Iona Prep Physics

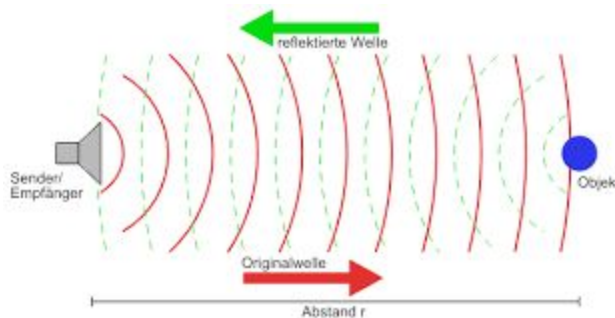# Lab: Using Sonar to measure a distance
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Question: How accurate is the Phyphox Sonar Ranging function?

Theory:
The Sonar[1] function generates a "click" which travels at the speed of sound and reflects off an object and returns. Using the time and employing d=vt, the distance to the object can be calculated.

In this experiment you will use your Smartphone to measure the distance to an object. You will also measure the distance using a regular meter stick or ruler, and then compare the results.

Some important details:
Use the Echo Location tab.
Expand the graph using the two arrows, and
Since the calculation involves the speed of sound, you need to enter that. The speed of sound depends upon the temperature according to the following formula:
The speed of sound at any temperature can be calculated from the equation
V = 331 m/s + (0.59 m/s C) (Temp C)
To make it easier, there is a table on the next page on which you can find the speed of sound.
Since the speed varies slowly with temperature, use the closest temperature on the chart to find the speed of sound.

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[1] the method of echolocation used in air or water by animals such as bats or whales.
"the fishing nets are detectable by dolphin sonar" Wikipedia

Compute the % difference between them.
% difference = 100%(Phyphox distance - Measured distance) / Measured distance
Try doing this 3 times at different distances.

See data table and temperature chart below:

Data:

Temp F	Speed (m/s)	Measured Distance (cm)	Phyphox reported Dist(cm)	% difference

Temperature T (°F)	Temperature T (°C)	Speed of sound (m/s)
0	-17.78	320.51
5	-15.00	322.15
10	-12.22	323.79
15	-9.44	325.43
20	-6.67	327.07
25	-3.89	328.71
30	-1.11	330.34
35	1.67	331.98
40	4.44	333.62
45	7.22	335.26
50	10.00	336.90
55	12.78	338.54
60	15.56	340.18

65	18.33	341.82
70	21.11	343.46
75	23.89	345.09
80	26.67	346.73
85	29.44	348.37
90	32.22	350.01
95	35	351.65