

Echolocation Worksheet

1. After this activity, do you feel more or less comfortable with measuring time?

Please circle one: **More** **Less**

2. John and Sally are going to race their robots. John and Sally's robots begin the race at exactly the same time. If John takes 22 seconds to finish the race, and Sally takes 24 seconds, who won?

Please circle your answer: **John** **Sally**

3. John and Sally are very competitive, so they are once again settling an argument by using their robots. Each robot is fitted with an ultrasonic sensor so it knows when to turn around before hitting the wall and come back to the starting line. The wall is 4 feet from the starting line. John and Sally start at the exact same time from the starting line. John's ultrasonic sensor threshold is set to < 12 inches, and Sally's is set to < 23 centimeters. John's robot takes 18 seconds round trip, and Sally's takes 20 seconds. Who won the race in the fastest time?

Circle your answer: **John** **Sally**

4. Using the information in question 3, whose sensor detects the wall first?

Circle your answer: **John** **Sally**

Please justify your answer:

5. Using the information in question 3, how fast are John and Sally's robots traveling? (Show your work.)

John:

Sally:

6. Does increasing the sensor's threshold value of John's robot from < 12 to < 15 inches help him detect the wall sooner or later than if he kept it at 12 inches?

Please circle one: **Sooner** **Later**

7. Did robotics help you understand measuring time better? Circle one: **Yes** **No**

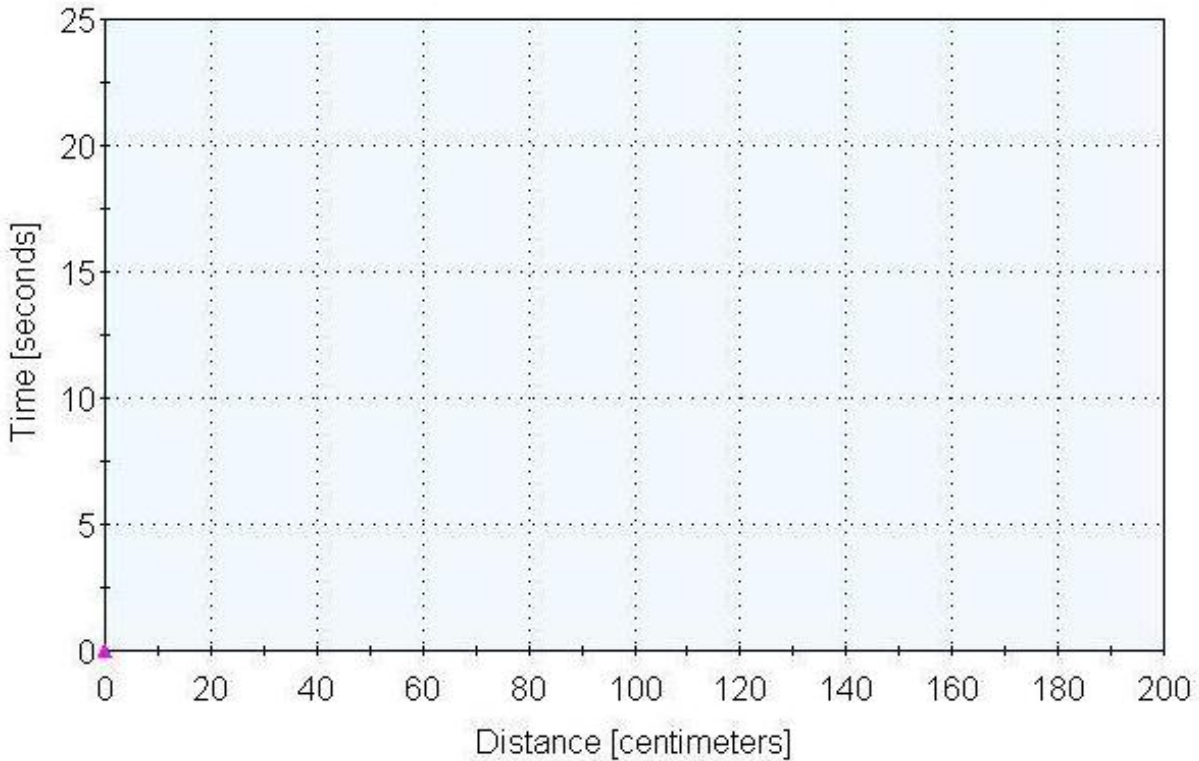
Explain:

Name: _____ Date: _____ Class: _____

8. Graph the following data from Sally testing her ultrasonic sensor's threshold and how long it took her robot to detect the wall before triggering it to turn around:

Data: (10 cm, 22 s), (20 cm, 15 s), (40 cm, 9 s), (80 cm, 5 s), (160 cm, 2 s)

Time vs Distance



9. Refer to question 8 and the graph. For which distance does the robot take the longest to respond to the object? Please circle your answer:

10 cm **20 cm** **40 cm** **80 cm** **160 cm**

10. Does changing the placement of the ultrasonic sensor to the back of the robot affect the distance that the robot detects the object? Circle one:

sooner **no change** **later**

Name: _____ **Date:** _____ **Class:** _____

11. Describe how a bat uses echolocation or submarine uses sonar to detect prey or avoid obstacles?

12. If you could make your own device that is inspired from nature, what would it come from, and what problem would it solve?

13. Other than ultrasonic sensors that emulate animal echolocation, what is another use of biomimicry in engineering design?