Grade 6 Line graphs

6.SP.1	
Create, label, and interpret line graphs to draw conclusions.	1. Determine the common attributes (title, axes, and intervals) of line graphs by comparing a set of line graphs. 2. Determine whether a set of data can be represented by a line graph (continuous data) or a series of points (discrete data), and explain why. 3. Create a line graph from a table of values or set of data. 4. Interpret a line graph to draw conclusions.

Clarification of the outcome:

- A line graph is dot graph for which the dots (points) are connected. Points should only be joined if the data is continuous. This means that it is POSSIBLE (does not have to occur) to have data values between whole numbers. Another way to say this is that fractional values are possible (e.g.: 1.8, 4 2/3). At least one of the two data sets must be continuous for a line graph to be used to graph the data. Line graphs are typically used to graph measurement data such as length, time, etc. because measurement data is continuous.

  Refer to: MY data display methods
- Discrete data involves only whole numbers. For example, frequency counts are discrete data. It is not possible to have a value in between two whole numbers with discrete data. For example, counts of people in the room are always whole numbers. You cannot have 8.7 people present in the room. You can have 8 or 9 people present, but not a number between 8 and 9.

Required close-to-at-hand prior knowledge:

- Able to collect and record collected data.
- Understands dot graphs.
- Can use a stopwatch or equivalent timer to time something.

SET SCENE stage

The problem task to present to students:

Organize students into pairs. They will be measuring each other's heart rate by counting beats for 15 seconds and multiplying the result by 4 (to obtain the per minute rate). The procedure is:

1. Student B measures student A's heart rate. Then student A measures student B's heart rate. This provides an initial rate for each student in the pair.
2. Student A jumps up and down 5 times. Student B measures student A's heart rate immediately after. The data is recorded in student A's chart.
3. Student B jumps up and down 5 times. Student A measures student B's heart rate immediately after. The data is recorded n student B's chart.
4. Repeat steps 2 and 3 five times in all.

Student A heart rate data		Student B heart rate data	
Initial heart rate		Initial heart rate	
Rate after jump #1		Rate after jump #1	
Rate after jump #2		Rate after jump #2	
Rate after jump #3		Rate after jump #3	
Rate after jump #4		Rate after jump #4	
Rate after jump #5		Rate after jump #5	

Comments

A line graph is well suited to graphing this type of data because heart rate per minute is continuous data. It is possible to have a heart rate of 63.8 beats per minute, for example. The '.8' part means that the heart has not quite completed its beat cycle at the end of the minute.

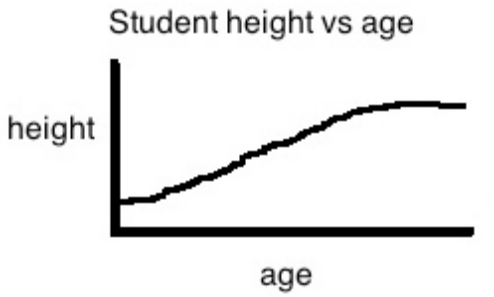
DEVELOP stage

Activity 1: Revisits SET SCENE and addresses achievement indicator 2.

- Ask selected groups to describe their data.
- Ask students if a bar graph can be used to graph the heart beat data. Ensure that students realize that frequency and categories such as favorite food are not involved in the heartbeat data. Therefore a bar graph is not appropriate.

Activity 2: Addresses achievement indicators 1, 2, 3, and 4.

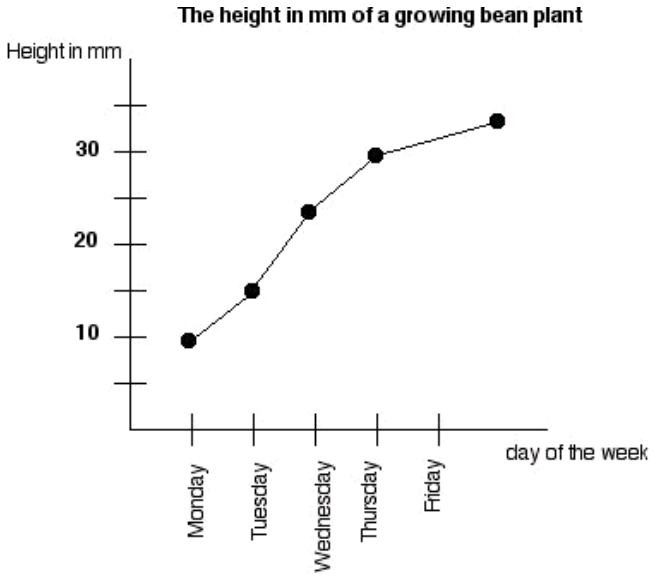
- Show students a line graph showing height of student versus age of student. Tell them that age and height are examples of continuous data. Discuss what the term 'continuous data' means. Ask students why age and height are continuous data. Ensure they realize height and age do not have to be whole numbers.



- Ask students for other examples of continuous data. (e.g. heart rate, blood pressure, weight).
- Ask students to describe the features of the graph: title and axes.
- Ask students and discuss why the graph consists of an unbroken curvy line. Ask them to explain why height does not start at zero and why height drops slightly at the end of the line graph.
- Ask students if a line graph can be used to show their heartbeat data. Have the groups graph their data, using a line graph (heart beat on the vertical axis). Ensure that they label it correctly.
- Discuss in depth why the data points should be joined. [It is appropriate to join the dots because heart rate is continuous data. The other data set, <u>when heart rate measurement was taken</u>, is discrete data.]
- Have different groups present their line graphs. Ask them to interpret the results. [For example, jumping up and down increases heart rate.]

Activity 3: Addresses achievement indicators 1, 2, 3, and 4.

- Show students a line graph involving continuous data (e. g. height of bean plant versus day of week). Height is continuous data. Day of week is discrete data. Discuss the features of the line graph: continuous data (a measurement of height) on the vertical axis and discrete data (day of week) on the horizontal axis.



- Organize students into two groups of girls and two groups of boys. Have each group collect data (only within that group) on height of person and shoe size of person. Ask the groups to graph their data, using a line graph (height on vertical axis; shoe size on horizontal axis). Ensure they label it properly. Have the different groups present their line graphs and interpret them.
- Ask students to identify the continuous data. Ensure they realize height is continuous data but that shoe size is categorical data (even though shoe size involves numbers and comes in 1/2 sizes). Shoe size is a label for a category that represents a zone of foot lengths and widths. Numbers are used as the LABELS (for example: size 5, size 5 1/2, etc.) You could just as easily use letters for shoe size labels (sizes: A, AA, B, BB, etc.) or words (e.g. sizes: small, narrow small, wide small-medium, etc.).

Activity 4: Addresses achievement indicators 1 and 2.

- Present students with a variety of line graphs where some involve only continuous data and others involve continuous data and discrete data. Ask them to identify the continuous and discrete data and to explain their decision.
- Discuss the interval for each graph (the separation between values/categories on horizontal axis). [For example, the interval for the ice melting graph is 1 unit of temperature. The interval for the bean plant graph is a day of the week.]

Activity 5: Revisits SET SCENE & addresses achievement indicators 1, 2, 3, 4, & practice.

- Organize students into groups. Provide them with second hand data (e. g. average length of daylight per week for eight weeks). Have them graph the data, using a line graph. Have some of the groups present and interpret their line graphs.

Activity 6: Revisits SET SCENE and addresses achievement indicators 2, 3, and 4.

- Organize students into pairs. Ask them to design a heart rate project (like the one from SET SCENE) but this time it does not involve jumping and down between measurements. It involves doing something else.
- Ask students to carry out the project and graph the data.
- Ask selected groups to describe their project, show the graph, and interpret it. Discuss results.

Activity 7: Assessment of teaching.

- Provide students with second hand data, where one of the variables involves continuous data and the other discrete data. Have them identify which data is continuous and which is discrete. Have them make a labelled line graph for the data.

If all is well with the assessment of teaching, engage students in PRACTICE (the conclusion to the lesson plan).

An example of a partial well-designed worksheet follows.

The worksheet contains a sampling of question types. More questions of each type are needed.

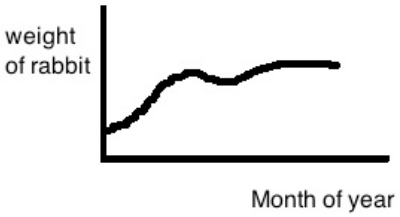
The MAINTAIN stage follows the sample worksheet.

Question 1.

For the line graph,

_____ is continuous data and

_____ is discrete data.



Question 2.

List three examples of continuous data.

List three examples of discrete data.

Question 3.

Johnny collected data on favorite movies and the number of people who liked the movies. He made a line graph of the data. Is a line graph the appropriate type of graph for Johnny's data? Explain.

Question 4.

Make a line graph of the data.

Time taken to walk	193 sec	401 sec	485 sec	704 sec	950 sec
Length of walk	200 m	400 m	600 m	800 m	1000 m

MAINTAIN stage

Mini-task example

Every so often:

- Provide a line graph. Have students identify the continuous data and the discrete data (if it occurs). Have them describe and interpret the graph.

Rich-task example

Have students do a small science project that involves measurement data taken over a period of time. Part of the project will involve making a line graph and discussing what it indicates about the data.

Comments

Integrating line graphs with science in a project is a good way to maintain line graphs. It should encourage student engagement.