

# Measure Distance Using the GLX, a Meter Stick, and a Measuring Tape



**Background:** A motion sensor can permit the analysis of motion of an object (e.g.: a ball, a person, a car, etc.). The motion sensor uses ultrasonic pulses on a target to estimate the distance and the change of position of a target. The sensor works a little bit like a bat recognizing its way in a cave. The bat emits an ultra sound signal which bounces off the wall of the cave, the difference of the frequency between the emitted signal and the echo bouncing from the wall (Doppler Effect) permits the bat to estimate the distance of the wall.

The sensor is accurate in a range of 15 cm (0.15 m = almost six inches) to a range of 8 meters (around 26 feet =  $8\frac{3}{4}$  yards).

The picture on the right illustrates the [giant golden crowned flying fox](#). (This is a species of giant bats.)

Students must be familiar with the “Background” information in order to do the activity. Discuss it as a class or you may have them research bats on the internet. You may work on the “Problem” as a brainstorming activity as a class or you may have students brainstorm within their group.

Students may have to experiment with the angle of the motion sensor to find the best setting.

## GLEs:

| GLE #                     | GLE Text and Benchmarks   |
|---------------------------|---|
| <b>Science as Inquiry</b> |   |
| 1.                        | Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)   |
| 2.                        | Pose questions that can be answered by using students’ own observations, scientific knowledge, and testable scientific investigations (SI-E-A1) |
| 3.                        | Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)                              |
| 4.                        | Predict and anticipate possible outcomes (SI-E-A2)  |
| 5.                        | Identify variables to ensure that only one experimental variable is tested at a time (SI-E-A2)  |
| 6.                        | Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)            |
| 8.                        | Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)                            |

| <b>GLE #</b>            | <b>GLE Text and Benchmarks</b>   |
|-------------------------|--|
| 9.                      | Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)                  |
| 10.                     | Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)                                |
| 12.                     | Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6) |
| 13.                     | Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)   |
| 21.                     | Use evidence from previous investigations to ask additional questions and to initiate further explorations (SI-E-B6)   |
| <b>Physical Science</b> |  |
| 23.                     | Determine linear, volume, and weight/mass measurements by using both metric system and U.S. system units to compare the results (PS-E-A2)  |

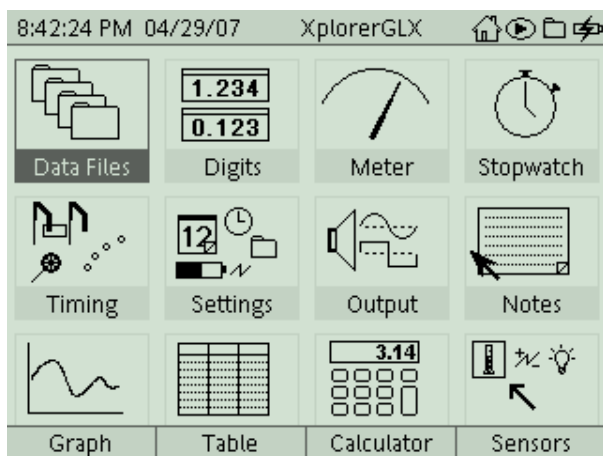
# Measure Distance Using the GLX, a Meter Stick, and a Measuring Tape Activity

## Problems:

1. What unit of measure (mm, cm, and m) is best to use when measuring short distances? Justify your answer.
2. What unit of measure (mm, cm, and m) is best to use when measuring short distances? Justify your answer.
3. If you had to choose between a digital measuring device (ex. GLX), a meter stick, or a measuring tape to measure length, which would you use? Explain your answer.

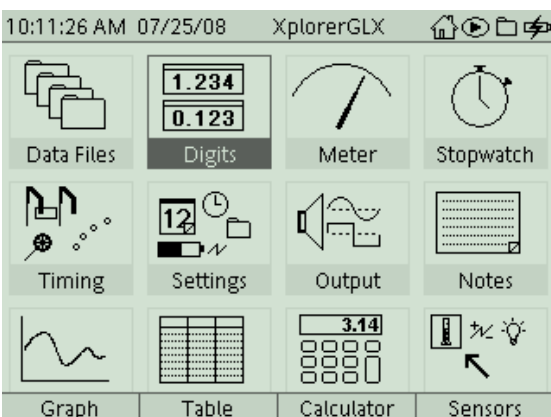
**Materials:** meter sticks, measuring tapes, a box or a book (standing up) to use as an object, GLX connected to the motion sensor

## GLX Setup:



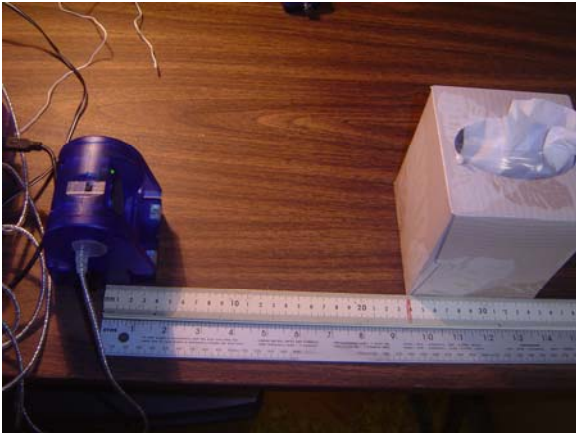
Connect your motion sensor on the top of the GLX.

1) Click on the home symbol, you will obtain the screen pictured on the left:



2.) Select digits using the right arrows to go to digits in the menu screen and then press the select button  $\sqrt{\quad}$ . Now the screen will display a reading of the distance separating, for example, a wall from an object in the classroom.

**Part I:** Measure the distance of an object less than 1 meter away (39 inches) and not closer than 0.20 m = 20 cm (8 inches) from the motion sensor.



- 1) Complete one measurement with the motion sensor. Record your measurements in m, cm, and mm.
- 2) Keep the motion sensor and the object in the same place. Repeat the same measurement using a meter stick.
- 3) Repeat the same measurement with a measuring tape.
- 4) Use your answer sheet to record your data and analyze your results.

**Part II:** Measure the distance of an object less than 5 meters away (195 inches) and not closer than 2 m = 200 cm (66 inches) from the motion sensor.

- 1) Complete one measurement with the motion sensor. Record your measurements in m, cm, and mm.
- 2) Keep the motion sensor and the object in the same place. Repeat the same measurement using a meter stick.
- 3) Repeat the same measurement with a measuring tape.
- 4) Use your answer sheet to record your data and analyze your results.

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## Student Answer Sheet

Student(s): \_\_\_\_\_

### Part 1:

|                | DISTANCE |
|----------------|----------|
| Motion sensor  | m        |
|                | cm       |
|                | mm       |
| Measuring tape | m        |
|                | cm       |
|                | mm       |
| Meter stick    | m        |
|                | cm       |
|                | mm       |

### Part 2:

|                | DISTANCE |
|----------------|----------|
| Motion sensor  | m        |
|                | cm       |
|                | mm       |
| Measuring tape | m        |
|                | cm       |
|                | mm       |
| Meter stick    | m        |
|                | cm       |
|                | mm       |

### Analysis:

1. What unit of measure (mm, cm, and m) is best to use when measuring short distances? Justify your answer.
2. What unit of measure (mm, cm, and m) is best to use when measuring short distances? Justify your answer.
3. If you had to choose between a digital measuring device (ex. GLX), a meter stick, or a measuring tape to measure length, which would you use? Explain your answer.