BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set E3 Measurement & Data: Line Plots

Includes

Skills & Concepts

- ★ Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch
- ★ Show data by making a line plot where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters
- ★ Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes)
- ★ Estimate lengths using units of inches, feet, centimeters, and meters

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Bridges in Mathematics Grade 5 Supplement
Set E3 Measurement & Data: Line Plots

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Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set E3 ★ Activity 1

ACTIVITY

Creating & Measuring the Beanstalk

Overview

After listening to the story *Jim and the Beanstalk,* by Raymond Briggs, students will create a paper beanstalk with a partner and measure its parts in both inches and centimeters. In the second half of the session, students will use the measurements to create a line plot and answer questions about their data.

Skills & Concepts

★ Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch (CCSS 3.MD.4)

★ Show data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters (CCSS 3.MD.4)

★ Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes (CCSS 2.MD.1)

★ Estimate lengths using units of inches, feet, centimeters, and meters (CCSS 2.MD.3)

You'll need

★ *Jim and the Beanstalk,* by Raymond Briggs (optional, see Advanced Preparation)

★ 30" × 6" strips of white butcher paper, half class set, plus 2 extra (see Advanced Preparation)

★ Creating and Measuring the Beanstalk (page E3.4, run 1 copy for display)

★ Measuring tapes with inches and centimeters, half class set

★ green and red crayons, class set

★ green and red markers, class set

★ Word Resource Cards (inch and centimeter) optional

Advance Preparation

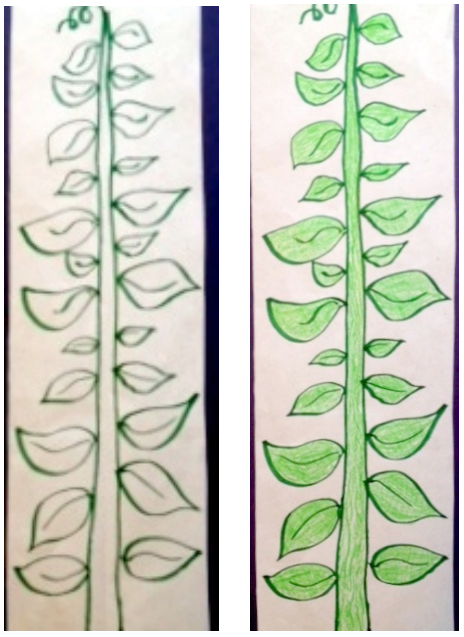
Locate a copy of the story, *Jim and the Beanstalk,* by Raymond Briggs in your school or local library. This engaging story is about a clever boy named Jim who measures his way out of a number of problems with a giant.

For the beanstalk: Prepare your own example of a beanstalk following these steps:

★ Take a strip of 30" × 6" white butcher paper (it can be longer or shorter) and draw a thick "stalk" down the center of the paper (lengthwise) using a green marker. Make it wider at the bottom and thinner at the top. End with a spiraling vine at the top if you wish.

★ Draw some large and small green leaves along both sides of the stalk up and down the length of the paper with the green marker. You should have at least 20 or more leaves. Add veins if you wish.

★ Color in your whole beanstalk with the green crayon.



Activity 1 Creating & Measuring the Beanstalk (cont.)

Instructions for Creating the Beanstalk (can be done during a different part of the day)

1. Have the materials for one beanstalk handy along with the sample beanstalk you made. Post the direction page, Creating and Measuring the Beanstalk.

Remind students that we have been estimating, measuring and comparing lengths of objects around the classroom using both inches and centimeters during workplaces. In Unit 1, Workplace 1E students used inches, and then in Unit 2, Workplace 2C, students used centimeters. Display the inch and centimeter Word Resource Cards for reference if you have them.

2. Read the story, *Jim and the Beanstalk,* by Raymond Briggs, about a very clever boy named Jim who woke up early one morning to find a giant beanstalk growing outside his window. Climbing to the top of the beanstalk, he found a castle and an old giant in need of some help with problems only Jim could solve. Discuss the story briefly.

> ***Teacher*** *How long do you think the giant's glasses turned out to be? The wig? Teeth? I wonder how tall the beanstalk was that Jim had to climb?*
>
> ***Students*** *He really didn't get a chance to measure it!*
>
> ***Teacher*** *No, he really didn't. So I think we should do it for him!*

3. Let students know that today they will be creating their own beanstalk with a partner. Once they are done, they will measure the beanstalks in both inches and centimeters. Finally, they will create line plots to display all the data they collected.

Show a sample of the beanstalk you made and have students briefly pair-share things they notice.

> ***Students*** *I see a long green stem and lots of leaves. I think you used crayon.*
> *The leaves are all different lengths.*
> *I think I counted twenty leaves, but I'm not sure.*

4. Using the sample materials, demonstrate drawing a beanstalk using the Advance Preparation procedures, and refer to Creating and Measuring the Beanstalk as needed.

5. Call on a few students to explain the task, including putting their names in the bottom corner of the paper. Have students get their markers, crayons and pencils out, while you pass out paper strips to each pair of students.

Note *Some students might find it easier to draw the stalk down the middle of the paper if it is folded in half lengthwise first.*

Instructions for Measuring the Beanstalk

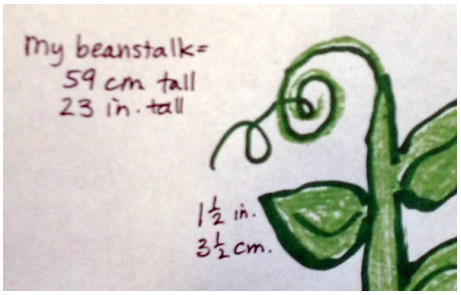
6. Once the beanstalks are complete, post your completed beanstalk on an easel or chart stand and have a measuring tape handy.

Activity 1 Creating & Measuring the Beanstalk (cont.)

7. *How tall is your beanstalk?* Have students think-pair-share their estimates. Lead a brief discussion about how tall in inches and how tall in centimeters and why their estimates in centimeters would be greater. Review how to use a measuring tape, including where a half-inch or half-centimeter might be.

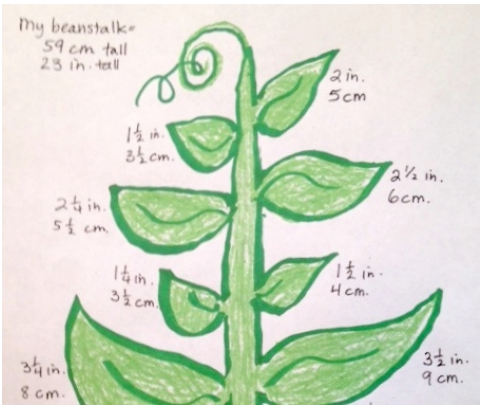
8. Have a student help you use the measuring tape to measure the length of the beanstalk from the top to the bottom in both inches and centimeters. Then show students how to record these lengths using abbreviations (in. for inches, and cm. for centimeters) at the top of the strip of paper.

9. Have students decide which leaf is the longest and then estimate its length. Have a student help you measure the length of the leaf from tip to stem. Review that one end of the leaf aligns with the "0" end of the tape. Measure the leaf in both inches and centimeters and record both the data next to the leaf as shown below.



Continue measuring a few more leaves in this way until you think they have the idea.

10. Remind students to estimate, measure and record the length of the stalk, and every leaf in both inches and centimeters with their partner as you demonstrated.



Note *Collect and save the beanstalks for Activity 2, Recording the Beanstalk Data.*

NAME _____ **DATE** _____

Creating & Measuring the Beanstalk

To Create your Beanstalk

You will need

- 1 strip of white paper
- green and red crayons and markers

Directions

- Use a green marker, draw a long green beanstalk in the middle and along the length of the paper strip.
  - » Make it thinner at the top of the stem and thicker at the bottom.
  - » Add a curling vine at the top if you like.
- Draw large and small leaves along both sides of the stalk with your green marker. Add veins to the leaves if you like.
- Color in your beanstalk with a green crayon.
- Write your name and your partner's in the bottom corner.

To Measure your Beanstalk

You will need

- a measuring tape

1 Estimate first, then measure!

2 Use the measuring tape to measure (to the closest half inch or closest centimeter). Measure the whole beanstalk and each leaf from tip to stem.

3 Record the lengths on your paper next to the items.

CHALLENGE

4 Measure to the closest $\frac{1}{4}$ inch and closest $\frac{1}{2}$ centimeter.

Set E3 ★ Activity 2

ACTIVITY

Recording the Beanstalk Data

Overview

Using the beanstalks students created in Activity 1, students record their measurements to interpret questions about the data. During the second half of the lesson students record data to create a classroom line plot.

Skills & Concepts

- ★ Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch (CCSS 3.MD.4)
- ★ Show data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers and halves (CCSS 3.MD.4)
- ★ Estimate lengths using units of inches, feet, centimeters, and meters (CCSS 2.MD.3)

You'll need

- ★ Recording the Beanstalk Data Record Sheet (page E3.9 run a class set, plus 1 for display)
- ★ Student beanstalks from Set E3 Activity 1
- ★ Measuring tapes showing both inches and centimeters, half class set
- ★ red markers
- ★ sticky notes
- ★ Word Resource Cards (inch and centimeter), optional
- ★ Picture book, *Jim and the Beanstalk*, by Raymond Briggs (optional, see Advanced Preparation)

Advance Preparation Finish measuring and recording the lengths of the leaves on your sample beanstalk in both inches and centimeters. Have a measuring tape, red marker and sticky note and a copy of the Record the Beanstalk Data record sheet handy.
Locate a copy of the story, *Jim and the Beanstalk*, by Raymond Briggs in your school or local library.

Recording the Beanstalk Data

1. Display the beanstalk you made with all the leaves measured and recorded. Have a red marker, measuring tape, and a copy of the Recording the Beanstalk Data Record Sheet nearby.

Lead a brief discussion on the various measurements students recorded on their beanstalks. Were all the leaves the same length? How many leaves did they draw?

> ***Teacher*** *So now that we have all finished measuring the leaves and stems of our beanstalks, I am wondering what you notice about all different lengths on my beanstalk?*

2. Display the Recording the Beanstalk Data Record Sheet. Have students help you record the answers to the questions. Work quickly through the questions about your beanstalk, to allow more time for students to complete their own record sheet.

> ***Teacher*** *The first question is "How tall is your beanstalk?" So how tall did my beanstalk turn out to be?*
>
> ***Student*** *Your beanstalk says it is 23 inches tall and 59 centimeters tall.*

Activity 2 Recording the Beanstalk Data (cont.)

Teacher *Great! So let's record that on the worksheet.*

Set A12 Number & Operat ons: D viding Fractions & Whole Numbers Blackline Run a c ass set plus 1 copy for display

NAME _____ DATE _____

Recording the Beanstalk Data Record Sheet

Use your beanstalk measurements to answer the questions below.

1 My beanstalk is 23 inches and 59 centimeters tall.

2 How many leaves are on your beanstalk? _____

3 The longest leaf is _____ inches and _____centimeters long.

4 The widest leaf is _____ inches and _____centimeters wide.

5 Put a red dot on the smallest leaf on your beanstalk. How far is the red dot from the top your beanstalk?

My smallest leaf is _____ inches and _____centimeters from the top of the beanstalk.

6 Draw a red "X" somewhere along the beanstalk to show Jim climbing up the beanstalk. How far is the X from the bottom of the beanstalk?

My X is _____ inches and _____centimeters from the bottom.

7 What else do you notice?

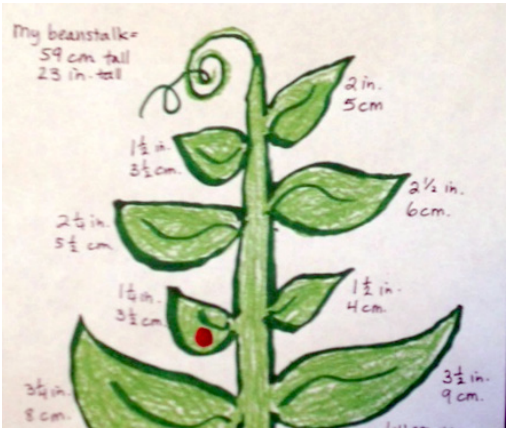
Teacher *The next question is "How many leaves are on your beanstalk?*

Student *We counted 24 on yours, but we only had 22 on ours.*

Teacher *So I'm going to write 24 on my worksheet, but you would write 22.*

3. Continue in similar fashion, to demonstrate using the measurements written on your beanstalk to complete questions 3 and 4. Highlight the fractional units when appropriate.

4. Then read question 5: "Make a red dot on the smallest leaf on your beanstalk. How far is that leaf from the top of your beanstalk?" Ask students to help you find the smallest leaf on your beanstalk. Demonstrate drawing a penny-size dot using a red marker on that leaf. Have a volunteer come up to help you measure the distance from the smallest leaf to the top of the beanstalk, and record both the inches and centimeters measurements on the record sheet. Invite students to consider why the centimeter measures are always more.

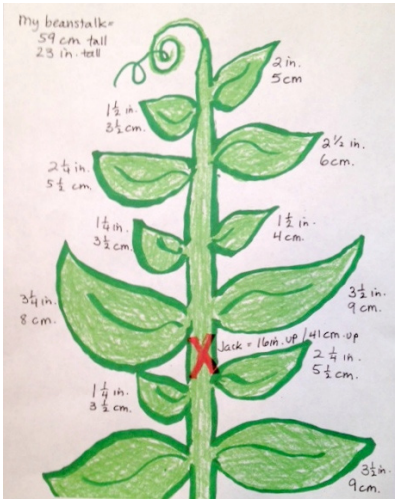


Activity 2 Recording the Beanstalk Data (cont.)

5. Remind students how Jim had to climb up and down the beanstalk three times to help the Giant with his problems.

> ***Teacher*** *Question 6 says: "Draw a red 'X' somewhere along the beanstalk to show Jim climbing up the beanstalk?" If Jim were climbing my beanstalk today, where do you suggest I put my X?*

Take a few suggestions, and then draw an X with the red marker somewhere along the stem of the beanstalk. Emphasize that when students draw an X on their beanstalks, it can be anywhere, not necessarily where you placed yours. The goal is to show a variety of different measurements.



> ***Teacher*** *Question 6 asks "How far is the X from the bottom of the beanstalk?" Think first and estimate how far you think my X is from the bottom.*

Have another volunteer help you measure the distance from the bottom of the beanstalk to the red X with the measuring tape. Record both inches and centimeters on the record sheet taking an opportunity to visit about fractional units when possible.

6. Record the number of inches from bottom to the X on the back (sticky side) of a sticky note with a pencil, and draw a large "X" on the front of the sticky note with the red marker. Ask students to do the same thing on the sticky note you will give them. Explain that you will use these for a special whole class measurement project, so they should stick the note on their beanstalk near the X for safe keeping.

7. Then send students off to work with their partner and complete the recording sheet.

8. While students are working together, draw a horizontal scale of a line plot on the white board. Number it from 0 to 30 inches and include half-inch measurements in between whole inch units. Note only a portion of the line plot is shown in the visual below.

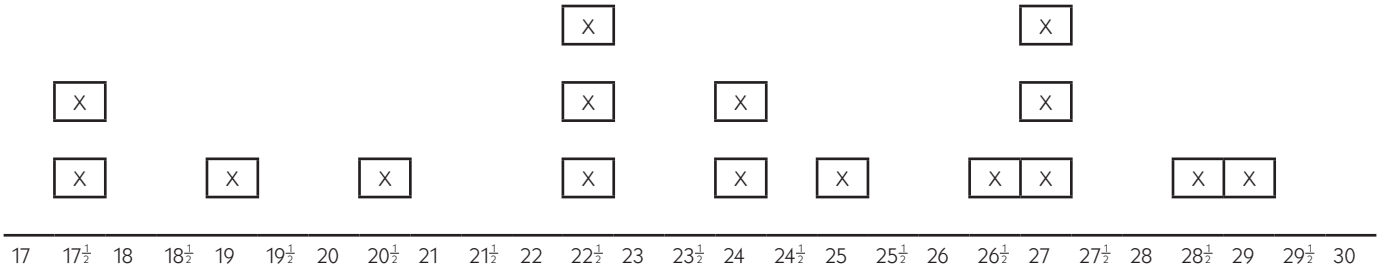
17 17½ 18 18½ 19 19½ 20 20½ 21 21½ 22 22½ 23 23½ 24 24½ 25 25½ 26 26½ 27 27½ 28 28½ 29 29½ 30

Activity 2 Recording the Beanstalk Data (cont.)

9. Once most of your students have completed all six questions on their record sheets ask students to think-pair-share what they notice about the illustration on the board. Call on several students to share their observations.

> ***Students*** *I see a long line of numbers. They must be inches! You used half inches too. I think those have to do with our beanstalks. It looks like some kind of graph we did in second grade. I think it's called a line plot!*
>
> ***Teacher*** *Some of you may have seen this kind of graph in second grade. And yes, mathematicians do call this a line plot. It is one way to keep track of data, and in this case we are going to keep track of all the different measurements showing how far Jim climbed up our beanstalks.*

Demonstrate placing your sticky note above the proper interval on the line plot and then call on a few pairs to place the X notes on the line plot. Finally, call the rest of the student pairs up, until all the data is displayed. A portion of the line plot is shown below.



10. Ask students to pair-share at least three observations they can make about the line plot data. Then lead a brief discussion. Include questions such as:

- What do the X's stand for? (Each X represents one measurement showing where Jim was on the beanstalk)
- What should we title our line plot?
- How should we label the horizontal axis? (Measurements in inches)
- Which measurement did we have the least of? (not counting zero)
- How many students had that measurement?
- Which measurement did we have the most of? How many students had that measurement?
- How many more students had this measurement than those who had the least measurement? How did you figure that out? How does the line plot help?

Note *Collect and save the beanstalks for Activity 3, Beanstalk Leaf Line Plots.*

INDEPENDENT WORKSHEET

Use Set E3 Independent Worksheet 1 on page E3.17 to provide students additional practice with line plots.

NAME _____ **DATE** _____

Recording the Beanstalk Data Record Sheet

Use your beanstalk measurements to answer the questions below.

1 My beanstalk is _____ inches or _____centimeters tall.

2 How many leaves are on your beanstalk? _____

3 The longest leaf is _____ inches or _____centimeters long.

4 The widest leaf is _____ inches or _____centimeters wide.

5 Put a red dot on the smallest leaf on your beanstalk. How far is the red dot from the top your beanstalk?

My smallest leaf is _____ inches or _____centimeters from the top of the beanstalk.

6 Draw a red "X" somewhere along the beanstalk to show Jim climbing up the beanstalk. How far is the X from the bottom of the beanstalk?

My X is _____ inches or _____centimeters from the bottom.

7 What else do you notice?

Set E3 ★ Activity 3

ACTIVITY

Beanstalk Leaf Line Plots

Overview

Using their Beanstalks created in Activity 1, students create 2 line plots independently, one with inch measurement and the second line plot with centimeter units. Then, they compare the data on both line plots.

Skills & Concepts

★ Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. (CCSS 3.MD.4)

★ Show data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (CCSS 3.MD.4)

You'll need

★ Inches Line Plot (page E3.14 run a class set plus 1 for display)

★ Centimeter Line Plot (page E3.15 run a class set plus 1 for display)

★ Beanstalk Leaves Record Sheet (page E3.16 run a class set plus 1 for display)

★ Student beanstalks from Set E3 Activity 1

★ Measuring tapes showing both inches and centimeters, half class set

★ red markers

Instructions for Beanstalk Leaves Line Plots

1. Lead a brief discussion about the leaves on your beanstalk.

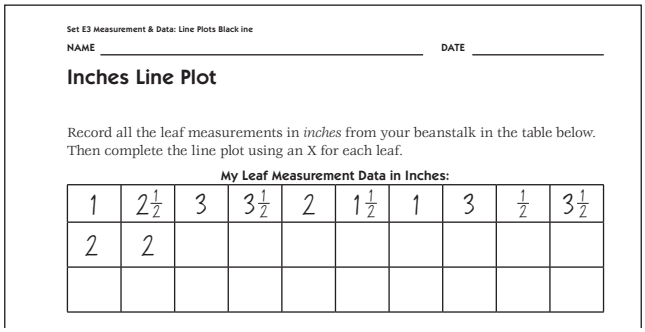
> ***Teacher*** *Now that we have collected data about our beanstalks and made a line plot of how far up Jim climbed our beanstalks, I am wondering about the leaves on our beanstalks and if we can learn something about all the different leaves you drew. What do you notice about my leaves?*
>
> ***Students*** *Some are longer than others. Some are about 3 inches. But some are smaller than that, at least on mine they were.*
>
> ***Teacher*** *I wonder how many of my leaves were close to 3 inches and how many were smaller or larger than that?*
>
> ***Students*** *We could count them. We could make a list. Oh, then we could make another line plot?*
>
> ***Teacher*** *Those are all good suggestions. A line plot is an excellent way to keep track of the different length measurements.*

2. Display a copy of the Inches Line Plot master. Have students comment on what they notice about it, and then complete enough of the worksheet together so they get the idea.

> ***Students*** *It has a little table with 30 spaces at the top of the sheet. At the bottom there is another line plot. It looks like inches and half inches on the line plot.*
>
> ***Teacher*** *You are very observant. There are enough spaces for you to record up to 30 lengths of your leaves. If you have more than 30, don't worry about those. The intervals on the horizontal axis of the line plot are both whole and half inches to represent all the possible lengths of leaves you used in your own beanstalk. We are only going to use our inch measurements on this worksheet for now.*

Activity 3 Beanstalk Leaf Line Plots (cont.)

3. Begin by recording all the inch measurements of your leaves in the data table. Be sure to record all the lengths even if they repeat and have students help you keep track of ones you have already recorded from your beanstalk, by making a checkmark by the leaves or some other system you all agree on.



Set E3 Measurement & Data: Line Plots Black ine

NAME _____ DATE _____

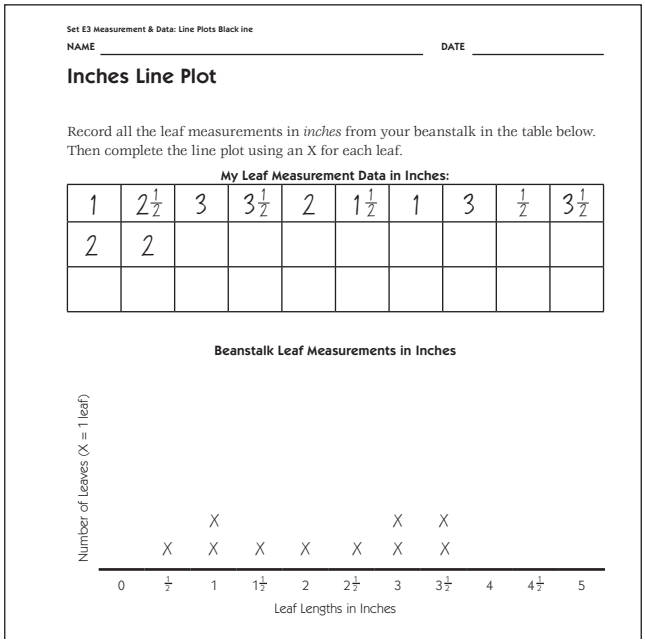
Inches Line Plot

Record all the leaf measurements in *inches* from your beanstalk in the table below. Then complete the line plot using an X for each leaf.

My Leaf Measurement Data in Inches:

1	$2\frac{1}{2}$	3	$3\frac{1}{2}$	2	$1\frac{1}{2}$	1	3	$\frac{1}{2}$	$3\frac{1}{2}$
2	2								

4. Place an X on the line plot representing the various lengths. Have volunteers help you decide where to place each X, and cross off the measurements you have used from the table as you go to help keep track. Do just enough for students to get the idea.



Set E3 Measurement & Data: Line Plots Black ine

NAME _____ DATE _____

Inches Line Plot

Record all the leaf measurements in *inches* from your beanstalk in the table below. Then complete the line plot using an X for each leaf.

My Leaf Measurement Data in Inches:

1	$2\frac{1}{2}$	3	$3\frac{1}{2}$	2	$1\frac{1}{2}$	1	3	$\frac{1}{2}$	$3\frac{1}{2}$
2	2								

Beanstalk Leaf Measurements in Inches

Number of Leaves (X = 1 leaf)

0 $\frac{1}{2}$ 1 $1\frac{1}{2}$ 2 $2\frac{1}{2}$ 3 $3\frac{1}{2}$ 4 $4\frac{1}{2}$ 5

Leaf Lengths in Inches

5. Students also complete a leaf line plot using their centimeter data on the Centimeter Line Plot worksheet. Display and refer to this worksheet as needed. On the Beanstalk Leaves Record Sheet they will answer questions about their line plots.

6. Review the directions and send students to their seats to get their beanstalks and pencils, while you pass out the worksheets.

Activity 3 Beanstalk Leaf Line Plots (cont.)

Extensions

- Create a large classroom bulletin board line plot display using all the data from the students' measurements of Jim climbing the beanstalks. Discuss what the line plot reveals about their data. Display the beanstalks as well.
- Have students add up all the different lengths of their leaves on their beanstalks to find the total length in both inches and centimeters. They may record this on their beanstalks if they wish.
- Invite students to create a T-chart to determine the relationship between their centimeter and inch units.

INDEPENDENT WORKSHEET

Use Set E3 Independent Worksheet 2 on page E3.18 to provide students additional practice with line plots.

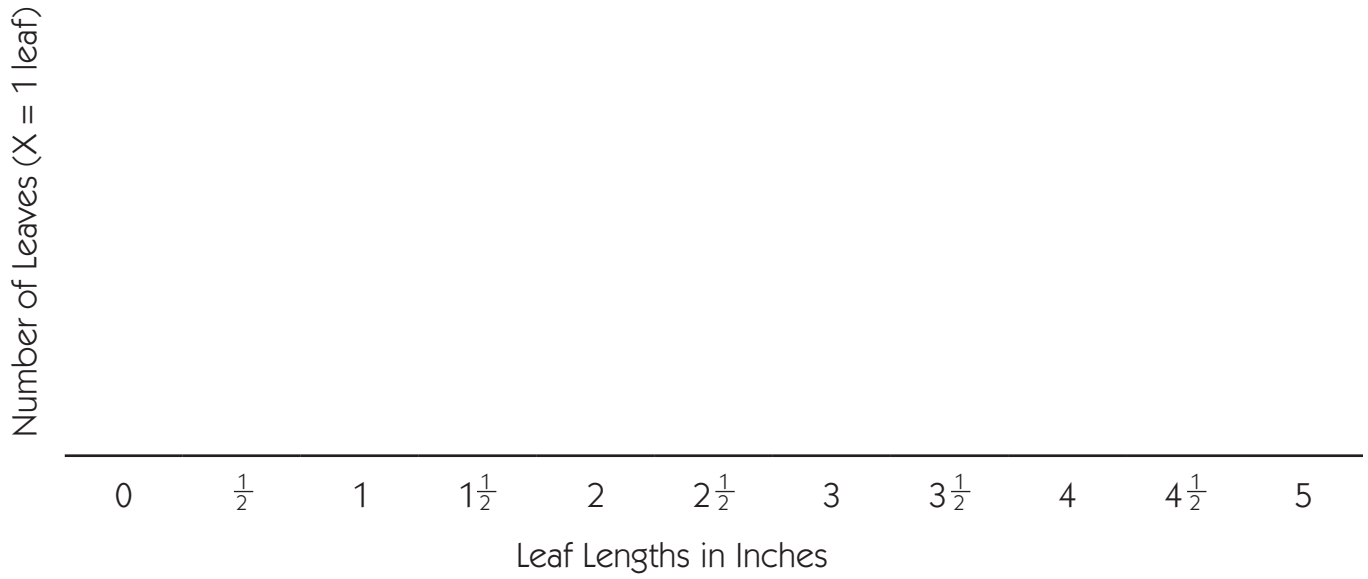
NAME _____ **DATE** _____

Inches Line Plot

Record all the leaf measurements in *inches* from your beanstalk in the table below. Then complete the line plot using an X for each leaf.

My Leaf Measurement Data in Inches:

Beanstalk Leaf Measurements in Inches



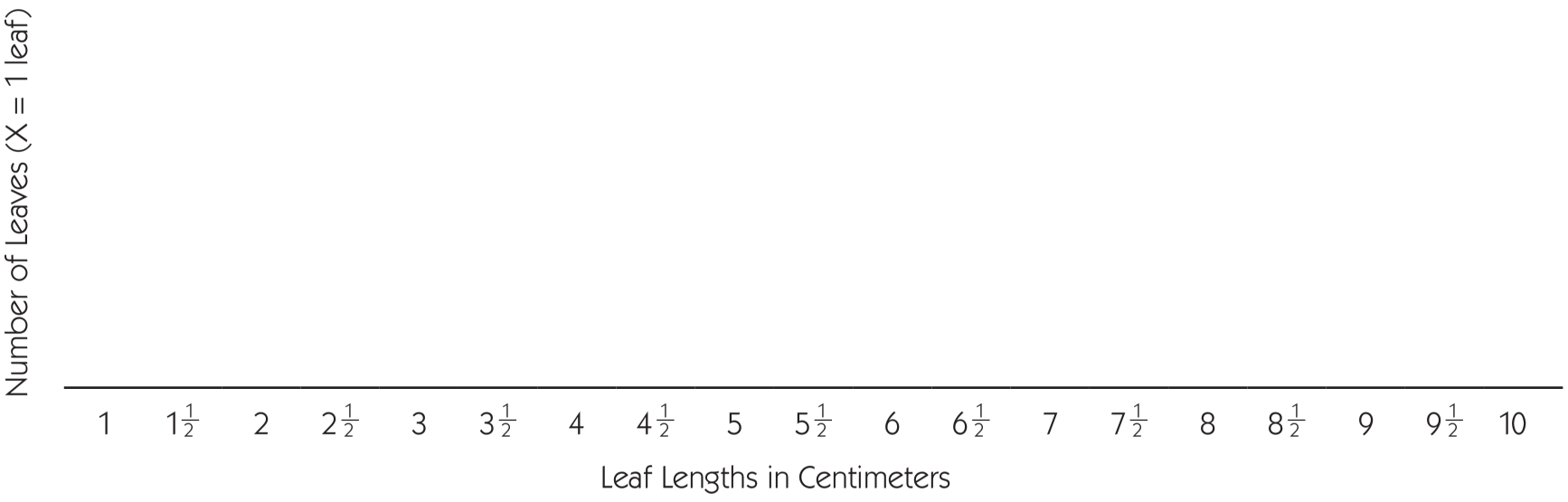
NAME _____ DATE _____

Centimeters Line Plot

Record all the leaf measurements in *centimeters* from your beanstalk in the table below. Then complete the line plot using an X for each leaf.

My Leaf Measurement Data in Centimeters:

Beanstalk Leaf Measurements in Centimeters



NAME _____ **DATE** _____

Beanstalk Leaves Record Sheet

Answer the following questions about your line plots:

1 Which leaf length did you have the most of?

a _____ inches or _____ centimeters

b How many leaves had this length? _____

2 Which leaf length did you have the least of?

a _____ inches or _____ centimeters

b How many leaves had this length? _____

3 How is your Inch Line Plot different than your Centimeter Line Plot?

4 How are they the same?

NAME _____ DATE _____

Set E3 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Beanstalk Line Plot

Mrs. Englund's third graders were measuring their beanstalks again! This time they measured the leaves in centimeters and wondered how many of each leaf measurement they had. They decided to use a line plot to display their data.

Leaf Measurements in Centimeters

3	4	$3\frac{1}{2}$	$3\frac{1}{2}$	5	5	7	$5\frac{1}{2}$	9	8	6	$3\frac{1}{2}$	6	4	$4\frac{1}{2}$
8	$5\frac{1}{2}$	$8\frac{1}{2}$	$6\frac{1}{2}$	9	8	9	6	$3\frac{1}{2}$	$5\frac{1}{2}$	$9\frac{1}{2}$	7	$7\frac{1}{2}$	4	8

Record the data on the line plot below.

Beanstalk Leaf Measurements in Centimeters

Number of Leaves (X = 1 leaf)

1 $1\frac{1}{2}$ 2 $2\frac{1}{2}$ 3 $3\frac{1}{2}$ 4 $4\frac{1}{2}$ 5 $5\frac{1}{2}$ 6 $6\frac{1}{2}$ 7 $7\frac{1}{2}$ 8 $8\frac{1}{2}$ 9 $9\frac{1}{2}$ 10

Leaf Lengths in Centimeters

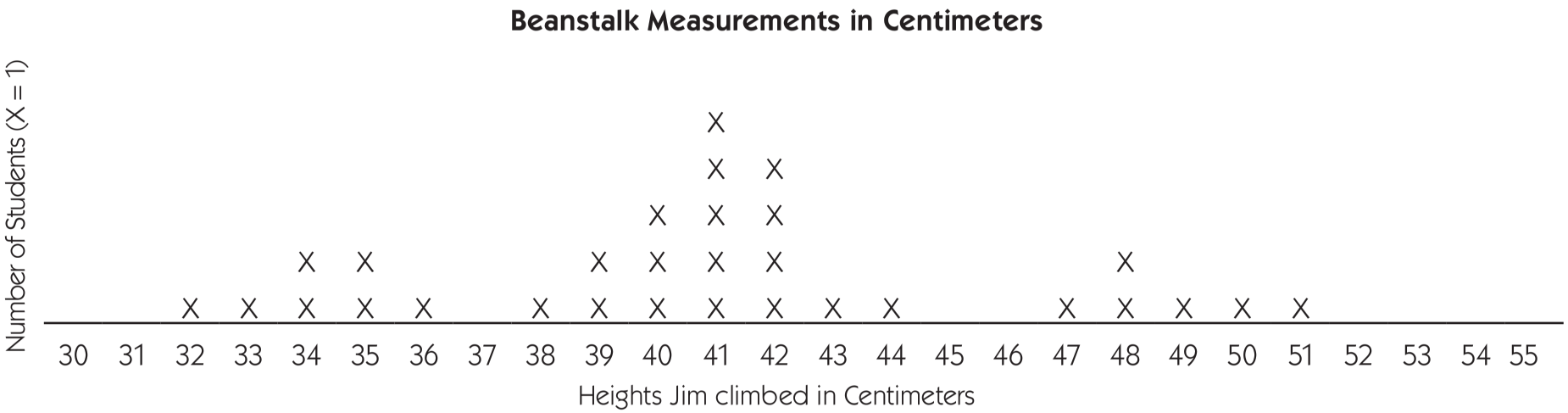
NAME _____ DATE _____

Set E3 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

Beanstalk Measurements

Mrs. Englund's third graders measured how far Jim climbed up their beanstalks using the nearest whole centimeters. The line plot below shows the heights Jim climbed.



Use the information from the line plot to answer the questions below.

1 How high did most of the students have Jim climb the beanstalk? _____

2 How many students had Jim climb 42 cm or higher? _____

3 How many students had Jim climb 41 cm or lower? _____

4 What else did you notice?