Review:

LIDAR: LIght Detection And Ranging, LIDAR produces a list of directions, relative bearings with accompanying distances to the obstacle(s) that the light bounced off of

ϕ : Greek letter, refers to the relative bearings from the LIDAR

Polar Coordinates: consist of an angle and a range

Robots keep track of position of obstacles on a map

Each cell on the map is either free, an obstacle, or unknown. Some cells we haven't seen yet, others we have a reflection from, and yet others had the sensor beam travel through them without detecting anything.

Since the sensors have some error, we track the probability that each cell is occupied instead of just the binary option of free or occupied.

We use **conditional probability** to keep track of this. We want the probability of their being an obstacle given that there was or was not a return from that cell.

$$p(obstacle|return)$$

However, what we typically have from our sensor specifications is the probability of getting a return if the cell has an obstacle (true positive rate) and the probability of getting a return when the cell is clear (false positive rate).

$$p(return|obstacle) \text{ or } p(return|clear)$$

Since we either get a return or we don't, we know that the probability of not getting a return is one minus the probability of getting a return for each case.

$$p(return|obstacle) = 1 - p(no\ return|obstacle)$$

We can also calculate the probability of getting a return from both cases by taking the probability of each event multiplied by the probability of that event happening.

$$p(return) = p(obstacle) \cdot p(return|obstacle) + p(clear) \cdot p(return|clear)$$

This leads us to **Bayes' Theorem**:

$$p(cell_{new}) = \frac{p(obstacle) \cdot p(cell_{old})}{p(return)}$$

Name: _____ Class: _____

Challenge Questions:

Robots are driving around collecting data about things in our homes and objects around the roads that we drive on. Should this information be allowed to be public or should it be kept private? Justify your answer.

Yes:
By sharing information, better systems and networks can be developed that can help people with disabilities.

No:
By sharing information, an individual's privacy can be violated (knowledge about the inside their home or their location)

Based on your previous answer, what are the social implications of privacy with respect to ethics?

Yes:
We have to be careful to use data that does not attach to an individual that could compromise their privacy. If personal information is shared with the world, the individuals will stop using that technology and look for something else.

No:
By not sharing information, an individual's privacy is not in jeopardy, but the community as a whole does not have the network infrastructure that it could have with data sharing.

Name: _____ Class: _____