

Probability Lesson

Prep Before Lesson:

- Have tables grouped so 10 groups of three students can sit together
- Have 11 iPads already fully-charged with the Ozobot App downloaded (one of these will be a spare – just in case)
- Have 11 Ozobots fully-charged – one for each of 10 tables
- Set at each grouping:
 - iPad
 - Ozobot
 - Ozobot “Color Code Key” (laminated sheet that came in the kit).
 - Pack of colored markers (blue, green, red, black)
 - Pencils
 - Handouts (1 for each student at the grouping) from the Ozobot Basic Training Lesson 2 link: <https://storage.googleapis.com/ozobot-lesson-library/basic-training-2/ozobot-basic-training-2.pdf>
 - Lesson 2, No. 1 Ozobot path with no color (pg. 8 of pdf)
 - Lesson 2, No. 2 Ozobot path that students have to color (pg. 9 of pdf)
- Bring up the Ozobot App on each iPad and scroll to OzoDraw – turn down the volume on the iPads so the students can hear your instructions.
- Use the Clevernote option of the Clevertouch to write down the solutions with the class as you go.
- Project the first page of the following pdf on the white board to start the lesson: http://pdfs.cpm.org/state_supplements/probability.pdf

Lesson:

Tell students they’re going to have some fun playing with the Ozobots to help better understand the concept of probability.

Say to Students:

We will use the OzoDraw Challenge in the Ozobot app.

- Open OzoDraw and click the “Start” button
- Click the “Challenge” mode
- Pick the first challenge in the list (the one that looks like a cross), then click OK.
- Place your Ozobot on the end that says “Start”, and watch him travel along the black lines. Redo this step several times. Notice how sometimes the Ozobot travels straight, sometimes it goes left, and sometimes it goes right.

SOLUTION 1: On your calculations sheet, calculate the probabilities of the Ozobot going left, right, or straight. **ANSW: $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{3}$**

SOLUTION 2: Add all three of the probabilities that you just wrote down, what do they add up to? **ANSW: They always add up to 1.**

Now let’s imagine that the track we see is a road and Ozobot has to get from “Start” to “Finish”. If the Ozobot turns left or right, there is a dead-end and Ozobot become stuck. Use the “go straight” code to make Ozobot reach the Finish every time you play. Drag the code from the “Available Codes” on the top right onto the track.

When you drag the code to the black road you’ll notice it is blinking. Blinking codes are called “flash codes”. Make sure you don’t place the flash code too close to an intersection because it won’t work.

After placing the code, put Ozobot on the “Start” and see if Ozobot reaches the “Finish”. Let Ozobot repeat the journey several times to make sure your code is in the right spot. (Pause here for about 30 seconds while students play try their code.)

Now you can see that Ozobot does not have a choice anymore. Ozobot is going straight every time. This means the behavior is not random anymore. Ozobot understands our instructions and executes them.

SOLUTION 3: Based on this experiment, write on your calculations sheet the probability of the Ozobot reaching “Finish”. **ANSW: The probability of reaching “Finish” is now 1.**

Now we’re going to use the paper handouts that you have in front of you. Let’s start with the one that says “Lesson 2 No. 1”. Whenever you switch your Ozobot from a screen to paper, you need to calibrate the Ozobot to let him know you’re switching things up. To calibrate the Ozobot, just hold the power button in on the side until it flashes white then place Ozobot on the large black circle. In this exercise, Ozobot picks up shoes at the start and has to bring a pair to the end of aisle 3. Put Ozobot on the line at the “Place her” arrow, facing right and see where Ozobot ends up. Repeat this a couple of times.

The start is on the left. Place Ozobot on the start and observe Ozobot’s behavior at the intersection. There are three options: turn left, turn right and go straight.

SOLUTION 4: Now let’s look at the probabilities. What are they for the first intersection (a)? **ANSW: 1/3 left, 1/3 right, 1/3 straight.**

SOLUTION 5: What are the probabilities for the second intersection (b)? **ANSW 1/2left, 1/2right**

Advanced Students

Since we already know the probability of turning left at the first intersection is $1 / 3$, we know that the probability of reaching the end of aisle 1 is $1 / 3$. In the same manner, the probability of reaching the end of aisle 2 is also $1 / 3$.

To reach aisle 3, we first have to go straight at the first intersection, which happens with $1 / 3$ probability. Then, Ozobot has to turn left at the second intersection, which happens in $1 / 2$ of the cases. Therefore, the total probability of reaching the end of aisle 3 is $1 / 3 \times 1 / 2 = 1 / 6$. Similarly, the probability of reaching aisle 4 is also $1 / 6$.

SOLUTION 6: Do all the probabilities still add up to 1? **ANSW: Yes, they do (for the aisles): $1/3 + 1/3 + 1/6 + 1/6 = 1$**

Continue (If Time Allows):

Let’s help Ozobot reach aisle 3 every time with the use of codes.

Take handout #2 and use the following codes:

Try 1: go straight and left.

Fill in these two codes into two of the available spaces and cover the unused spaces with black marker. Place Ozobot on the line at the “Place here” arrow, facing right, and see if Ozobot makes it to the end of aisle 3.

Do the same experiment 2 more times, each time using a fresh copy of handout #2, but with different codes:

Try 2: jump right, left, u-turn

Try 3: u-turn (2X), go straight (2X)

Probability With Ozobots

Calculations Sheet

Group Member Names: _____

Period _____

1. Using the first challenge in OzoDraw, calculate the probabilities of the Ozobot going left, right, or straight.
2. Add all three of the probabilities that you just wrote down, what do they add up to?
3. Based on this experiment, write on your calculations sheet the probability of the Ozobot reaching "Finish".
4. Using the paper handout "Lesson 2 No. 1", what are the probabilities for the first intersection (a)?
5. What are the probabilities for the second intersection (b)?
6. Since we already know the probability of turning left at the first intersection is $1/3$, we know that the probability of reaching the end of aisle 1 is $1/3$. In the same manner, the probability of reaching the end of aisle 2 is also $1/3$.

To reach aisle 3, we first have to go straight at the first intersection, which happens with $1/3$ probability. Then, Ozobot has to turn left at the second intersection, which happens in $1/2$ of the cases. Therefore, the total probability of reaching the end of aisle 3 is $1/3 \times 1/2 = 1/6$. Similarly, the probability of reaching aisle 4 is also $1/6$.

Do all the probabilities still add up to 1? Write the equation.