

E-A. – Freestyle Looming and Probability

Grade 12 Foundations of Math

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Students engage in the process of designing, which is a fundamental process in any culture's mathematics whether the culture is Indigenous or Western. In this two-day lesson, Indigenous freestyle looming becomes a segue into an important probability concept – constructing a probability tree diagram without replacement.

A. Indigenous Perspectives

Show and discuss images from the PowerPoint (see Appendix A). Discuss and expand on the following points:

1. Before contact with Europeans, what looming materials did First Nations people use? The answer is: They used porcupine quills, seashells, deer antlers, and pinecone scales. Many designed and constructed **wampum belts** to display and record stories, especially *explaining* treaty relationships between one First Nation and another.
2. First Nations people also recorded major events by using buffalo robe stories, pictographs, birch bark scrolls, and lithographs. Major events worth recording included good hunting areas, years of poor hunting or harvesting, and years of sickness affecting the tribal community.
3. After contact, other materials for looming became available such as glass and plastic beads. Beads of different types and sizes are currently used. Glass beads, however, absorb heat in the summer, so they make a person feel even hotter. In the winter, glass beads become cold which cools the person. Moreover, glass beads are heavy to wear. Today, First Nations people prefer plastic beads.
4. Appendix A lists URLs for instructional video showings directions on how to do **freestyle looming**. Teachers should be acquainted with the process, so they can help students get started on their looming project.
5. Students learn freestyle looming by designing their own patterns and then constructing a piece of artwork according to their **coloured design**. About six different colours of beads work well. Students can make objects such as key chains, bracelets, or small artifacts in about 20 to 30 minutes. This is an example of mathematical designing and two-dimensional reasoning. In the context of an Indigenous culture, it can be called "Indigenous mathematizing."

B. Western Math Perspectives Found in a Curriculum

1. Introduce probability. Step by step, demonstrate how to calculate and construct a **probability tree diagram without replacement**. For example, grab a handful of black and white beads mixed in a glass container. Count how many beads were chosen in total (e.g., 23) and determine the number of each colour (e.g., 13 black and 10 white). Place the handful of beads in a container to hide the beads from view in order to make sure the selection of individual beads is indeed random. Demonstrate how a probability tree is constructed based on the random selection of three beads, one at a time. See Appendix B.
2. Students will repeat this process with their own initial handful of beads that will naturally have different numbers of black and white beads. Students will calculate their final probability of choosing said beads and the sequence in which they were chosen. Who had the lowest probability? Highest? (see section Assignment)

C. Designing and Creating Loom

1. Designing their loom – students will plan their design for their keychain loom. They will need to use their three randomly chosen beads (see section B.1) and can add up to 50 more beads (various colours) to their design. Students will create their design on graph paper, so they can visualize their process.
2. Making their loom – students will construct their keychain or artifact using their design.
3. Write a sentence that tells what your loom design means to you. Hand this in with your completed loom object.

D. Comparing Indigenous Mathematizing and Western Math:

Show the wampum belt and a probability tree, side by side. Ask, “What kind of story can each of them tell us?” (The probability tree is part of the language of math.) Accept any reasonable answer. Draw students’ attention to the fact that they **both tell two different stories**.

E. Assessment

1. Students will hand in their probability trees with the following answers attached.
 - a. What is the probability of choosing all black?
 - b. What is the probability of choosing all white?
 - c. What is the probability of choosing at least one black?
 - d. What is the probability of choosing at least one white?
2. Students will hand in their loom artifact plus their description of what its design means to them.

F. Timeline

Day 1

1. Use the PowerPoint presentation to discuss Indigenous perspectives and historical context of looming. Students will also learn the looming process from information in the PowerPoint.
2. Introduce probability and demonstrate how to build a probability tree without replacement by selecting three beads from a container of mixed beads.
3. Students will choose their three beads (see section B.1) and create a probability tree.
4. Students will design and begin to create their loom.

Day 2

1. Students finish their loom or begin a new one if they finished the previous day.
2. Revisit the probability tree. Show how they can use their probability tree to answer the “Assessment” questions. Students will hand in their tree, calculations, loom artifact, and statement of what it means to the student.
3. Comparing Indigenous mathematizing and Western math.

G. Resources

1. Examples of probability trees without replacement in other contexts:
<https://math.tutorvista.com/statistics/probability-without-replacement.html>, etc.
2. Books:
Beadwork. ISBN 9781897541258.
Wapikaniy: A Beginner’s Guide to Métis Floral Beadwork. ISBN 9781896832555
Beadwork Techniques of the Native Americans. ISBN 9781929572113
3. Videos: see Appendix A.

Appendix A

First Nations Math: Freestyle Looming

Short Form

October 2018

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Porcupine Quill Uses



The quills of the porcupine were very useful for Native Americans. They would use them for hair brushes and other grooming. They would also master a practice that is still used today - - quillwork. Quillwork is an art form where porcupine quills are woven in different forms including loom and embroidery. The quills would be reshaped and dyed using natural plant-based dyes and used for multiple purposes, such as embellishing clothing.

<https://slideplayer.com/slide/13594311/>

Before contact, First Nations people used materials from Mother Earth to decorate their hide and fur clothing. They used items such as porcupine quills, deer antler buttons, pinecone scales, seashells, and shell buttons. Dyes were extracted from plants.



A quillwork knife sheath

Before the introduction of glass beads, quillwork was a major decorative element used by the peoples who resided in the porcupine's natural habitat [1] that included Indigenous peoples of the Subarctic, Northeastern Woodlands, and Northern Plains. The use of quills in designs spans from Maine to Alaska.[2] Quill working tools were discovered in Alberta, Canada and date back to the 6th century CE.[3]



<https://en.wikipedia.org/wiki/Quillwork>



https://groups.google.com/forum/#!topic/indigocrystalchildren/i7h5BH_kyhc

Early Wampum belts (tend to be created more by the Ojibway and Mohawk people) were created by using a looming technique with porcupine quills. The patterns often reflected stories. Experiences were also recorded on buffalo robes, painted rocks (pictographs), carved rocks (petroglyphs), and birch bark scrolls. Wampum belts recorded early treaty relations and negotiations. First Nations people had no paper or writing tools, but they had inventive ways to record history.

URLs for Other Photos Used in the Original E-A Appendix A (19.5 MB)

You could assemble a vivid PowerPoint from Appendix A for your students using the preceding pages and what follows.

1. Here are more examples of porcupine quill looming using Indigenous design patterns. This is Indigenous math!

<https://www.penn.museum/sites/journal/630>

2. Then the early settlers introduced beads to First Nations peoples through early trading. Beads were added to the Indigenous art of looming.

<https://crafts.tutsplus.com/tutorials/jewellery-fundamentals-how-to-use-a-bead-loom--cms-21845>

<http://plbrown.blogspot.com/2011/01/so-many-questions-wampum-belts-part-2.html>

<http://www.modeknit.com/2006/04/maundy-thursday.html>

When contact initiated trading between the Early Europeans and the First Nations people. The first beads were made of glass, which turned out to be both too cold in the winter and too hot in the summer. Later, the introduction of plastic beads changed everything! There are various sizes of beads beginning from the seed bead to the pony bead. Looming was also a technique that led to some beautiful artwork.

3. Some beaded loom projects:

<https://www.pinterest.ca/pin/362891682453920324/>

<https://www.pinterest.ca/pin/191473421634795892/>

<https://www.pinterest.ca/pin/439663982343413011/>

<https://www.pinterest.ca/mornmagic/jewelry-bead-loom/>

<https://craftgawker.com/post/tag/loom-beading/>

Most looming designs are attached to a surface, such as leather to make a belt, or are sewn onto a purse or jewelry surface.

4. Pony bead projects:

<https://www.pinterest.ca/pin/182184747397470477/>

<https://eclecticlamb.com/2013/07/23/3-easy-pony-bead-projects/>

<https://arrowskidsclub.wordpress.com/category/pony-bead-crafts-2/>

<http://www.patcatans.com/craft-projects/holiday-crafts/back-to-school-crafts/football-pony-bead-patterns>

<https://www.horizongroupusa.com/march-national-craft-month/>

<https://www.ladyb.com.au/pony-bead-projects-books>

Contemporary beading has become very commercialized and unique in any design.

5. Making single loom bracelets:

<https://www.youtube.com/watch?v=L1yn0ugeR9k>

https://www.youtube.com/watch?v=ON0gQooE_PA

<https://www.pinterest.ca/pin/182184747397470477/>

These are examples of free loom stitch bracelets. It uses the looming technique without the need of a loom.

6. Now you are going to do your own design

<http://perlerbeaddesigns.blogspot.com/2012/03/guitar-hero-anyone.html>

<https://www.vectorstock.com/royalty-free-vector/cross-stitch-heart-pattern-vector-1213941>

https://play.google.com/store/apps/details?id=com.crochetdesigns.beadloom&hl=en_US

Most bead artists use graph paper to create a design before they begin their pattern.

Appendix B

An Example of a Probability Tree with No Replacement (beginning with 23 black and white beads)

