

Module 6 Lesson 4

Math Lab: Counting Beats

You can work by yourself as you follow the steps outlined in the Procedure section, but you will be required to work with a partner to complete the Analysis section.

Materials

- CD or MP3 player
- music CD or MP3 song
- stopwatch or timepiece

Procedure

You are required to complete Part A: Data Collection and Part B: Graph Data.

Part A: Data Collection

Step 1: Choose a song to which you can count the beats. All songs have a beat, but you may find examples that are easier to count in the hip hop and funk genres, as well as in electronica and pop music. If you have ever nodded your head or tapped your foot to music, then consider each nod or tap as a beat.

Step 2: Play your selected song. Count the number beats (e.g., nods or taps) that you discover in the song for a period of 10 seconds. Record this number in the following table. **Note:** You may have to allow the music to play through the introduction before a regular beat pattern is established.

Time (s)	Number of Beats
10	
15	
20	
30	
60	

Step 3: Now count the number of beats for 15 seconds. Record this number in the table shown with step 2. In order to do this, you may want to start the track again or else start counting from wherever the music is playing.

Step 4: Continue to count and record beats 20, 30, and 60 seconds. Record your findings to the table shown with step 2.

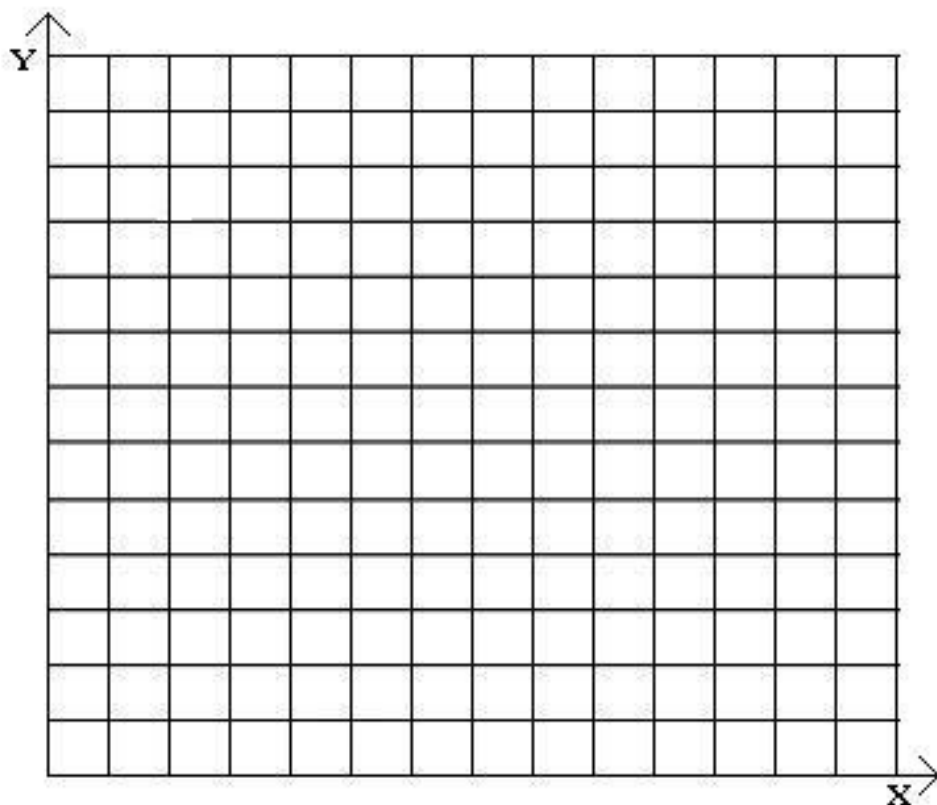
Tip

Most calculators can be used to help you count the beats. Take your calculator out and try this. Press “1” and then “Enter.” Then press the plus key followed by “1” and “Enter.” The display should show the number 2. Now press “Enter” again. The display should show 3. Every time you press “Enter,” the calculator counts one additional unit. Use this method to count your beats by tapping your finger with every beat!

Part B: Graph Data

Step 5: On a piece of graph paper, plot the data you collected.

- Be sure to place the independent and dependent variables on the appropriate axes.
- Extend your time axis to 120 seconds. Extend your “Number of Beats” axis to an appropriate number.



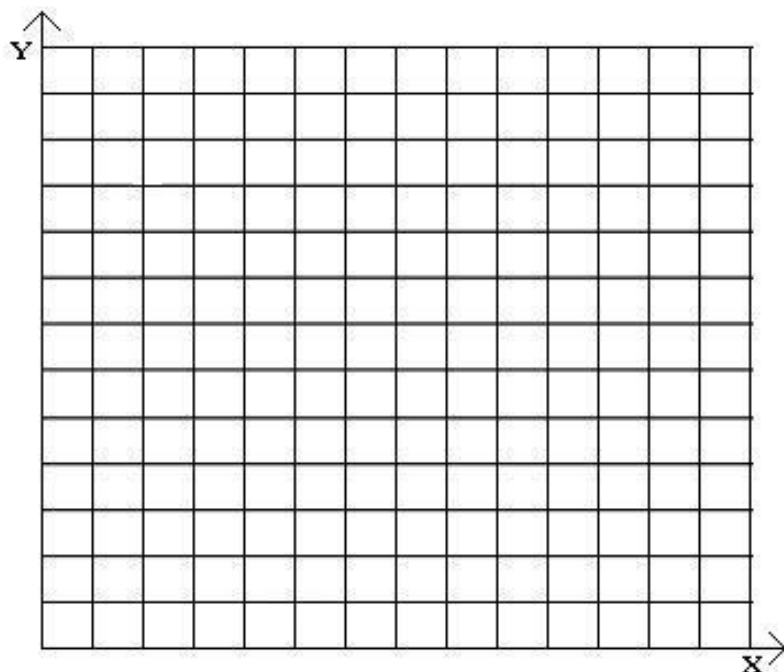
Step 6: Draw a line of best fit through the points.

Analysis

Complete this section of the Math Lab working with a partner (if possible). Examine each other's graph and results. Then work together on the following analysis questions. You may find that you may need more data to help in detecting patterns. In those cases, you may want to select additional songs to analyze. Apply the steps in Part A and Part B to any additional songs you choose to analyze.

1. What is the BPM (beats per minute) of your selected song?
2.
 - a. What is the slope of the line?
 - b. What does the slope represent?
 - c. How does this compare with the BPM?
3.
 - a. What is the y -intercept of the line?
 - b. What does the y -intercept represent?
 - c. Would this y -intercept change with a different song? Why or why not?
4. What is the equation of the line expressed in function notation?
5. Compare the BPM of your partner's selected song with that of your own. Record the slope.

6. When mixing two songs, it is important to match the tempos of the two songs to ensure a smooth transition. Assume that you are planning to begin mixing your partner's song with your song at the 45-second mark. Draw a graph representing the beats of your partner's song onto your own graph.



7. a. Is your partner's graph steeper or less steep than yours?
- b. What does the slope of the line imply about the tempo of the song?
- c. If you had a device that could be used to adjust the tempo of any song, how would you make the tempos of the two songs equal?
8. Use two points on the graph to determine the equation of the second (your partner's) line.
9. a. What is the y-intercept of the second line?
- b. What is its significance?