



DRAGON LESSON: BREATH PROBABILITY

CURRICULUM LEVEL 3

ACHIEVEMENT OBJECTIVE

S3-3: Investigate simple situations that involve elements of chance by comparing experimental results with expectations from models of all the outcomes, acknowledging that samples vary.

PURPOSE

Compare expected results about the chance a dragon has a particular attribute with experimental results.

DESCRIPTION

Students estimate the likelihood the next dragon will have a particular attribute. They back-up their estimates with reasoning based on the dragon cards they have. The students then test their reasoning with a simulation and compare their expectations with the experimental results.

EQUIPMENT

- One pack of Dragonistics Data Cards
- A way for students to record their results

KEY VOCABULARY

Experimental results, probability, simulation, trial.

ACTIVITY

Students should be familiar with the dragon cards and the data they contain. Remind them of the four different dangerous breath types and their symbols.



Fire



Ice



Acid



None

You can order Dragon Cards and download other free lessons at CreativeMaths.net



STORY

Dr Nic is wary of dragons with fire breath. Each day she visits a small island to monitor the first dragon she finds. She wants to know how likely it is that this dragon will have fire breath.

EXPECTATIONS OF CHANCE

Organise the class into groups of two or three. Give each group 20 dragon cards, the dragons on their island. Each group is investigating a different island.

Each group can investigate Dr Nic's question or make up their own. They choose an attribute to investigate and record their question. The question should be about the first dragon Dr Nic meets:

E.g., What is the chance that the first dragon has fire breath?

What is the chance that the first dragon is 7m tall or taller?

Each group looks at their dragons and discusses what they expect, with reasoning to back up their thinking. Have them record their expectations.

General reasoning progression is non-probabilistic ("fire is best"), probabilistic language ("unlikely"), a whole number (6 dragons), a subset statement (6 out of 20), a probability (6/20, 0.3, 30%). The teacher might visit a few groups, listen to their general reasoning then ask questions to help progress their reasoning.

SHARING REASONING

Once groups have had time to develop their expectations, each group shares their expectations and reasoning with another group. The students question each other's reasoning to help understand it.

SIMULATION

This part of the lesson will test expectations against what could happen in practice. This is done by simulating what might happen to Dr Nic 20 times. We could think about this as recording what happens to Dr Nic on 20 different days, or replaying the *same day* 20 different ways to see what could have happened.

Each group will use their dragon cards to simulate the situation. The simulation involves 20 trials. (You can use a different number of trials but this needs to be decided before starting the simulation.)

SIMULATION – FIRST TRIAL

The first simulation trial has all groups performing each step at the same time. This ensures everyone knows how to run a trial and what to record.

Each trial works as follows. Make sure all groups have finished each step before moving on to the next one.

1. Shuffle all of the group's dragon cards, thoroughly.
*This ensures the dragon order is random and each trial is independent of the previous one. It is important to include this step in **every** trial.*
2. Stack the dragon cards facedown, take the top card and look at the dragon.
*This is the **first** dragon that Dr Nic meets today.*
3. Record whether the first dragon matches the criteria (e.g., has fire breath) or not (e.g., has a different dangerous breath). Tally marks are useful.
The table can either have two columns (fire breath and not fire breath) or four (one for each breath type). Instead of tally marks students might record the current number, crossing out the previous one.
4. Replace the dragon card in the pile.
This ensures that the same dragons are on the island each day. It is possible for Dr Nic to meet the same dragon first on different days.

SIMULATION – REMAINING TRIALS

The groups now complete the remaining trials on their own. They need to repeat the four steps exactly as they did for the first trial and to keep track of the number of trials they perform. It may be useful to provide a recording sheet like the one opposite.

Once complete, each group compares the results of the simulation with the expected results considering the following questions. Do the results match the expected results? Why might they be different?

FEEDBACK

Each group reports what they found to the class. Make connections between the findings of different groups. Ask what they expect to happen if you ran the lesson again using exactly the same groups and exactly the same dragon cards. Would the results be exactly the same? Why?

FOLLOW UP LESSONS

Since the results will differ each time, students need more exposure to probability to build intuition and fluency.

Dragon Lesson: Breath Probability

The lesson can be repeated using exactly the same sets of dragon cards (the same islands). Compare the results between the two simulations for an island.

Or, the lesson can be repeated using different questions. Groups might look at a different attribute, the second dragon or even the first two dragons.

Where to next? More ideas at CreativeMaths.net – and do give us feedback as to what worked for you.

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Record Sheet

Steps for each simulation trial

1.  Shuffle
2.  First dragon
3.  Record
4.  Replace

Trials

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

Record

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