ELEMENTARY MATH PROJECT

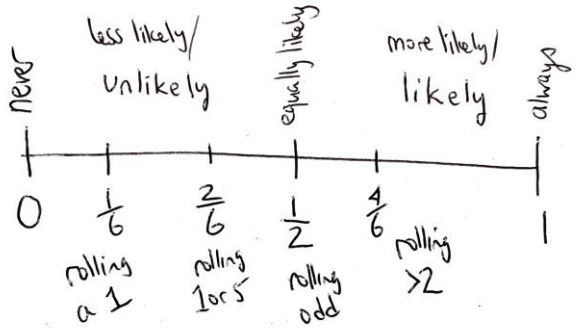
GRADE 5
Data and Probability
Key Number Concept 1: Double Bar Graphs & Probability Experiments
Sample Week at a Glance

This sample week integrates both data and probability key concepts for this grade level.

Prior to the sample week below, students will have had experiences with analyzing and interpreting various graphs as part of instructional routines such as Data Talks and Slow Reveal Graphs. Up until this point, students will not have seen any double bar graphs during this routine. During these talks, students also connect their knowledge of probability from previous years to help interpret the data. The probability focus here would be on the likelihood of events using comparative language. Students will also have had experiences creating single bar graphs.

To prepare students for representing probability as a fraction, it is recommended to have discussed fraction concepts with your class prior to the lessons below. Specifically, students will have had practice representing, comparing, and ordering fractions as well as working with equivalent fractions.

Monday	**Lesson Topic: Introduction to Double Bar Graphs** **Before:** Data Talks. Use a double bar graph that is relevant to the students in your class. Here is an example. What does the graph tell us? How is this similar/different to a single bar graph? Why would you want to use a double bar graph vs a single bar graph for this data? **During:** Ask students to brainstorm some questions they might want to explore where comparing two things is useful. You can do this in small groups while you give support to those who need it, and then have students share as a class. Record these ideas for all students to see. As a class, vote on one to explore that is doable in class. Then do it! By a show of hands, have students answer the question while you record the data in a tally chart which clearly shows two columns that can be put into a double bar graph. Individually or in pairs, ask students to graph the data on grid paper or a whiteboard with a grid. Adapt by leading a small group of students through this process or doing it as a whole class if needed. Extend by asking students who are done early to check in on their peers for support and feedback. **After:** Reconvene as a class. Share how you did it or use one or more student samples as teaching points. Did students transfer the data correctly? Is there a

	title? Are axes labelled appropriately? Then ask students to interpret the data. What does the data tell them? How is this useful? Ask students to hand in their graphs for formative feedback. Based on this, you may need to walk students through another day of co-creating a double bar graph and interpreting it.
Tuesday	**Lesson Topic: Creating and Analyzing Double Bar Graphs** **Before:** Slow Reveal Graphs. Select a double bar graph that your students might find interesting. Here are some examples. Get students to share what they notice and wonder at each step of the reveal. What does the graph tell us? What does the double bar graph tell us that a single bar graph would not? **During:** Math Workshop. Some ideas include: ● Meet with teacher to go over the key points in creating a double bar graph and how to interpret the data ● Some examples of double bar graphs that are incomplete or have errors. Students have to find these and describe them or fix them. ● Examples of double bar graphs. Students have to interpret them and write three ideas that the data shows. ● Online practice (e.g., Mathletics) ● Data is given. Students create a double bar graph by hand. ● Data is given. Students use technology (e.g., MS Excel) to create a double bar graph following instructions (written or video). **After:** Class share on Math Workshop. Then ask students to write in their math journals. What do they understand or feel good about? What are they still needing help with? Collect for formative feedback.
Wednesday	**Lesson Topic: Probability Interlude** **Before:** Number Talks. Do a number talk with a simple probability task such as rolling a die. Ask about the probability of… ● Rolling a 1 ● Rolling a 1 or a 5 ● Rolling an odd number ● Rolling a number greater than 2 How do students describe their probabilities? Students may use language like “likely” or “unlikely”. Some students may say things like “1 in 6” or use a fraction. Record these ideas together using a graphic like a number line.  You may need to prompt these ideas. Then formalize how to write probability as a fraction:

	Probability of event = Number of desired outcomes / Total number of outcomes **During:** provide each student with a die. Students work in pairs to complete a die experiment similar to the one outlined here but without using the terms theoretical and experimental probability. They roll a die 60 times. They graph their results. You can make a double bar graph by plotting each student's result in the pair side by side. What is the probability of rolling each number 1 through 6? Then connect this activity to the number talk with the follow up questions such as: ● What do you expect the probability to be for… ○ Rolling a 6 ○ Rolling a 2 or 3 ○ Rolling an 8 (probability is 0) ○ Rolling an even number ○ Rolling a number less than or equal to 4 ○ Rolling a number greater than 0 (probability is 1) ● How did your experimental results compare? Adapt by having pairs work together to do a single bar graph instead or simply record results in a chart. Extend by having students use equivalent fractions to compare their results more accurately. **After:** Meet as a class to discuss the activity. Why are the expected results (often) different from the actual results? Exit ticket: Give students an example with a spinner with equal regions (e.g., 1 green, 2 reds, 1 blue) to see if they are able to write probabilities as fractions for the questions like: ● Spinning green ● Spinning red ● Spinning red or blue ● Not spinning blue Use this as formative feedback for the next lesson on probability. **Alternatively:** If students need more practice mastering double bar graphs, you could give students additional practice and save the Probability Interlude lesson until next week.
Thursday	**Lesson Topic: Double Bar Graph Project (Day 1)** **Before:** Display a variety of double bar graphs, ideally with different ways to compare data (i.e., not just "boys" vs "girls"). Use a search engine like Google to help you. Have students work in pairs or small groups to ascertain what the survey question was for each graph and why they think so. Share some of these as a whole class. Discuss what makes a good survey question, why we need to be sensitive about the questions we ask (e.g., boys vs girls for gender non-conforming students), and how the question will compare data (i.e., create a double bar graph). **During:** Students are asked to create their own survey questions that would be suitably graphed with a double bar graph. Have students work in pairs to brainstorm a variety of questions they could ask. A few students can share some of their examples to the class for inspiration. Then students select ONE survey question that they will make the basis of

	their project. Again, they can do this in pairs. What answer options will they provide (if any)? How will they be comparing data? Is their question relevant and sensitive to the students they will be asking? The teacher could provide a template for this if necessary. **After:** Have a class discussion on how the question process went. Ask pairs to swap their questions with another group (perhaps more than once) to get some feedback. You may want to collect them to give your own feedback. Ask students how they will be collecting the data. Discuss some ways to do this efficiently and effectively. For example, how will they know they have surveyed everyone? Not double counted someone? Will they make a tally chart? This will take place tomorrow. Some students may want some time now to think this through.
Friday	**Lesson Topic: Double Bar Graph Project (Day 2)** **Before:** If you provided feedback for survey questions, give students some time to make any necessary changes. Then ask students to collect data from their peers and to record it in an organized manner (e.g., tally chart). **During:** Once data is collected, you might consider having students individually display the data and draw conclusions for assessment purposes. Alternatively, students work together but you can conference with them to assess each student's understanding. In any case, students will display their data using a double bar graph which includes a title and labelled axes. They are asked to make at least three inferences/conclusions based on the data. **After:** Have students meet together to discuss how the project is going. Ask some reflection questions, which you may decide to have students answer as part of their projects. Here are some examples to choose from: ● What did you enjoy most about this activity? ● What did you find most challenging? ● What did you learn from this activity? ● What would you do differently next time? Students will likely need more time to polish their displays and to flesh out their conclusions or reflections. Consider providing some additional feedback before the final submission.

In the week to follow, provide students with some additional time to finish their projects. Once all students have finished, ask students to share their project findings. Here are some ways to do this efficiently:

- Gallery Walk. Students tour the class looking at other students' displays and analysis of their data. As a class, a few students could share what they learned or found interesting.
- Small Group Share. Put students in small groups of around 4 students to take turns sharing their projects with one another. As a class, a few students could share what they learned or found interesting.
- Speed Pair Share. Students find another student to share their project for a few minutes. Then the teacher says "next" and students find a new partner. This can be repeated a few times. As a class, a few students could share what they learned or found interesting.

In addition to the above, the week continues with more probability experiments that give further practice of the probability concepts learned from the previous week. Alternatively, if you did not get to the Probability Interlude lesson, you could start with this lesson and then do more probability experiments with dice, spinners, cards, marbles in a bag, etc.

Suggestions for Assessment

By the end of grade 5, students should be able to ask a survey question to compare data and display the data using a double bar graph. They should be able to make inferences based on the data and draw conclusions. Students should be able to reflect on this process as well.

By the end of grade 5, students should be able to predict single outcomes in a variety of probability experiments (e.g., spinner, rolling a die) and represent the probability of a single event using a fraction.