Probability Unit

Likelihood Levels

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WARM UP

In this lesson, we **will explore how likely it is for a certain outcome or observation to occur in a random situation**.

But before we need to remain some key concepts about random situations

The following situations are described below:

a) Go out to the schoolyard and measure the noise level at school.
b) Record waiting time at school snack bar.
c) Go out to the schoolyard and count the number of people in the schoolyard.
d) Record how long it takes for the schoolyard to clear out after recess.

Which of these situations are random? Why?

WARM UP

What we should remember for this lesson

- There are situations in which we cannot anticipate what will be observed due to uncertainty. We say **these situations are random**, and **that chance** is involved.

ACTIVITY 1

In pairs, consider the following situations with three possible associated observations and answer the questions.

For each situation:

a) How likely do you think each observation is?

b) Would you say that some observations are more likely than others?

	Possible Observations		
Random Situation	**Observation 1**	**Observation 2**	**Observation 3**
Measure the noise level at school	Noise level is very loud during recess.	Noise level is null during recess.	Noise level is louder during recess than during class.
Record waiting time at school snack bar	Waiting time is less than a couple of minutes.	Waiting time is more than an hour.	Waiting time is longer during recess than during class.

ACTIVITY 1

Work in pairs

For each situation:

a) How likely do you think each observation is?

b) Would you say that some observations are more likely than others?

	Possible Observations		
Random Situation	**Observation 1**	**Observation 2**	**Observation 3**
Counting the number of people in the schoolyard	There's no one in the schoolyard during recess.	A few people are there during PE class.	The schoolyard is more crowded during recess than during class.
Recording how long it takes for the schoolyard to clear out after recess	The schoolyard is empty right after the bell rings.	The schoolyard takes less than 5 minutes to empty.	The schoolyard takes less than half an hour to empty.

ACTIVITY 1

Whole class discussion

- What words did you use to talk about situations you considered very unlikely?
- Why do you say one observation is more likely than another? What are you basing that on?
- What made you think that situation was “less likely” than the one another group suggested?

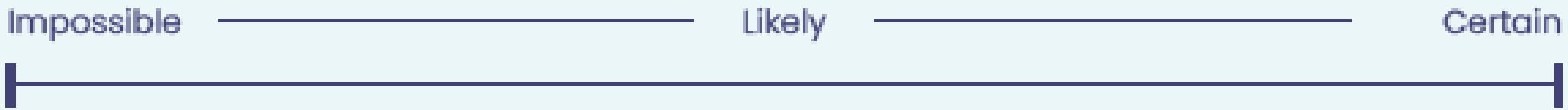
CONCLUSIONS

- In random situations, observations can have different **levels of likelihood.**
- To describe these levels, we will consider an observation that never occurs as *impossible*; one that always occurs as *certain*; and one that may occur, but doesn't always, as *likely*.
- The presence of likely observations is what gives a situation its random nature.

LEVELS OF LIKELIHOOD

Diagram

The levels of likelihood can be represented in a diagram like the one below, where observations that are more likely to occur are placed closer to Certain, and those that are less likely are placed closer to Impossible.



ACTIVITY 2

1

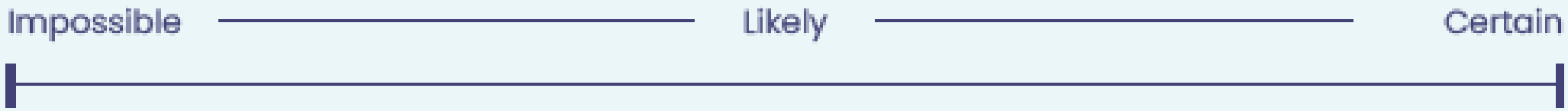
In groups, classify the following observations according to their level of likelihood as “Impossible,” “Likely,” or “Certain”.

a) It will be cloudy tomorrow morning.
b) It rains in Puerto Montt on a winter day.
c) Toast with jam falls jam-side down.
d) A cat lands on its feet.
e) I won’t tell anyone the gossip I just heard.
f) The sun rises in the morning.
g) The moon falls to Earth.
h) A rainbow appears in the sky after the rain.
i) I win five rounds of rock-paper-scissors in a row.
j) Chile qualifies for the next men’s World Cup.
k) Alexis Sánchez wins an Olympic medal in archery.
l) I’ll get an A on the next math test.

ACTIVITY 2

2

Place the previous observations on the diagram below.



Note: The closer an observation is to “Certain,” the more likely it is to happen. On the other hand, the closer it is to “Impossible,” the less likely it is to happen.

ACTIVITY 2

3

Compare the diagrams from each group and reflect on the following questions:

a) Are there differences in the level of likelihood assigned to each observation?

b) Why do you think this happens?

ACTIVITY 2

Whole class discussion

- How did you decide whether something was 'likely'? What did you base your decision on?
- Did you all agree on impossible observations? What about certain ones?
- Why do you think different groups placed the same events in different positions on the scale when they considered them 'likely'?"

CONCLUSIONS

- “Certain” and “impossible” observations tend to be consistent, but **the greatest variability** in likelihood appears with “likely” observations.

- The assessment of the likelihood level **can vary depending on each person’s perceptions.**

ACTIVITY 3

In groups, imagine the following situation:

When you arrive at a birthday party, you receive a surprise candy bag. The birthday girl put them together in a bit of a hurry, so the bags are quite different from one another. When you receive your bag, you must take out one candy at random (without looking) and observe its color.

ACTIVITY 3

1

For each of the following bags, indicate how likely it is that the candy you draw **will be red**. Justify your answer in each case.

ACTIVITY 3

2

How does chance play a role in this situation?

3

Among the situations you classified as “Likely,” which one has a higher level of likelihood? Justify your answer.

ACTIVITY 3

Whole class discussion

- What level of likelihood did you assign to each bag in terms of drawing a red candy: impossible, likely, or certain? Is there any bag where it's impossible to get a red candy?
- What information did you use to decide which bag had a higher or lower likelihood of drawing a red candy?
- In which bags would you say chance is involved? Does chance play a role in bags where getting a red candy is impossible or certain? Why?

CONCLUSIONS

- There are situations in which it is possible to estimate the level of likelihood more accurately when all relevant information is available. In these cases, the assessment of the likelihood level does not depend on personal opinions. For example, in question 1, the colors of all the candies in each bag are known, so the likelihood of each observation is assessed objectively

LESSON SUMMARY

- We learned to qualitatively assess the **likelihood level** of an observation from a random situation using the terms “impossible,” “likely,” and “certain.”

- We used a diagram to **visually represent the level of likelihood**, where observations that are more likely to occur are placed closer to “Certain,” and those that are less likely are placed closer to “Impossible.”

LESSON SUMMARY

- We recognized that there is **implicit subjectivity** when assessing the level of likelihood, which depends on the perceptions and experiences of the person making the observation.

- We introduced the idea that **by considering more information** about a situation, it is possible to reduce the subjectivity involved in assessing the likelihood of an observation.

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