

Title: Fractions In Action

Brief Overview:

Students will explore the use of fractions as they develop skills to identify, compare and order, convert and measure whole and mixed numbers. Data analysis will be used to solve multi-step problems, as well as create graphs, charts, and number lines. Upon completion of this unit students will be able to add and subtract fractions and mixed numbers.

NCTM Content Standard

Numbers and Operations
Functions
Knowledge of Measurement and Statistics
Knowledge of Number Relationship and Computations
Reasoning

Grade Level:

4-5

Duration/Length:

4-5 days for 90 minutes daily; one day used for summative assessment

Student Outcomes:

Students will:

- Read, write, and represent fractions or mixed numbers using symbols, models and words.
- Find equivalent fractions.
- Identify and determine equivalent forms of proper fractions.
- Use models to identify equal fractions.
- Find Least Common Denomination
- Use customary units to measure to $\frac{1}{4}$ of inch.
- Compare and order fractions and mixed numbers with or without symbols.
- Locate fractions and mixed numbers on a number line.

Materials and Resources:

Lesson 1

- Student mathematics journals
- Calculators
- Observation check list
- Snap cubes
- Student Resource Sheets 1 & 2

- Teacher Resource Sheets 1 & 2
- Fractions in Action by

Lesson 2

- Centimeter blocks
- Over head centimeter blocks
- Bingo fraction Bingo game card (Student Resource Sheet 3)
- Over head transparency for teacher recording Bingo card (Teacher Resource Sheet 3)
- Student mathematics journal
- Colored pencils
- Colored transparency pens
- Scratch paper
- Observation check list

Lesson 3

- Student math journals
- Ruler using customary units
- Colored pencils
- Colored transparency pens
- Number line transparency (Teacher Resource Sheet)
- Student number line (Student Resource Sheet)
- Bubble Gum Tape (or Fruit Roll Up by the Foot)
- Observation check list (Teacher Resource Sheet)
- Bubble Gum Data chart (Student Resource Sheet 5)
- Transparency data chart (Teacher Resource Sheet)
- Calculators

Advanced Preparation for the *Taz's Treats*:

Teachers should make an overhead transparency of Student Resource Sheet 1 *Taz's Treats* and cut out individual bones for use on the overhead projector.

Teacher needs to use index cards to make proper and improper fractions for *Fraction Memory Game* Teacher Resource Sheet 2.

Development/Procedures:

Lesson 1

Preassessment-

- Write the following word problem on the chalkboard or overhead projector:

Taz had 14 dog treats. How many treats can he get a day in order for them to last 1 week? You must write a number sentence and explain how you arrived at your answer.

- Review with students qualifications for receiving rubric scoring.

- 3 The response demonstrates a comprehensive understanding and analysis of a problem.
 - 2 The response demonstrates a general understanding and analysis of a problem.
 - 1 The response demonstrates a minimal understanding and analysis of a problem.
 - 0 The response is completely incorrect, irrelevant to the problem, or missing.
- Instruct the students to write their answers in their journals. Allow 5-7 minutes for students to answer questions on their own.
 - Solicit one volunteer to share his/her response. After a volunteer has shared, students will be asked to score the volunteer based on the rubric and tell why they felt the response deserved that score. Repeat for one or two more student response(s).

Launch-

- Read a segment of the story *Fractions In Action* (other available fraction literature can be used to assist in gaining student interest and prior knowledge.) Discuss with the students ways fractions are used each day. An example could include “When eating lunch, we often have one whole sandwich. Ask students how they like their sandwich cut, in $\frac{1}{2}$ or $\frac{1}{4}$ pieces. Allow 1 minute for student responses.

Teacher Facilitation-

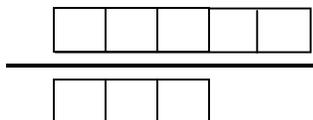
- Display a transparency of Student Resource Sheet1, *Taz’s Treats*. Referring back to preassessment question on the overhead display all fourteen bones and allow students to tell how to divide the bones to show equal groups.
- While separating the bones, point out that the seven groups of two show how many bones *Taz* can have each day, which is the correct response for the preassessment question.
- Using the bones arranged in 7 groups of 2, ask the students to give the total amount of treats and display it as the denominator.
- Review with the students that $\frac{\quad}{14}$ is the denominator and it tells the total amount in the set.
- At this time allow students to either refer back to their math vocabulary, or allow 1-2 minutes for students to record the definition in their journals.
- Next have students identify one of the groups of bones *Taz* can have, and display it as the numerator.

An example could be $\frac{2}{14}$. Point out to the students that this is called a proper fraction.

- Allow 1-2 minutes for students to record the definition of a proper fraction: a fraction whose numerator is less than its denominator.

Student Application-

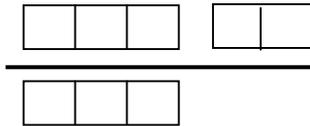
- Engage students in making several proper fractions using their *Taz* bones. Students can work with partners taking turns naming different fractions created using the bones.
- Sample fractions can include $\frac{4}{14}$, $\frac{6}{14}$, or $\frac{12}{14}$
- Next, write the following fraction on the overhead $\frac{5}{3}$.
- Point out that this fraction is called an improper fraction because the numerator is greater than the denominator. Allow students 1-2 minutes to record the definition in their journals.
- Inform the students that we will use this improper fraction, $\frac{5}{3}$, and turn it into a mixed number, a combination of a whole number and a fraction. Allow students 1-2 minutes to record the definition in their journals.
- Model on the overhead using 5 red snap cubes for the numerator and 3 yellow snap cubes for the denominator. Cubes should be assembled as shown in diagram. (Suggested colors are red and yellow. Teacher can make other color choices keeping in mind to use a different color for the numerator and the denominator.)



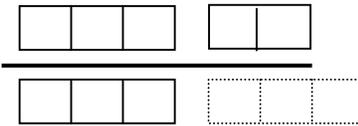
- Inform the students that this diagram could be written as a fraction. Tell students to determine the way to represent this amount as a written fraction. $(\frac{5}{3})$
- Explain to the students that the numerator (5), represents how many pieces we have, and the denominator (3) represents the total number in our set. Rewrite fraction as shown: $\frac{5}{3} = \underline{5 \text{ pieces}}$
3 whole
- After students respond remind students that this type of fraction is called an improper fraction, students can be encouraged to tell you what an improper fraction is from the previous definitions.
- Next inform students that we will take this improper fraction and turn it into a mixed number by using the operation of division.
- Ask the students to define mixed numbers. Remind them to refer back to their vocabulary definitions for assistance. Before continuing you may review with

the students that the fraction, $\frac{3}{3}$, is the same as 1 whole. You may briefly have students name other sample fractions resembling 1 whole.

- Demonstrate for the students by removing 2 red snap cubes from the denominator, keep the remaining 2 cubes next to the fraction. Cubes should resemble diagram shown.



- Ask the students: “How many more snap cubes are in my numerator than in my denominator?” (2)
- Explain and model for students the use of division to turn your improper fraction into a mixed number. Examples can include $5 \div 3 = 1 \text{ r } 2$ or as a fraction it should be written as $1 \frac{2}{3}$



- Students should review the two ways division problems can be written.
- Model again using another fraction. Begin with snap cubes to draw the fraction and then show two forms of division followed by the remainders. Express your results in the form of a mixed number.

Embedded Assessment-

- While students are working in pairs to complete the remaining two sample fractions from the overhead, teacher will informally assess students abilities to change improper fractions to mixed numbers.
- Have students complete *Improper Fractions and Mixed Numbers* Student Resource Sheet 2. Answer Key can be found on Teacher Resource Sheet 1.

Reteaching-

- Students who are having difficulty with identifying improper fractions or changing improper fractions to mixed numbers will play a round of Fraction Memory Cards, Teacher Resource Sheet 2. Fraction memory can be played like the original Memory game. Teacher can use sample resource cards, or can make up their own memory cards. Cards should have the mixed fraction and its matching improper fraction. Students are to take turns seeing who can find the most matches.

Extension-

- Students who understand the lesson can make up their own cards to use for another Fraction Memory Game to be played with a different partner.
- Teacher can also assign additional reinforcement for homework.
When reviewing correct responses to preassessment, teacher may at this time review adding and subtracting fractions with like denominators using $\frac{4}{14}$, $\frac{6}{14}$, or $\frac{12}{14}$.

Development/Procedures:

Lesson 2

Advanced Preparation for Fraction Models and Fraction Bingo:

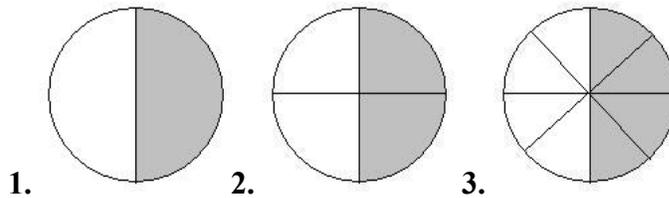
Cut and distribute three sheets of the same size construction paper for every student. Make sure students have colored pencils available for Fraction models. These items can be placed in the center of their stations.

Copy Student Resource Sheet 3, Equivalent *Fraction Bingo* prior to the lesson. Give each student one copy of the Fraction Bingo sheet.

Preassessment-

- Write the following journal prompt on the chalk board or overhead projector:

Part A *Name the shaded region of the following models using proper fractions.*



Part B *Using what you know about fractions, decide if equal parts are shaded on all three of the models above. Explain your answer using complete sentences.*

- Instruct the students to write their answers in their mathematics journal. Allow students about 7 minutes to answer the questions on their own. Carefully observe students as they complete the task. Explain to students that you do not expect them to know the answer to part B using computations. On the overhead projector record student responses.

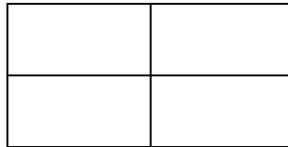
Launch-

- Have students take one sheet of construction paper from the middle of the table (station). Using the overhead projector draw a rectangle representing the construction paper. Also, retrieve one sheet of construction paper for demonstration. Ask the students to vertically fold the paper in half. Review terminology if needed. Demonstrate folding the paper in half. Observe to verify that each child has folded his/her paper correctly. Ask students to

shade in half of the rectangle. Shade in half of the rectangle of the overhead projector.



Ask the students to raise their hands and tell how much of the fold construction paper is shaded in ($1/2$)? Write your response in their mathematics journal. Next, have the students fold their papers in half horizontally. (Review terminology if needed.) Model how to fold the paper to the class. Draw a horizontal line on the overhead. Ask, how many folded parts are shaded in? Instruct students to write in their mathematics journals.



$2/4$

Have students fold the paper in half again vertically. Demonstrate folding the paper to the class. Draw two more vertical lines separating each vertical half on the overhead projector. Ask the students how many of the folded parts are now shaded in? Have students record their responses in their mathematics journals.



$4/8$

Draw all three models on the overhead. Ask students, "What do you notice about all three models on the overhead?" (Response should indicate all three models have equal parts shaded in.)

Teacher Facilitation-

- After discussing student responses to models, have them put all materials away except for their mathematics journal and pencil. Attention should be directed to the teacher and the overhead projector.
- Have student write down the title of the lesson, **Equivalent Fractions**.
- Write the following fraction on the overhead and have students write it in their journals.

$$\frac{1}{2} =$$

- Explain to the class that in order to make equivalent fraction, you must **multiply or divide the numerator and the denominator by the same number**. For example

$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$

* Therefore, $\frac{1}{2} = \frac{2}{4}$

- Explain to the students that we can make an equivalent fraction for $\frac{2}{4}$ by **multiplying** the numerator and denominator by the same number.

$$\frac{2}{4} \times \frac{2}{2} = \frac{4}{8}$$

- * So, $\frac{1}{2}, \frac{2}{4}, \frac{4}{8}$ All three fractions are equivalent to one another because they show the same amount.

- Now explain how to show equivalent fractions by **dividing** the denominator and numerator by the same digit.

- * “Copy this fraction down in your mathematics journal.” $\frac{8}{12}$

* $\frac{8}{12} \div \frac{2}{2} = \frac{4}{6}$ therefore $\frac{8}{12} = \frac{4}{6}$

- * “Now we can write an equivalent fraction for $\frac{4}{6}$ by dividing the numerator and denominator by 2.” $\frac{2}{3}$

$$\frac{4}{6} \div \frac{2}{2} = \frac{2}{3} \quad \text{Therefore } \frac{4}{6} \text{ is equivalent to } \frac{2}{3}$$

- So, $\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$ are all equivalent.
- Repeat modeling multiplying and dividing by the same digit using two more examples.
- Ask the class, “Does anyone know what it is called when we reduce or make the equivalent fraction smaller?” (Simplify)

- Ask class if there are any questions before proceeding to student application.

Student Application-

- Model how to play *Equivalent Fraction Bingo* Student Resource Sheet 3. Have each student take one *Equivalent Fraction Bingo* sheet and a bag of centimeter blocks from the center of the table or station.
- Instruct students to write the given fractions on the blank bingo card in random order. After writing each number on the card cross the fraction out so it is not copied down twice.
- Next, tell the students that you are going to call out a proper fraction and they must find all of the equivalent fractions on their game boards. Using centimeter cubes to mark the equivalent fractions on their game boards. They may use scratch paper to solve for the equivalent fractions. The student(s) who has four in a row wins the game, (any direction).
- Model an example for the class.
- Teacher will mark down on the overhead transparency fractions that have been called on the Bingo Record Sheet. (Teacher Resource Sheet 3)
- Ask class if there are any questions before they begin.

Embedded Assessment-

- While students are playing the game looked to be sure that everyone is participating and record behavior and participation on observation check list.
Discuss with students the observation behaviors you will be looking for.

Reteaching-

- If student does not understand concept, play a few rounds of the game with them in a small group while other students work with a partner or independently. Continually monitor for participation.

Extension-

- Students who understand the lesson should create their own Equivalent Fraction Bingo Game Card.
- Homework may be give for reinforcement.

Advanced Preparation for Bubble Gum Tape Exercise:

Teachers will need to purchase Bubble Gum Tape or Fruit Roll Up By The Foot. Pre measure and cut bubble gum tape to four measurements:

$\frac{5}{2}$ in, $1\frac{3}{4}$ in, $2\frac{5}{8}$ in, and $2\frac{1}{4}$ in prior to the lesson.

Copies of the *Bubble Gum Tape Data Sheet* (Student Resource Sheet 5) need to be duplicated prior to lesson. Pre-cut colored strips of paper for students to measure. (Four strips per student.) Measure the colored strips of paper the same length as the bubble gum tape.

Development/Procedures:

Lesson 3

Preassessment-

- Write the following prompt on the overhead or the chalkboard. (Have students take one color of each strip from the center of the table or station.)

Using customary units measure each strip to the nearest $\frac{1}{4}$ in.

- Instruct students to write their answers in their math journal. Allow students 5 minutes to measure all four strips. Carefully observe students as they complete the task.

Launch-

- Discuss measurements with the students. Ask the students if they notice any similarities or differences with their measurements. Do not give out the correct measurements as of yet. You may wish to record their data on the overhead projector. Next, ask the students to place these four measurements, from the colored strips, in order from least to greatest based on prior knowledge of number sense. Have them explain why they chose that particular order. Ask for volunteers to share their responses. We will revisit the correct order after teacher facilitation.

Teacher Facilitation-

- Using the overhead projector write down the following fractions as they appear.

$$\frac{5}{2} \qquad 1\frac{3}{4} \qquad 2\frac{5}{8} \qquad 2\frac{1}{4}$$

- Have students continue taking notes in their math journals. Ask them to write down the following fractions and mixed numbers.

- Tell the class that they will be **comparing and ordering** fractions and mixed numbers.
- Ask the class to observe the data of fractions and if they notice any differences amongst the numbers. Ask for volunteers to respond. ($\frac{5}{2}$ is an improper fraction.)
- Explain to students that in order to compare and order fractions we must first change the improper fraction to a mixed number in order to compare and order the mixed numbers.
- Review the skill together with the class using the overhead projector.

$\frac{5}{2}$ **improper fraction** (divide your denominator into your numerator)

$$5 \div 2 = 2\frac{1}{2} \text{ mixed number}$$

Therefore, $\frac{5}{2} = 2\frac{1}{2}$, they are **equivalent fractions**

- “Are there any questions?” In your journal write $2\frac{1}{2}$ next to $\frac{5}{2}$, model on the overhead.
- * Before we can place these fractions and mixed numbers in order we must have a **common denominator**. (Review)

- What is a **least common multiple** for 2, 4, and 8? Class responds.

2(2,4,6,8,10)

4(4,8,12,)

8(8,16,24)

- Review Least Common Multiple (**L.C.M.**) **Explain** to the class that the L.C.M. will help them find the Least Common Denominator so that they can compare and order fractions and mixed numbers.

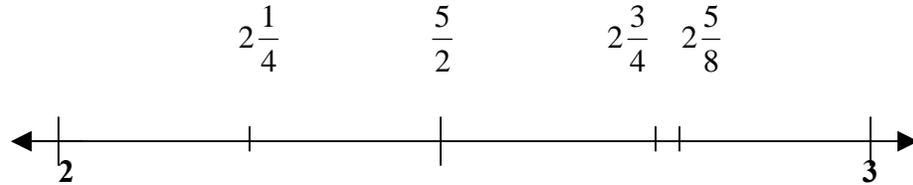
$$\frac{5}{2} = 2\frac{1}{2} \quad \times \quad \frac{4}{4} = \frac{4}{8} = 2\frac{4}{8}$$

$$2\frac{1}{4} \times \frac{2}{2} = \frac{2}{8} = 2\frac{2}{8}$$

$$2\frac{3}{4} \times \frac{2}{2} = \frac{6}{8} = 2\frac{6}{8}$$

$$2\frac{5}{8} \times \frac{1}{1} = \frac{5}{8} = 2\frac{5}{8}$$

- “Are there any questions about making equivalent fractions using the least common denominator?”
- “Next, we are going to order the fractions from least to greatest on a number line **using the original fractions and mixed numbers** given.



- “Are there any questions?”

Student Application-

- Students will now take one piece of bubble gum tape from the center of the table or station. (Note: Bubble gum tape has been premeasured.)
- Using your customary units on the ruler, measure your bubble gum tape to the nearest $\frac{1}{4}$ in.
- Each student will now take one Bubble Gum Tape Data Sheet from the center of the table.
- Record your measurement onto your data sheet next to your name.
- Using your groups data complete the Bubble Gum Tape data sheet, filling in the columns and completing the number line.
- Find the equivalent fractions to compare and order your groups mixed numbers.
- Next, place your group’s mixed numbers in order onto the number line provided.

Embedded Assessment-

- While students are independently completing their own Bubble Gum Tape Data Sheets, observe their calculations and behavior with the observation check list.

Reteaching-

- Work with students that are having difficulty completing the bubble gum Tape Data Sheet.

Extension-

- Students that understand comparing and ordering fractions can measure pre-cut Fruit Roll Ups by the foot and create a Fruit Roll Up Data Sheet to record data.
- Homework may be assigned for reinforcement.

Summative Assessment-

Students will demonstrate an understanding of proper and improper fractions, mixed numbers (Student Resource Sheet 2), equivalent fractions, and comparing and ordering fractions on a number line by completing two Brief Constructed Responses. They will need to use appropriate mathematical reasoning to justify their thinking.

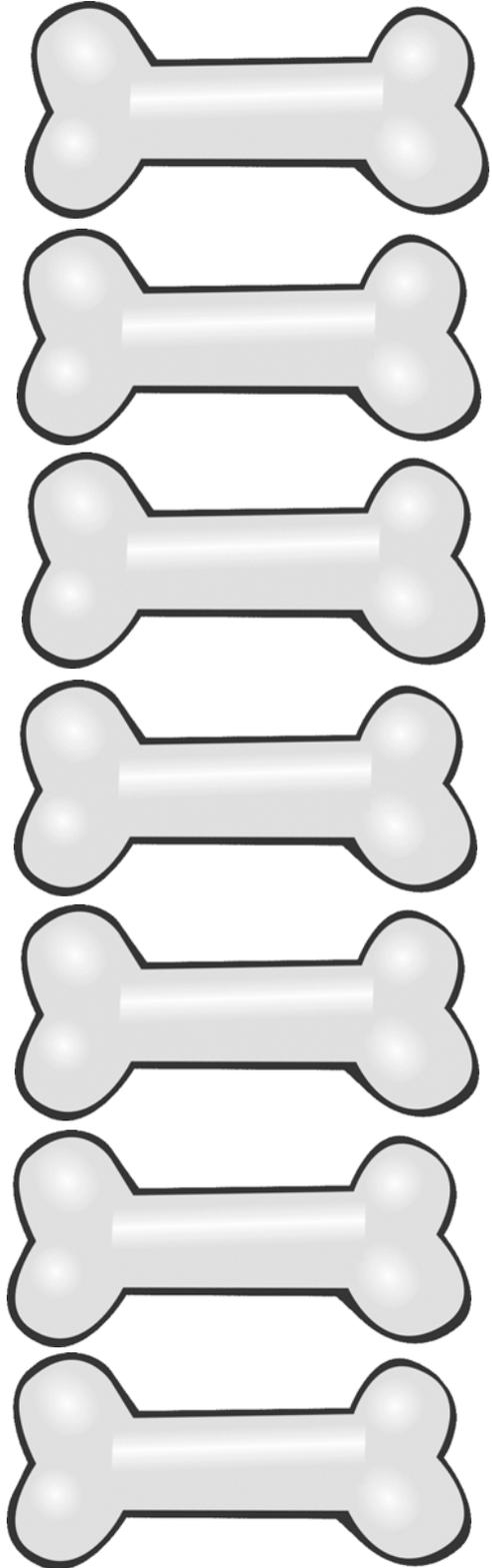
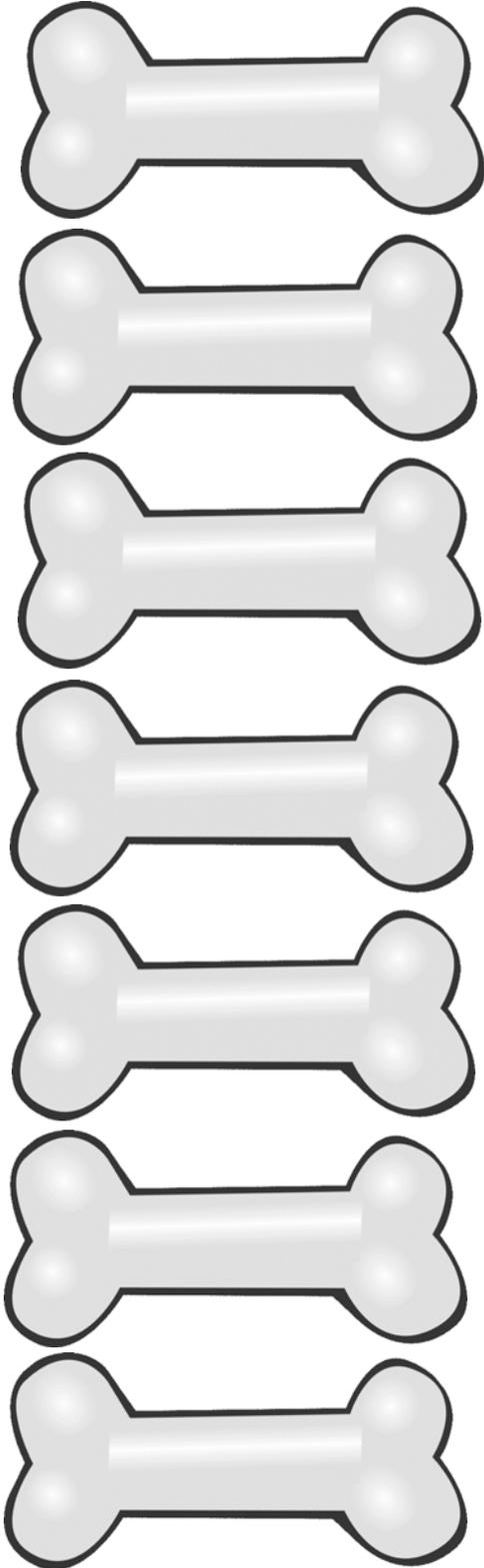
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Taz's

Treats



Fraction Memory Cards - Sample

$$\frac{5}{3}$$

$$1\frac{2}{3}$$

$$\frac{3}{2}$$

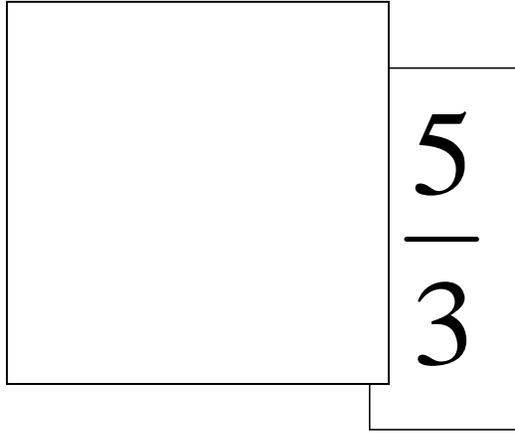
$$1\frac{1}{2}$$

$$\frac{11}{7}$$

$$1\frac{4}{7}$$

$$\frac{14}{9}$$

$$1\frac{5}{9}$$



Improper Fractions and Mixed Numbers Assessment

Part 1: Change the following improper fractions to mixed numbers.

1. $\frac{6}{4} = \underline{\hspace{2cm}}$

2. $\frac{7}{3} = \underline{\hspace{2cm}}$

3. $\frac{3}{2} = \underline{\hspace{2cm}}$

4. $\frac{4}{3} = \underline{\hspace{2cm}}$

5. $\frac{9}{4} = \underline{\hspace{2cm}}$

Part II: Change the following improper fractions to mixed numbers.

1. $2 \frac{1}{5} = \underline{\hspace{2cm}}$ 2. $1 \frac{2}{3} = \underline{\hspace{2cm}}$ 3. $4 \frac{2}{5} = \underline{\hspace{2cm}}$

4. $2 \frac{2}{4} = \underline{\hspace{2cm}}$ 3. $5 \frac{1}{6} = \underline{\hspace{2cm}}$ 6. $2 \frac{3}{8} = \underline{\hspace{2cm}}$

Equivalent Fraction Bingo

Write the given fractions on the blank bingo card. Mix them up to help you play your game.

$$\frac{2}{4} \quad \frac{3}{6} \quad \frac{2}{6} \quad \frac{7}{14} \quad \frac{6}{12} \quad \frac{4}{8} \quad \frac{5}{10} \quad \frac{10}{12}$$

$$\frac{6}{8} \quad \frac{4}{16} \quad \frac{6}{9} \quad \frac{8}{10} \quad \frac{8}{12} \quad \frac{6}{14} \quad \frac{9}{12} \quad \frac{10}{14}$$

Improper Fractions and Mixed Numbers Assessment

Part 1: Change the following improper fractions to mixed numbers.

1. $\frac{6}{4} = \text{-----}$

2. $\frac{7}{3} = \text{-----}$

3. $\frac{3}{2} = \text{-----}$

4. $\frac{4}{3} = \text{-----}$

5. $\frac{9}{4} = \text{-----}$

Part II: Change the following improper fractions to mixed numbers.

1. $2 \frac{1}{5} = \text{-----}$ 2. $1 \frac{2}{3} = \text{-----}$ 3. $4 \frac{2}{5} = \text{-----}$

4. $2 \frac{2}{4} = \text{-----}$ 5. $5 \frac{1}{6} = \text{-----}$ 6. $2 \frac{3}{8} = \text{-----}$

**Fractions in Action-Summative Assessment
Brief Constructed Response (BCR)**

Look at the proper fractions below.

$$\frac{3}{4} \quad \frac{4}{6} \quad \frac{9}{12} \quad \frac{6}{8} \quad \frac{9}{16}$$

Step A

Identify and write all equivalent fractions from above and place them on the line below.

Step B

Use what you know about equivalent fractions and explain how you know that your answer is correct. Use words, numbers, and or symbols in your explanation.

Bubble Gum Tape Data Sheet (Example)

<i>Name</i>	<i>Measurement</i>	<i>Equivalent Fraction</i>
<i>Brittany</i>	$1\frac{4}{5}$	$1\frac{4}{5} \times \frac{4}{4} = 1\frac{16}{20}$
<i>Sam</i>	$1\frac{3}{4}$	$1\frac{3}{4} \times \frac{5}{5} = 1\frac{15}{20}$
<i>Number Line</i>		
<p>A horizontal number line with arrows at both ends. It is labeled 'Number Line' above it. There are four vertical tick marks. The first tick mark is labeled '1' below it. The second tick mark is labeled $1\frac{3}{4}$ below it. The third tick mark is labeled $1\frac{4}{5}$ below it. The fourth tick mark is labeled '2' below it.</p>		

Bubble Gum Tape Data Sheet

<i>Name</i>	<i>Measurement</i>	<i>Equivalent Fraction</i>
<i>Number Line</i>		
<p>A horizontal number line with arrows at both ends. It is labeled 'Number Line' above it. There are two vertical tick marks. The first tick mark is labeled '1' below it. The second tick mark is labeled '2' below it.</p>		

**Fractions in Action - Summative Assessment
Brief Constructed Response**

Seventeen third graders at Star Elementary School volunteered to clean up their playground. There are four available trashcans for the students to share.

Step A

Write the fraction showing the number of students compared to the number of trashcans. Identify the type of fraction you have written using the correct word name.

Step B

Use what you know about Proper/Improper Fractions and Mixed Numbers to explain, why your answer is correct. Use words and /or numbers in your explanation.

**Fractions in Action-Summative Assessment
Brief Constructed Response (BCR)**

Look at the proper fractions below.

$$\frac{3}{4} \quad \frac{4}{6} \quad \frac{9}{12} \quad \frac{6}{8} \quad \frac{9}{16}$$

Step A

Identify and write all equivalent fractions from above and place them on the line below.

Step B

Use what you know about equivalent fractions and explain how you know that your answer is correct. Use words, numbers, and or symbols in your explanation.

Summative Assessment

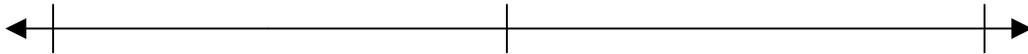
Extend Constructed Response (ECR)

Look at the fractions and mixed numbers below.

$$\frac{7}{4} \quad 1\frac{3}{4} \quad \frac{6}{3} \quad 1\frac{2}{8} \quad \frac{2}{4}$$

Step A

Correctly place the fractions and mixed numbers on the number line below.



Step B

Using what you know about fractions and mixed numbers explain how you would represent $\frac{10}{3}$ on the above number line. What changes would you need to make to the number line to place $\frac{10}{3}$ correctly on the number line? Use number, words, and or symbols for your explanation.

Summative Assessment-
