Circular Motion with accelerometers

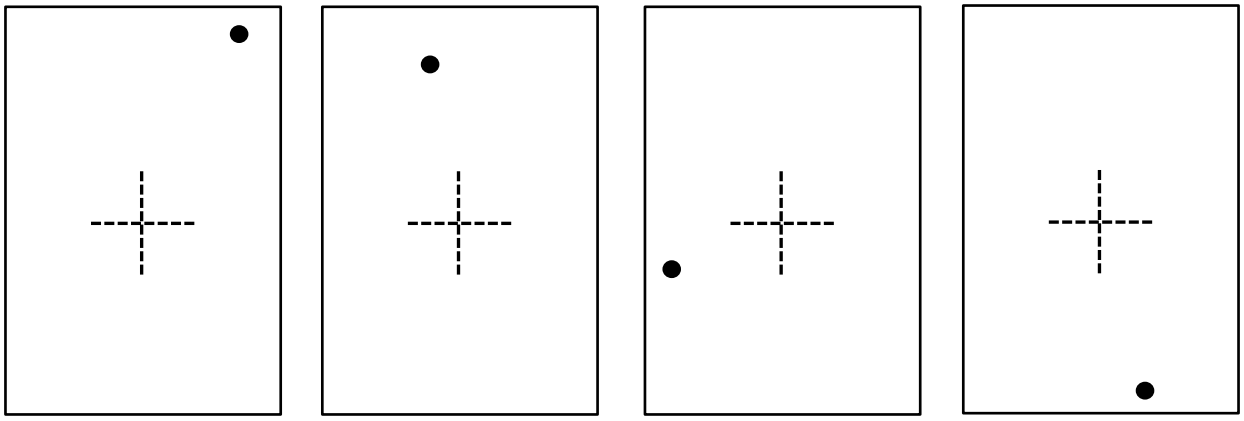
PRE-LAB EXERCISES

EXERCISE 0.

Read AppInstructions.pdf (choosing the android or iOS version, depending on which type of phone you have). Follow all instructions. Completion will result in a graph and the display of some average values. Your teacher may request that you staple a single-page print-out of it to the end of these pre-lab exercises.

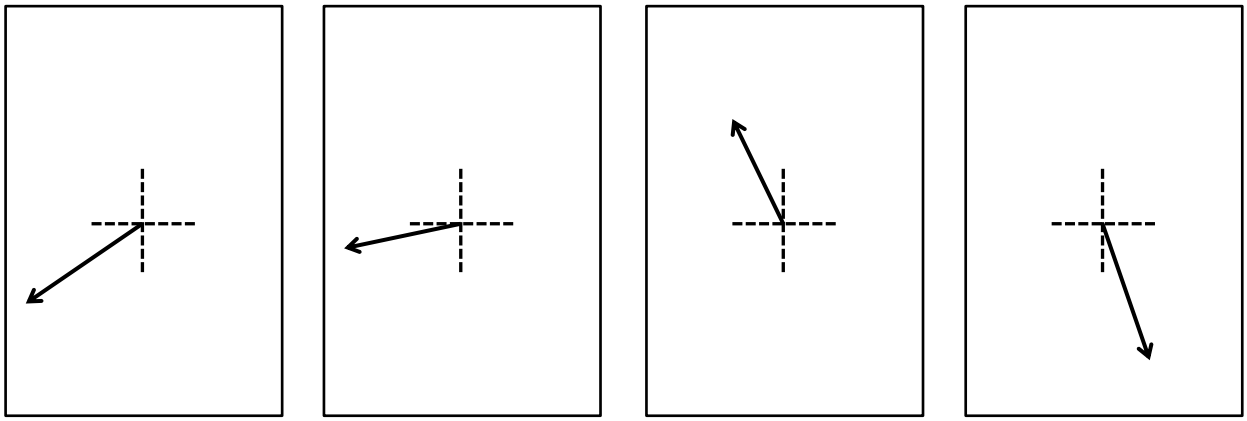
EXERCISE 1.

John stands in a rectangular field at various positions and points, arm outstretched, towards the crosshairs at the center of the field. For each position, draw two arrows indicating the direction that he is pointing. The **first arrow** emanates from the black dot where he is located, and the **second arrow** is a translation of this arrow to the origin, i.e. an arrow emanating from the central crosshairs.
The length of the arrow is not important.



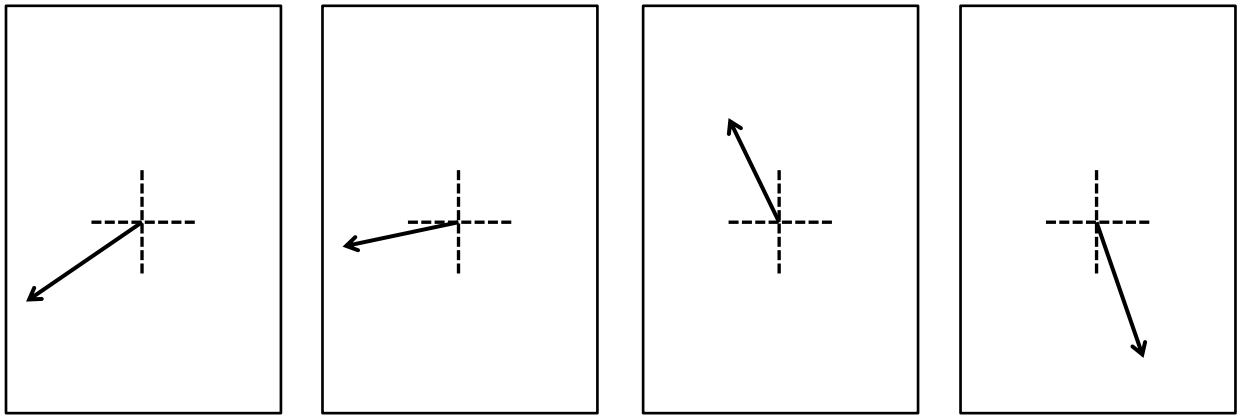
EXERCISE 2.

John does the same pointing game, only now we only have the resulting arrow indicating the direction. The only information we have about his position is that he was walking along the perimeter line of the field. For each scenario, draw a black dot indicating the position he must have been pointing from.



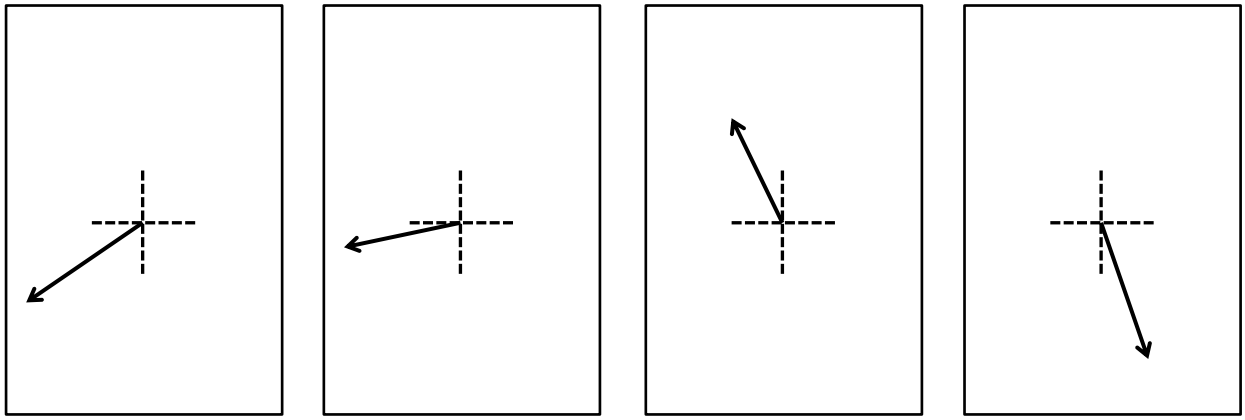
EXERCISE 3.

Same as the previous exercise, only now John could be walking anywhere on the field. For each scenario, draw a gray area indicating the quadrant in which he must be standing.



EXERCISE 4.

Same as the previous exercise, only now draw 3 dots per diagram, indicating 3 positions at which John could have been standing, for which the arrow would be <u>exactly</u> in the direction shown.



EXERCISE 5.

A cell phone is rotating on a circular table. Its accelerometer sensor points in the direction of the centripetal acceleration due to uniform circular motion. We don't know where the accelerometer is located within the phone, but we have three candidate positions indicated. Draw **three** arrows emanating from the crosshairs indicating the direction of the acceleration for each of these positions.

Indicate which sensor position(s) would result in an acceleration vector:

a) whose y-component is zero

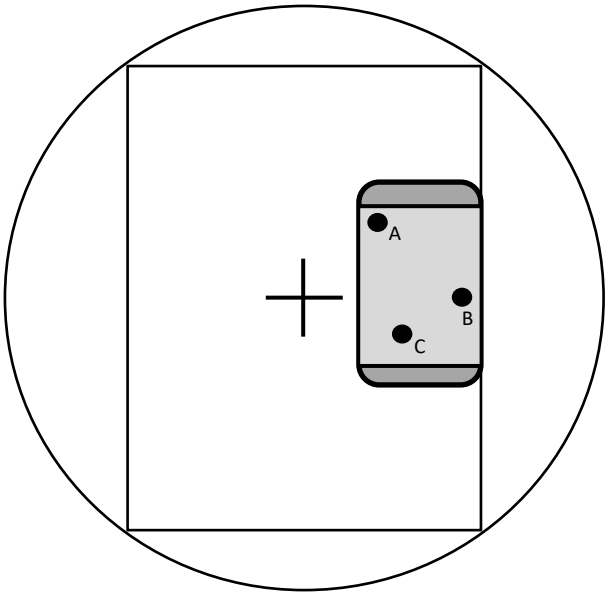
[A] [B] [C]

b) whose y-component is negative

[A] [B] [C]

c) whose x-component is negative

[A] [B] [C]



EXERCISE 6.

For **each** acceleration vector shown, draw 2 dots indicating possible accelerometer positions within the phone.