give students time to set up their assembly lines in the way they feel is best for efficiency.
- Tell students when to begin as this will aid in time keeping. Allow higher able students to start timing on their own.
- Student will assemble their first poster
- When the poster is assembled, the time keeper will note time in seconds
- Teacher will record times from each group on the board
- Repeat the process three more times, recording times after each poster is made.
- Distribute the single stem and leaf plot right, Student Resource 16
- Students will complete stem and leaf plot using time data collected during the assembly line process.
- This stem and leaf plot is be created left to right
- Have children locate and label the mode of the stem and leaf plot
- Return the stem and leaf plot created in Day 2 to the students, Student Resource 14
- Place Day 3 stem and leaf plot on top of Day 2 – the right side of Day 3 stem and leaf plot should be folded over in order for the stems to overlap.
- Slide them together until the stems align, at this point only one stem should be visible.
- Tape the two stem and leaf plots together so that it creates a double stem and leaf plot.

Embedded Assessment

Have children complete the brief constructed response, Student Resource 17, using the double stem and leaf plot created during class. Teacher Resource 11.

Reteaching

Continue working with students on place value and ordering numbers. Students need have mastery with hundreds, tens and ones.

Extension

Students can work in pairs and threes in order to determine the median of the data set for Day 3 data. They can work together to find the range between the two sets of data.

Summative Assessment:

The summative assessment will provide the teacher information regarding the mastery of the skills associated with bar graphs and stem and leaf plots. Student Resource 18 and Teacher 12 should be given after the completion of the three day lesson.

Appendix A: Teacher Resources

Authors:

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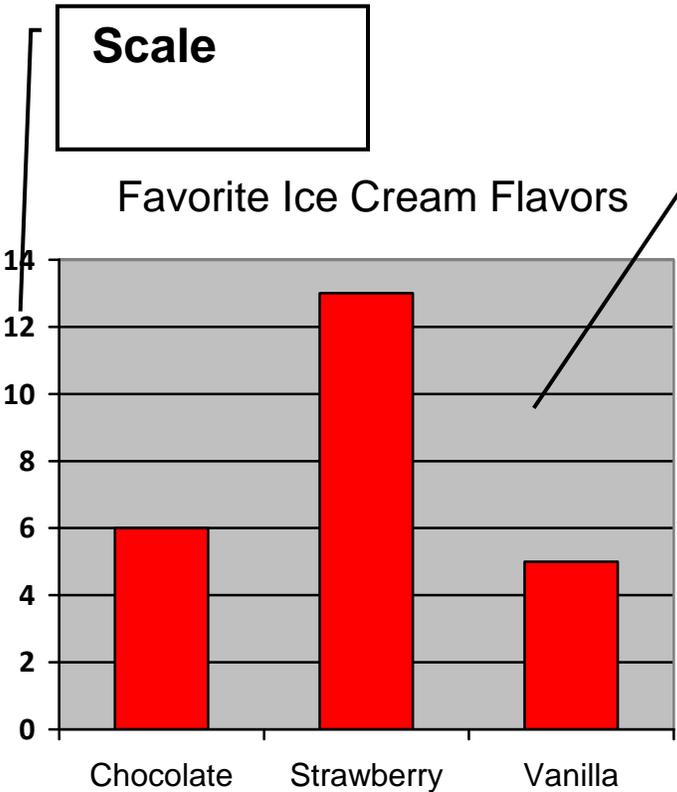
Lisa-helen Rotter
Sherwood Elementary School
Montgomery County Public School

Name: _____ Date: _____

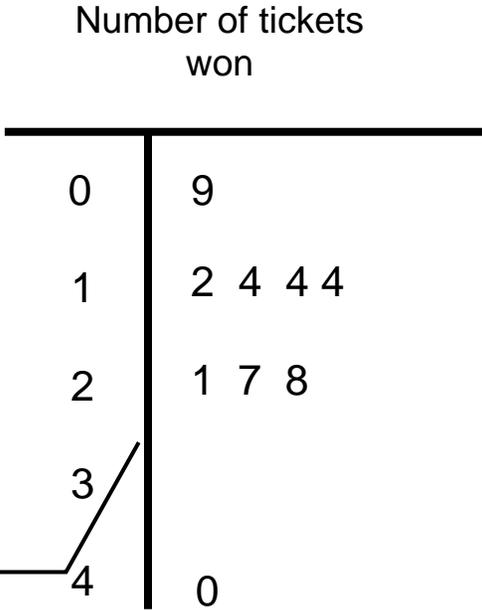
Pre-Assessment

Word Bank:
 stem and leaf plot x axis bar graph scale

Match the four graph terms to the object below.



Bar Graph



X- axis

Stem and Leaf Plot

Key: 0 | 9 = 9 tickets
 9

Grace's Campaign

Use the data from the first page to answer the following questions

1. How many students chose vanilla as their favorite ice cream flavor?

5 students

2. What number sentence would you use to find out how many more students chose strawberry than vanilla?

13 – 5

3. What was the greatest amount of tickets awarded?

40 tickets

Bonus: Find the range of data in the stem and leaf plot.

40- 9 = 31

Common Character Traits

adventurous	disagreeable	messy
active	energetic	mischievous
ambitious	entertaining	neat
artistic	exciting	nosy
athletic	fair	patriotic
awesome	friendly	persistent
bold	fun-loving	proud
bossy	funny	quiet
brave	generous	respectful
carefree	gentle	selfish
caring	gullible	serious
cheerful	honest	shy
conceited	humble	sloppy
confident	humorous	stubborn
considerate	imaginative	studious
cooperative	independent	straight - forward
courageous	intelligent	thoughtful
creative	inventive	timid
curious	lazy	trustworthy
dangerous	leader	unselfish
daring	loveable	warm
demanding	loyal	witty

Roles for Group Activity

Scribe: Construct the bar graph.

Facilitator: Make sure everyone is on task and refer to the check off list. Check off the list when your group is completed.

Speaker: Share data with the class.

Resources: Collect and organize materials.

If your bar graph could talk what would it say?

Be sure to include:

- What is the purpose of the graph?
- What information does your graph show?
- What conclusions can you draw based on the data shown on the graph?

Results will vary depending on group data:

The purpose of the bar graph is that it shows the most important characteristics of a good leader. _____ was the mode/most with _____ votes. _____ had _____ votes. _____ had _____ votes too. The characteristic with the least amount of votes was _____. _____ had _____ more votes than _____. _____ was the most important characteristic of a leader for our group.

Dear Students,

Hi! My name is Grace and I am running for class president at Woodrow Wilson Elementary. I need your help in making campaign posters to represent who I am. These campaign posters must have a title, a picture of me, a picture of the American Flag, and three of my best character traits. There is only one problem. I need to have these campaign posters put up today. I am leaving it up to you to figure out the best way to make a lot of posters in the least amount of time. I am depending on you to help me.

Sincerely,

Grace Campbell

Dear Students,

Hi! My name is Thomas and I am running for class president at Woodrow Wilson Elementary. I need your help in making campaign posters to represent who I am. These campaign posters must have a title, a picture of me, a picture of the American Flag, and three of my best character traits. There is only one problem. I need to have these campaign posters put up today. I am leaving it up to you to figure out the best way to make a lot of posters in the least amount of time. I am depending on you to help me.

Sincerely,

Thomas Cobb

Grace Campbell for President

Artistic



Fair

Considerate



Thomas Cobb for President

Studious



Energetic

Conceited



Higher Level Questions to Ask

- Compare. What makes them similar? Is that the only way they are similar?
- Contrast. How are they different?
- Write a number sentence to contrast two sets of data. How many more does _____ have than _____?
- Order the choices from least to greatest.
- Determine the mode. Explain why it is selected the most?
- Decide why _____ was selected the least. Explain why you think that happened.
- Determine the median.
- Determine the range.
- What if another group had the same set of data as you, what does that mean to the class?
- What if we combined two sets of data? How would our results change? Would we have a new mode?
- What do you anticipate other group’s data will look like?
- Convince the class on why _____ is the most important character trait using your data.

Blooms Taxonomy verbs for high level questioning

Analysis		Synthesis		Evaluation	
analyze	arrange	combine	create	assess	convince
classify	breakdown	compose	formulate	compare	conclude
infer	compare	anticipate	generalize	criticize	decide
correlate	outline	integrate	substitute	explain	defend
connect	contrast	modify	rearrange	discriminate	grade
divide	explain	compile	invent	persuade	measure
discriminate	select	design	negotiate	judge	justify
focus	point out	plan	speculate	rank	summarize
separate	order	express	reorganize	reframe	support

**Intervention Data
for Stem and Leaf Plot**

The following data shows the time it takes for students in Mrs. Barrington's class to get to school. Some students in her class are bus riders, car riders, and walkers.

Student name	Time (minutes)
Grace	15
Anthony	8
Rose	16
Robbie	16
Thomas	10
Fletcher	21
Hannah	15
Henry	5
Clara	18
Sam	15
Max	7
LaShawn	24
Amanda	16
Tiffany	6
Doug	16

Name _____

Date _____

Brief Constructed Response

Using the double stem and leaf plot that you created in class answer the following questions.

Step A

What was the mode for single poster production? Answers will vary

What was the mode for assembly line poster production? Answers will vary

Step B

Use what you know about stem and leaf plots to explain which way is faster.

Acceptable answers:

- The mode was faster when the poster was assembled using an assembly line
- When comparing the two graphs the data is clustered at around shorter times when the poster was created by an assembly line
- It takes longer to make a poster by yourself ... my time was XX seconds which is higher than the mode but when my group made a poster our time was less time than the mode.

Name: _____ Date: _____

Summative Assessment: Answer Sheet

1. Use the chart paper to create a stem and leaf plot of the various electoral votes for the east coast.

Be sure to include: the title and the data in the correct place

Electoral Votes

State	Number of votes
Connecticut	7
Delaware	3
DC	3
Florida	27
Georgia	15
Maine	4
Maryland	10
Massachusetts	12
New Hampshire	4
New Jersey	15
New York	31
North Carolina	15
Pennsylvania	21
Rhode Island	4
South Carolina	8
Virginia	13

2. What is the median?

Answer: 11

3. What number sentence would you use to find the range?

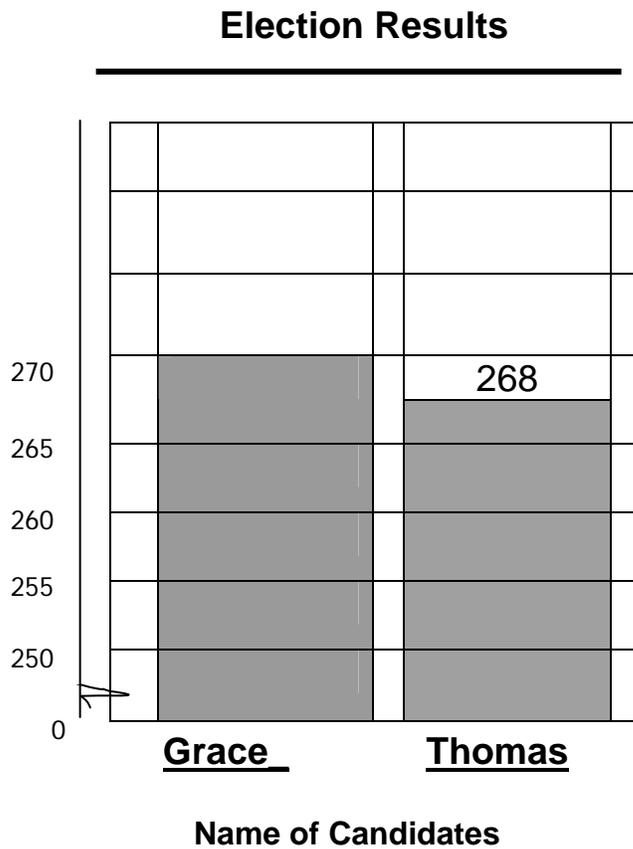
Answer: $31 - 8 = \text{range}$

Brief Constructed Response

Step A: Use data to complete the bar graph.
 Make sure that all the parts of the bar graph are included.

Election Results

Name of candidate	Number of votes
Grace	270
Thomas	268



Step B: Using what you learned about bar graphs use evidence to show who won the election. Use words and/or numbers in your explanation.

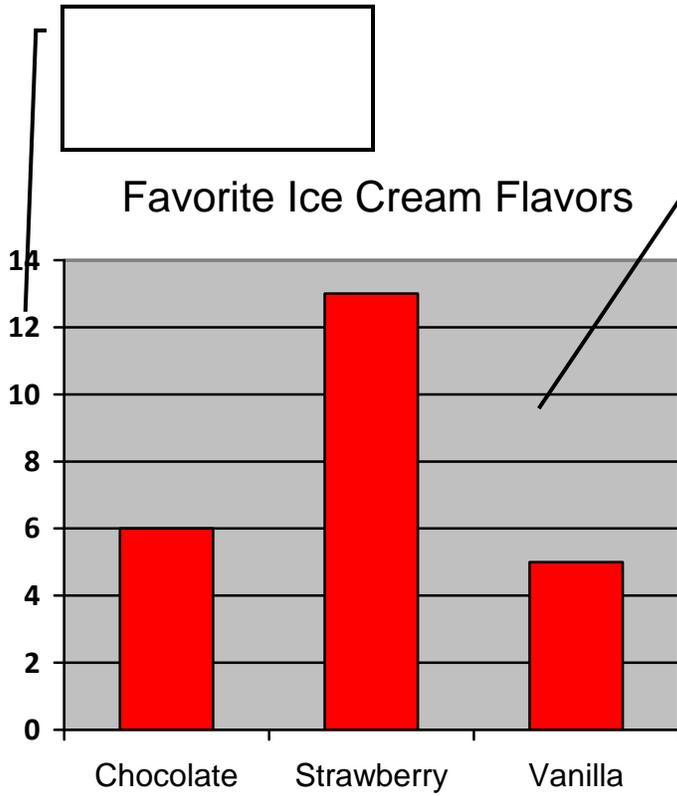
By looking at the bar graph Grace received 270 votes and Thomas got 268 votes. I know this by the scale counting by 5. Grace has 2 more votes than Thomas. $270 - 268 = 2$. Therefore, Grace won the election.

Name: _____ Date: _____

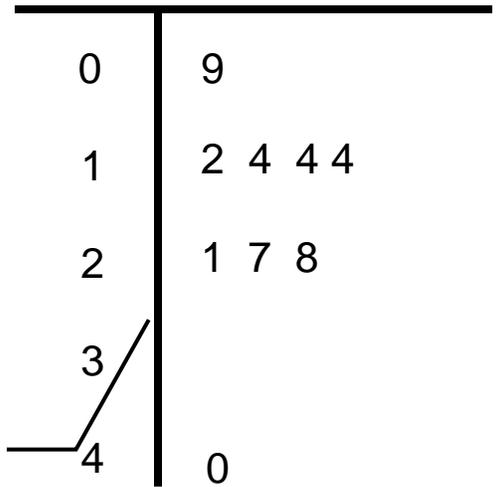
Pre-Assessment

Word Bank:
 stem and leaf plot x axis bar graph scale

Match the four graph terms to the object below.



Number of tickets won



Flavors

Key: 0 | 9 = 9 tickets

Use the data from the first page to answer the following questions

1. How many students chose vanilla as their favorite ice cream flavor?

- 4 students
- 5 students
- 6 students

2. What number sentence would you use to find out how many more students chose strawberry than vanilla?

- $13 - 5$
- $12 - 6$
- $12 + 6$

3. What was the greatest amount of tickets awarded?

- 44 tickets
- 28 tickets
- 40 tickets

Bonus: Find the range of data in the stem and leaf plot.

Group members:

Group roles:

Scribe: Construct the bar graph.

Facilitator: Make sure everyone is on task and refer to the check off list. Check off the list when your group is completed.

Speaker: Share data with the class.

Resources: Collect and organize materials.



Make sure you have included:

- A title
- Labeled x and y axis
- Scale starting at zero
- Data placed correctly
- Labeled data sets

Name: _____ Date: _____

Use the bar graph we created yesterday to answer the following questions in a complete sentence

1. What is the purpose of the graph? _____

2. Which character trait was selected the most? _____

3. Order the character traits from the least amount of votes to the greatest amount the votes.

least

greatest

Grace Campbell for President

Character
Trait



Character

Character Trait



Thomas Cobb for President

Character Trait



Character
Trait

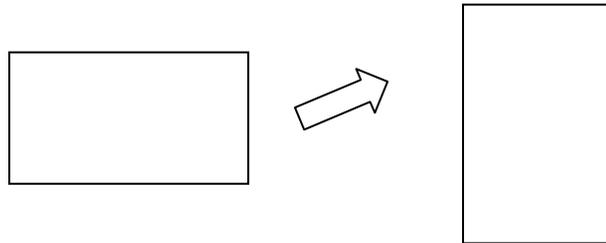
Character Trait



Campaign Poster Assembly Instructions

- Materials:
- construction Paper
 - glue
 - picture of candidate
 - bag with title, character traits, and flag

Step 1: Grab a sheet of construction paper. Turn it to portrait.



Step 2: Glue the title at the top center of the poster

Grace Campbell for President

Thomas Cobb for President

Step 3: Glue the picture of the candidate in the center of the poster with the head facing correctly



Step 4: Go through the six different character traits and choose three that BEST fit your candidate.

Creative **Studious** **Fair** *Considerate* **Energetic** *conceited*

Step 5: Glue the three character traits on the poster anywhere so they are seen.



Step 6: Glue American flag at the bottom right corner.

Studious

Creative

Fair

conceited

Energetic

Considerate



Grace Campbell
for President

Grace Campbell
for President

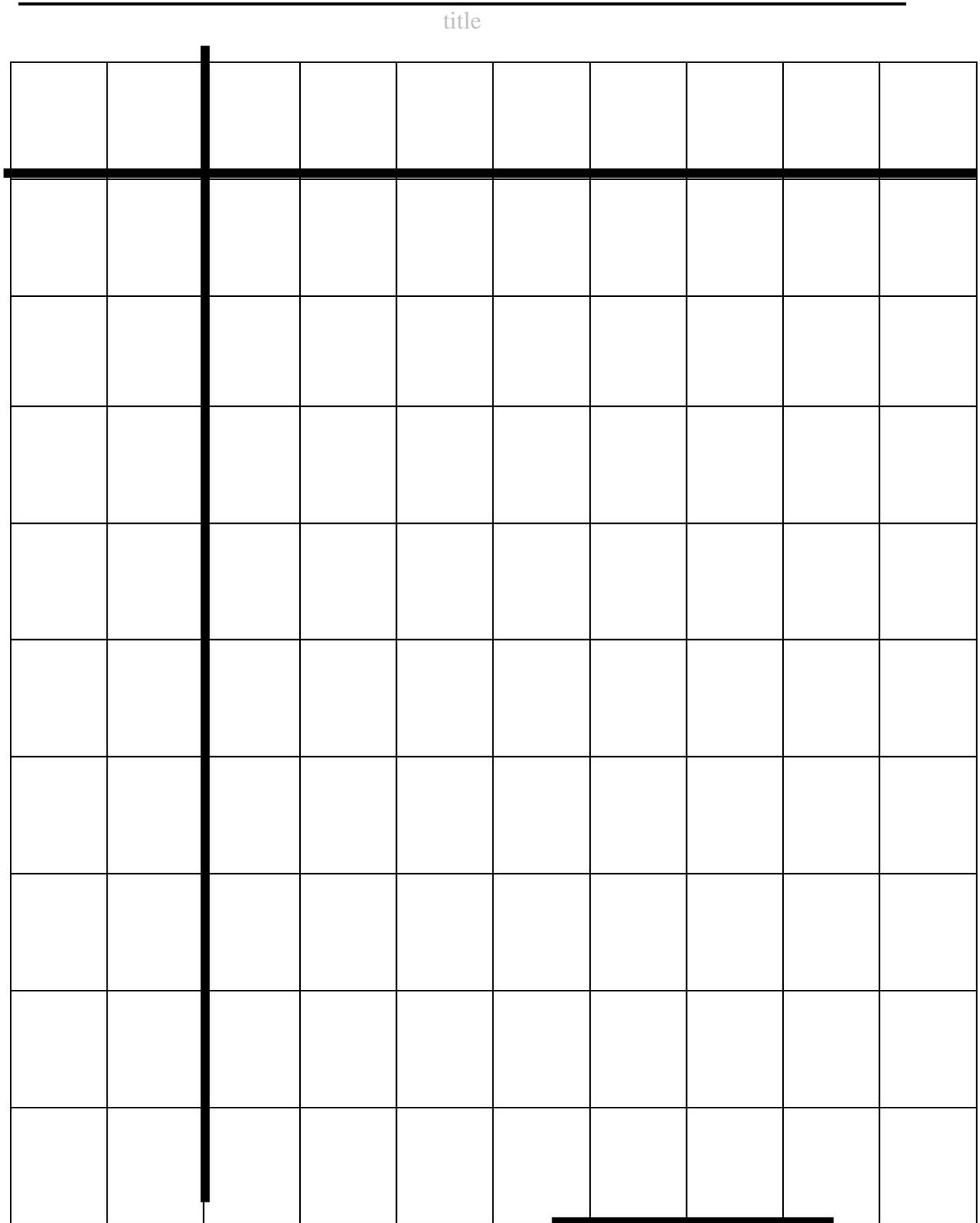
Thomas Cobb
for President

Thomas Cobb
for President





Stem and Leaf Plot



Key:

Name _____ Date _____

Directions: Using the stem and leaf plot that is displayed answer the following questions.

1. What is the title of the stem and leaf plot?

2. What is the shortest amount of time it took to assemble a campaign poster? _____

3. What is the longest amount of time it took to assemble the campaign poster? _____

4. What is the mode of the data? _____

5. How long did it take you to assemble the campaign poster?

6. Is your time above or below the mode?



Name _____

Date _____

Brief Constructed Response

Using the double stem and leaf plot that you created in class answer the following questions.

Step A

What was the mode for single poster production? _____

What was the mode for assembly line poster production?

Step B

Use what you know about stem and leaf plots to explain which way is faster.

Name: _____ Date: _____

Summative Assessment

1. Use the chart paper to create a stem and leaf plot of the various electoral votes for the east coast.

Be sure to include: the title and the data in the correct place

Electoral Votes

State	Number of votes
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New Jersey	15
New York	31
North Carolina	15
Pennsylvania	21
Rhode Island	4
South Carolina	8
Virginia	13

2. What is the median?

- 10
 11
 12

3. What number sentence would you use to find the range?

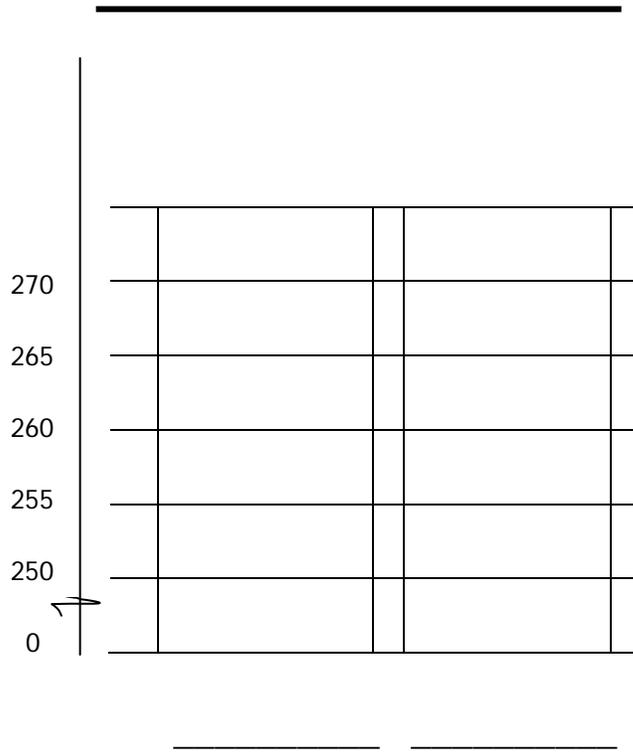
- $31 - 8 =$
 $31 + 3 =$
 $31 - 3 =$

Brief Constructed Response

Step A: Use data to complete the bar graph.
Make sure that all the parts of the bar graph are included.

Election Results

Name of candidate	Number of votes
Grace	270
Thomas	268



Name of Candidates

Step B: Using what you learned about bar graphs use evidence to show who won the election. Use words and/or numbers in your explanation.
