MACIMISE

Unit Overview
FRACTIONS WITH MATS

Enduring Understandings

Fractions found in Kosraean cultural activities, particularly woven mats

Performing operations on fractions

Skills

Making mats with simple designs

Comparing fractions found in woven mats

Adding and subtracting fractions

Knowledge

Traditional patterns in mat weaving

Fraction components, numerical representations and basic operations

Learning Strategies

Exploring and discovering

Modelling and observing

Participating in a group

Rationale

This plan will provide the students an opportunity to make paper mats and to learn fractions using the designs on the woven-paper mats.

Goals

Students will recognize the mathematics embedded in the process of weaving a mat and will improve their mathematical knowledge and skills.

Essential Questions

How can we use woven designs on a Kosraean mat to think about fractions?

Background

Rhoda Velasquez prepared this set of lessons because mat weaving is a common activity in Kosrae, Federated States of Micronesia. She wants students to discover that fractions are found in both common and cultural objects and activities. They are part of everyday life, so understanding fractions helps us appreciate the patterns in culture as well as in nature and in practical things people do.

Assessment

The teacher observes students' participation, process and progress as they develop and apply specific skills and knowledge. The teacher asks specific questions to confirm learning and assigns writing and initiates conversations to support learning process (e.g., reflection, knowledge).

Lesson One
INTRODUCING FRACTIONS

Focus
Fractions found in mat weaving

Objectives: *Students will*
- describe the meaning of a fraction as part of a whole.
- identify and define numerator and denominator.
- determine the fraction of a given part of a set or whole.
- make a simple design mat reflecting Kosraean culture.

Materials Needed
Story of Sru (see resource RL1)

Sample designs for students to choose from

Colored paper strips of equal length and width

Scotch tape

Paper and pencils

Teacher Activities

1.1. Introduce fractions using the story about Sru (See the resource RL1).
Ask students to write notes about fractions given in the story.

1.2. Facilitate the mat weaving activity.
Ask students to form groups of three.
Invite them to draw lots so each group can pick a different design for the mat making activity.
Direct students to begin weaving their mats (each student in a group makes the same design).

1.3. Ask students to determine the fraction(s) represented by the design in their woven paper mats.
Ask them to identify the numerator and denominator.
Ask them how they knew which was which.

1.4. Ask students to present their group's work to the class.
Have them explain the information they used and the process involved.
Prompt a discussion about what they learned and how it would be important learning.

Student Activities

1.1. Listen and make notes.

1.2. Choose the design. Observe and begin mat weaving by copying the given design.

1.3. Discuss ideas and determine the fraction(s) represented by the design on the mat.

1.4. Present their work and share ideas about the experience and the learning.

Lesson Two
COMPARING FRACTIONS

Focus
Comparing fractions, particularly inequalities

Objectives: *Students will*

- read and write the fraction for a given part of a whole.
- compare fractions represented by designs, using symbols for equal (=), greater than (>) and less than (<).

Materials Needed
Woven mats from Lesson One
Paper and pencils

Teacher Activities

Student Activities

2.1. Show students the mats that were woven in Lesson One.

Ask students to name and write the fractions representing portions of the woven mats. For example,

- If a design is made of 5 strips, and 3 strips are white and 2 strips are brown, then the fractions are 3 parts of 5 (3/5) and 2 parts of 5 (2/5).
- If a design is made up of 6 strips, and 3 strips are white and 3 are brown, then the fraction for <u>each</u> color in the design is 3 parts of 6 (3/6).

2.1. Name the fractions.

2.2. Show two mats at a time and have students make comparisons of the fractions, e.g.,

- Which has less dark-colored design?
- Which has more dark-colored design?

Ask students to write the comparisons, using the symbols =, < or > and to explain how they know, using fractions.

2.2. Participate by making comparisons.

Compare the fractions and write them down using the symbols =, < and >.

2.3. Divide students into groups of four.

Give each group several different mats (e.g., 4 or 5 mats).

Ask the groups to write down as many fraction inequalities as they can find among the fractions representing the dark-colored portions of the designs.

2.3. Discuss to decide fraction inequalities.

2.4. Invite students to share their work.

Encourage groups to explain what they learned and why it is important.

2.4. Present work, as a group, and share ideas.

Lesson Three
EQUIVALENT FRACTIONS

Focus
Fractions that look different but are equivalent

Objectives: *Students will*

- express fractions to name a given part of a whole.
- determine fractions that are equivalent, using the symbol for equal (=).
- draw pictures that show fractions that are equivalent.
- identify fractions with the same denominator.

Materials Needed
Woven paper mats
Tape or pins
4 large sheets of blank paper (chart paper) for posting on 4 walls
Markers

Teacher Activities

3.1. Show the woven paper mats.
Ask students to recall the fractions that represent the designs on the woven paper mats.

3.2. Identify each mat (A, B, C) and post an even number of mats on the walls.
Divide the class into four groups, each group choosing one wall.
Ask the groups to identify designs that have the same amount of dark even though the number of strips is different.

- e.g., 2 brown strips in a design of 4 strips (2/4) or 1 brown strip in a design of 2 strips (1/2) or 3 brown strips in a design of 6 strips (3/6).

Ask each group to write the fractions on the blank paper on their wall. (Give students about 4-5 minutes to look at all the mats on their wall.)
Ask the question: What do we call two fractions like this (1/2 and 2/4)?
Help students recognize that the fractions are equal and write the word "equivalent" on the board.
Ask students to identify fractions with the same denominator.

3.3. Direct groups to move clockwise around the room, taking 2-3 minutes at each wall to visit other groups' work.
Encourage them to analyze, check and/or critique other groups' work.

3.4. Have students present their work and their findings.
Invite them to ask questions and share what is important in the learning.

Student Activities

3.1. Respond to questions and prompts by the teacher.

3.2. Work in groups to examine the various mats posted on the wall.

Determine the fractions for the mats and decide which mats are described by equivalent fractions.

Use the word equivalent to describe fractions that can be represented with the equal sign: 1/2 = 2/4

3.3. Examine the other groups' walls and check their fractions, noting any possible errors

3.4. Present findings. Ask questions and share ideas.

Lesson Four
OPERATIONS WITH FRACTIONS

Focus
Adding and subtracting fractions

Objectives: *Students will*
- express fractions to name given parts of a whole.
- use woven mats and other objects to model fractions and solve addition and subtraction problems involving related denominators.

Materials Needed
Woven paper mats from Lesson One
Paper and pencils

Teacher Activities

4.1. Review fractions representing the dark portions of the designs on the woven mats.

4.2. Show one mat made with all white paper strips, one with all brown paper strips and some other mats with mixed brown and white designs. Ask students to give the fractions to name the brown portions in each.

4.3. Pose problems involving fractions for the students to solve.

Sample Fraction Problems (given orally)
1. Imagine that that each mat shows a garden.
   - The all-brown mat represents a garden that is all planted; the all-white mat shows that nothing has been planted.
   - How could we show 1/6 is planted? What about 3/6?
2. Imagine a garden is planted 1/6 with taro and 3/6 with ginger.
   - How much of the garden is planted? How much is not?
   - How could we show this with a mat?
   - What would we write (including equivalent fractions)?
   - How much more ginger is planted than taro?
3. Imagine a garden is planted 5/12 with taro and 2/12 with ginger
   - How much is planted overall?
   - How much more is taro (than ginger)?
   - How much less is ginger (than taro)?

Student Activities

4.1. Give answers by calling out fractions.

4.2. Listen, ask questions, and give responses.

4.3. Listen and suggest answers to the problems:

1. *All white is 0; all brown is 1 (or 12/12 or 8/8 or…); to show 1/6, then 1 strip in 6 is brown; to show 3/6, 3 of the 6 are brown.*

2. *We can count one-sixth and three-sixth portions together to see four-sixths, so we write 1/6 + 3/6 = 4/6 = 2/3. 3/6 ginger is 2/6 more than 1/6 taro, so the difference is 2/6 (= 1/3).*

3. *five-twelfths and two-twelfths is seven-twelfths planted, so we write 5/12 + 2/12 = 7/12 5/12 (taro) - 2/12 (ginger) means the difference is 3/12 or 1/4. Taro is 1/4 more; ginger is 1/4 less.*

Teacher Activities

Student Activities

4.4. Continue to pose problems, using other objects and model with a woven mat.

For example, imagine that a design on a mat is made with **four** strips and the four strips represent one pound of butter.

Also imagine that each brown strip represents the amount of butter that is used in a recipe.

- If a design has 3 brown strips, how much butter did I use in my recipe?
- How many strips are brown if I use 1/4 pound of butter in one recipe and 1/4 pound of butter in another recipe?
- If I use 3/4 pound of butter in one recipe and 1/2 pound of butter in another recipe, how much butter have I used?
  (NOTE: that one four-strip design is not enough to meet my needs.)

4.4. Listen to the problem(s) and respond.

If 4 strips is equal to one pound, then 1 strip is 1/4 of a pound.

3 brown strips means I used 3/4 of a pound.

2 strips are brown

I need more than one pound of butter. I see that one-half is the same as two-fourths, so

3/4 + 2/4 = 5/4 or 1 1/4

This means that for the mat to model the answer, we use one full design (4 strips) plus 1 strip from another design: 4/4 + 1/4 = 5/4, or 1 and 1/4 designs.

4.5. Put students into groups.

Ask students to create one or more similar problems for other groups of students, using designs from the mats as visual representations of the fractions.

Direct students to determine the answers to their problems and to write the answers in fractions.

4.5. Work in groups to prepare their problems and then solve them to determine the answer.

4.6. Have groups present their problem(s) to the class one at a time so that other students (in groups or individually) can solve each one.

Guide students to discuss solutions and help them determine a correct answer if there is any disagreement about the solution to a problem.

Discuss the learning, asking students to share what is important.

4.6. Participate by posing a problem and discussing the solution and by helping solve other groups' problems.

Discuss the learning and share what is important.

Lesson Five

WHEN ARE FRACTIONS EQUIVALENT?

Focus
Equivalent fractions identify equal portions of a whole

Materials Needed
Woven paper mats from Lesson One

Paper and pencils

Objectives: *Students will*

- express fractions to name given parts of a whole.
- solve addition and subtraction problems using woven mats as visual representations.
- create problems (and solutions) involving fractions.

Teacher Activities

5.1. Use mats to review knowledge of equivalent fractions for equal portions.

5.2. Ask students to choose (or, if necessary, design) mats that represent the answer to a given problem.

Sample Problem
Which mats represent a garden that is planted one-half in taro and two-thirds in ginger?

Consider follow-up questions:

- How much of the garden is planted?
- How do we write this?
- Which part is larger?

Create similar problems using different denominator portions.

Plenary for Unit: Fractions with Mats

Have students discuss what they now know about fractions.

Encourage them to explain how visual representations (like the mats) help them recognize equivalent and non-equivalent fractions.

Encourage them to talk about how to apply this knowledge in daily life.

Student Activities

5.1. Listen, ask questions and make comments.

5.2. Listen to the problem(s), discuss, and make suggestions for solutions and answers

e.g.,Choose mats with designs showing halves and sixths. Notice that one-half covers the same as three-sixths of a six-strip mat.

Write 1/2 = 3/6 and 1/3 = 2/6 so 1/2 + 1/3 = 3/6 + 2/6 = 5/6

The taro part of the garden is 1/2 or 3/6 and the ginger part is 1/3 or 2/6. The taro part is larger by 1/6: 3/6 - 2/6 = 1/6.

Discuss learning and express how the knowledge of fractions is important (including how they use fractions in their daily lives).

❖ Resource 1: Sru and the Fractions

The following story helps introduce the concept of fractions.

Narrator: The bell rang and the teacher said, "Look for the meaning of fraction, as your assignments".

All students went out of the room and other headed to their home. After school hours, Ninac Sepe brought her son Sru to the craft shop. They went inside and talked to the manager of the shop.

Sepe: Lenwo Ninac Mary, kom fuhkah?

Mary: Wona, kom pe?

Sepe: Wona, pe. I am here to make a proposal with you, can we talked for a second?

Sepe: (attending to his son and whispering) Sru. behave, Sit down here and wait for me, okay?

Sru nodded and his mother went to the manager's office. But after few seconds, Sru got curious and looked around.

Sru: (Talking to the Sales lady) Ninac, would you mind if I look around your shop?

Sales Lady: It's okay.

Sru got interested on the plate of colored seashells and started counting. He was surprised by the different colored shells – orange, yellow and white. He wondered as he pinpointed each color while silently counting: 3 yellow, 2 orange and 5 white-colored shells, 10 seashells!

Then his focus went to the weaving in a wristband. He started prying at it, mumbling as he determined the total number of little squares on it – 20 shaded and 20 non-shaded ones, a total of 40.

While Sru was busy determining the total number of little squares in the wristband, his older cousin Penina came and watched.

Penina: Oh, nice counting!

Sru: Older cousin Penina, there you are. It's nice to see you.

Penina: Nice to see you, too.

Sru: I heard that you are a math person and you even win at some math quiz bees.

Penina: (smiling) Hmmm, I just get lucky sometimes. What about you? How are you now in your math class? I could hear you mumbling some numbers.

Sru: I'm fairly average I think, but tomorrow we will study fractions, and I'm quite afraid of it.

Penina: Why, it is not a ghost that you have to be afraid of.

Sru: They say fractions are confusing and totally different.

Penina: Hmmm. Okay. What were you looking at awhile ago?

Sru pointed at the shells and the wristband.

Penina: Okay here it is, (taking the shells) A fraction is used to name parts of a set of objects/things. This is a collection of seashells, so it can be considered a set.

Sru nodded.

Penina: Now, how many seashells are there all in all?

Sru: 10 seashells

Penina: Then how many are colored yellow.

Sru: 3 shells.

Penina: So 3 out of 10 seashells are colored yellow. That is a fraction.

Sru: Really….is that so?

Penina: Yep, just don't forget the word "out of", okay, since it refers to the part of the set.

Sru: Therefore, the white colored seashells would be 5 out of 10, is it correct?

Penina: Correct. It is always in fraction form.

Sru: Can we write a fraction?

Penina. Sure. Here's how it is written: 3/10, 5/10

   3/10 is the fraction, showing that in the set of seashells, 3 are yellow.

   5/10 is the fraction, showing that in the set of seashells, 5 are white.

Sru: So the top number tells you how many colored shells are there.

Penina: Yes

Sru: But why isn't the bottom number the same?

Penina: Hmmm, so where do you think that 10 came from?

Sru: The total number of shells in the jar is 10.

Penina: Right! The 10 shells in the jar make the total number of the set, and that's what the bottom number shows.