ThinkUp! MATH

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Unit 11 Standards

(Student pages 67–72)

Michigan Standards for Mathematics: 5.NF.1

Domain Number and Operations–Fractions

Cluster Use equivalent fractions as a strategy to add and subtract fractions.

Standard 5.NF.1

Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. *(In general,* $\frac{a}{b} + \frac{c}{d} = \frac{(ad + bc)}{bd}$.*)*

Other Standards Addressed in this Unit

5.NF.2, 4.NF.1, 4.NF.3

Standards for Mathematical Practice Addressed in this Unit

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.

Unpacking the Standards

In grade 3, students developed an understanding of fractions as numbers. They also compared two fractions with the same numerator or the same denominator and generated simple equivalent fractions. In grade 4, students used visual fraction models to extend their work with equivalent fractions. Students recognized and generated equivalent fractions and began adding and subtracting fractions with like denominators of 2, 4, 5, 6, 8, 10, 12, or 100. In grade 5, students combine their understanding of equivalent fractions and addition/subtraction of fractions with like denominators to add and subtract fractions and mixed numbers with unlike denominators. Students need extensive opportunities to explore with various models and methods for finding common denominators before the introduction of an algorithm. Students should also understand that a common denominator will always result from using the given denominators as factors and the product as the common denominator (although not always the least common denominator). For example, $\frac{1}{2} + \frac{3}{4} = \frac{4}{8} + \frac{6}{8} = \frac{10}{8}$.

Unit 11
Standard 5.NF.1

Add and Subtract Fractions with Unlike Denominators

Getting Started

Introduction Activity

Students work with a partner. The teacher gives a bag of yellow, red, blue, and green pattern blocks to each pair. The teacher assigns the value of 1 to the yellow hexagon. Students find the value of the red trapezoid $\left(\frac{1}{2}\right)$, the blue rhombus $\left(\frac{1}{3}\right)$, and the green triangle $\left(\frac{1}{6}\right)$. Using no more than 12 blocks, pairs of students construct designs using the yellow hexagons and two other colors of blocks. Pairs work together to determine the total value of the design and record their design and sum on pattern block paper. The teacher displays students' designs on a classroom bulletin board.

(DOK 2, Bloom's Level: Synthesis/Create)

Suggested Formative Assessment

Following the Introduction Activity, each pair selects another pair's design and determines the total value represented. The teacher and class discuss the designs and responses. The teacher adjusts instruction and/or plans interventions as needed.

(DOK 2, Bloom's Level: Application/Apply)

Children's Literature Connections

The Ancient Formula: A Mystery with Fractions – Melinda Thielbar

Ed Emberley's Picture Pie: A Cut and Paste Drawing Book – Ed Emberley

If You Hopped Like a Frog – David M. Schwartz

Pizza Parts: Fractions! – Linda Bussell

Working with Fractions – David A. Adler

Vocabulary Focus

The following are essential vocabulary terms for this unit.

common denominator	equivalent fractions	lowest terms	simplify
denominator	fraction	mixed number	sum
difference	least common denominator	numerator	whole numbers

Vocabulary Activity

Vocabulary Verses

The teacher displays the lyrics to the "Greater Than One" song.

Greater Than One
(may be sung to the tune of
"For He's a Jolly Good Fellow")

If a fraction's numerator
Is greater than denominator
If numerator is greater...
That fraction is greater than 1.

That fraction is greater than 1.
That fraction is greater than 1.

If numerator is greater
If numerator is greater
Than denominator...
That fraction is greater than 1.

(DOK 1, Bloom's Level: Comprehension/Understand)

Suggested Formative Vocabulary Assessment

Students sing the song again while the teacher covers the words "numerator" and "denominator." Students supply these words from memory. Each student records a personal definition of "numerator," "denominator," and at least two other vocabulary words in a math journal. The teacher observes student responses, gathering evidence of learning.

(DOK 1, Bloom's Level: Comprehension/Understand)

Suggested Instructional Activities

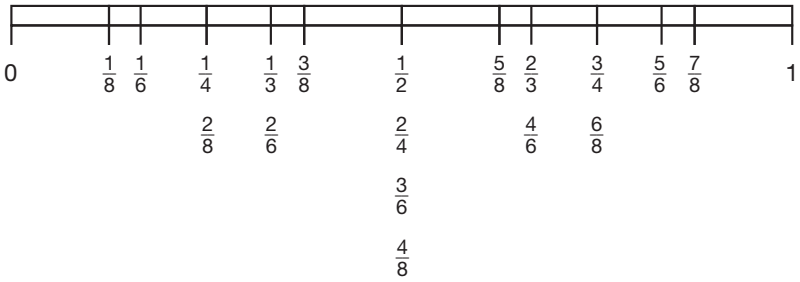
1. Students use fraction models, such as fraction circles, to solve problems that require adding and subtracting fractions and mixed numbers with unlike denominators. Students select the pieces needed to model both fractions. Students exchange fraction pieces for equivalent pieces so that both fractions have the same denominator (same color). Then students add or subtract the equivalent fractions to determine the answer.

   (DOK 2, Bloom's Level: Application/Apply)

2. Students develop a flowchart to outline the algorithm for adding and subtracting fractions. Students use the flowchart to verbally explain their steps in solving problems involving addition and subtraction of fractions and mixed numbers.

   (DOK 2, Bloom's Level: Comprehension/Understand)

3. The teacher gives students a set of word problems involving addition or subtraction of fractions with unlike denominators. Students use graphic organizers, such as the following, to assist in rewriting each problem so that the fractions have equal denominators. Students then solve the problems.



(DOK 2, Bloom's Level: Application/Apply)

Suggested Formative Assessment

Students turn to a partner and respond verbally to a statement or question posed by the teacher.

- *Name a time in everyday life when you may have to add or subtract fractions.* (Answers will vary.)
- *What must you do first before you can add or subtract fractions?* (Find a common denominator.)
- *When adding and subtracting fractions, why do you have to find a common denominator?* (The units must be the same before the sum or difference of two quantities can be determined.)
- *What are some ways to find the common denominator for two fractions?* (Multiply the denominators or find the least common multiple of the denominators (LCD).)

The teacher circulates among the student pairs to evaluate understanding and provide feedback.

(DOK 2, Bloom's Level: Analysis/Analyze)

Suggested Reflection/Closure Activity

Students play "Race to 5" in groups of three. Each group needs a die and a teacher-created set of cards printed with fractions. Each player begins the game by drawing two cards from the stack and finding the sum of the two fractions. Next, each player rolls the die twice and creates a fraction using the results as the numerator and denominator. The player either adds or subtracts the fraction from the previous sum. The first person to reach 5 (or any predetermined total) is the winner.

(DOK 2, Bloom's Level: Application/Apply)

Suggested Formative Assessment

Students complete the Motivation Station activity, "Don't Let Fractions Bug You," on page 72 in the student edition. The teacher observes and notes students' understanding of addition and subtraction of fractions and plans interventions as needed.

(DOK 1, Bloom's Level: Application/Apply)

Interventions

1. Students solve a given addition or subtraction problem involving halves, fourths, eighths, and/or sixteenths. To allow students to check their work, the teacher provides students with a customary ruler or yardstick (marked in half, fourth, eighth, and sixteenth inches). Students locate a fractional number on the ruler and "count on" or "count back" to verify the sum or difference.
   (DOK 2, Bloom's Level: Application/Apply)

2. Students use pattern blocks to model the process of adding or subtracting fractions with unlike denominators. The teacher identifies the value of a yellow hexagon as 1 whole. Students determine that the red trapezoid represents $\frac{1}{2}$, the blue rhombus represents $\frac{1}{3}$, and the green triangle represents $\frac{1}{6}$. The teacher displays a word problem involving the addition or subtraction of fractions or mixed numbers with unlike denominators of 2, 3, or 6 $\left(\text{e.g., } \frac{2}{3} + \frac{5}{6}\right)$. Students stack pattern blocks on yellow hexagons to represent each fraction or mixed number (2 blue rhombuses represent $\frac{2}{3}$ and 5 green triangles represent $\frac{5}{6}$.). Students make trades so that all fractions have equal denominators (Trade 2 blue rhombuses for 4 green triangles.). Students then add or subtract the fractions and make trades, as needed, to simplify the sum or difference.
   (DOK 2, Bloom's Level: Application/Apply)

3. The teacher provides each student with 2 fractions that have unlike denominators $\left(\text{e.g., } \frac{1}{2} \text{ and } \frac{1}{3}\right)$, crayons, and 2 paper plates. Students partition a plate into equal sections to represent each denominator and then shade sections to represent each numerator. Students further partition one or both plates to create shaded sections that are of equal size in both circles. Students use the paper plate models to find the sum and difference of the given fractions and document their work by recording pictures and equations $\left(\text{e.g., } \frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6};\ \frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}\right)$.
   (DOK 2, Bloom's Level: Application/Apply)

Suggested Formative Assessment

The teacher displays a one-step word problem requiring addition or subtraction of fractions with unlike denominators. Using dry erase boards, students write an addition or subtraction symbol, to indicate which operation should be performed to solve the problem, as well as a common denominator for the two fractions in the problem. The teacher provides feedback, and students amend responses if necessary. Each student then shows the work to solve the problem. The teacher observes student responses and plans additional instruction and/or interventions as needed.

(DOK 1, Bloom's Level: Application/Apply)

Unit 11
Standard 5.NF.1

Add and Subtract Fractions with Unlike Denominators

Extending Student Thinking

Each student pair creates and solves a problem in response to a given challenge.

Write a two-step problem in which both addition and subtraction are used to yield a final answer of $3\frac{1}{8}$. At least one number used must have a denominator other than 8.

When students find a solution, they partner with another pair and check each other's work.

(DOK 3, Bloom's Level: Synthesis/Create)

Skillful Thinking

Skillful Thinking = Deeper Learning through Revised Bloom's Taxonomy, Depth of Knowledge, and 9 Traits of Critical Thinking

The *9 Traits of Critical Thinking*™ include *adapt*, *collaborate*, *communicate*, *create*, *examine*, *inquire*, *link*, *reflect*, and *strive*. These traits foster high-quality thinkers. On the Skillful Thinking page in each unit of the student edition, traits are selected and identified in each questioning prompt to reinforce student use of the traits in the context of mathematics. The labeling of the traits assists students in recognizing that the application of a focus trait is needed to complete the questioning prompt. The educator should note that each questioning prompt in the student edition is not limited to the identified trait since multiple critical thinking traits may be utilized by the student to successfully respond to the prompt.

Communicate – I use clear language to express my ideas and to share information.

- ✓ Engagement Indicator – Students translate thoughts into words and actions that are clear and specific.
- ✓ Strategy to Facilitate the ***Communicate*** Trait – Require students to support responses with explanations, comparisons, examples, and/or evidence.

Examine – I use a variety of methods to explore and to analyze.

- ✓ Engagement Indicator – Students use analytical skills to make inferences, interpret data, integrate or organize ideas, and make connections.
- ✓ Strategy to Facilitate the ***Examine*** Trait – Students reflect on strategies used, self-assess for effectiveness, and determine next steps to produce desired outcomes.

Answer Key and Codings

Page	Question	Answer	DOK Level	Bloom's Original/Revised
67	1	$\frac{1}{12}$ of a pizza	1	Application/Apply
	2	The number 24 is not a common denominator for 9 and 12. Gerardo should have used 36 for the LCD of 9 and 12.	2	Analysis/Analyze
	3	$7\frac{3}{4}$	1	Application/Apply
	4	$4\frac{3}{10}$	1	Application/Apply
	5	$\frac{3}{8}$ gallon	2	Application/Apply
68	1	C	1	Application/Apply
	2	D	2	Comprehension/Understand
	3	D	1	Application/Apply
	4	B	1	Application/Apply
	5	B	2	Application/Apply
69	1	B	1	Application/Apply
	2	C	2	Analysis/Analyze
	3	D	2	Application/Apply
	4	B	1	Application/Apply
70	1	B	1	Application/Apply
	2	C	2	Comprehension/Understand
	3	C	2	Application/Apply
	4	B	1	Application/Apply
	5	$\frac{7}{8}$ in	1	Application/Apply
71	1	The clock should show 1:20. Yamir spent 5 minutes feeding the dog $\left(\frac{1}{12}\text{ hour}\right)$, 45 minutes cleaning his room $\left(\frac{3}{4}\text{ hour}\right)$, 20 minutes drying dishes $\left(\frac{1}{3}\text{ hour}\right)$, and 10 minutes hanging up clothes $\left(\frac{1}{6}\text{ hour}\right)$. This is a total time of $\frac{16}{12}$ or $1\frac{4}{12}$ hours or 80 minutes. If Yamir started his chores at 12:00 noon, he finished 1 hour and 20 minutes later at 1:20 p.m.	2	Application/Apply
	2	$6\frac{2}{3} + 13\frac{1}{2} = 20\frac{1}{6}$	3	Analysis/Analyze
	Journal	Answers will vary.	2	Comprehension/Understand

Unit 11
Standard 5.NF.1

Add and Subtract Fractions with Unlike Denominators

Answer Key and Codings

Page	Question	Answer	DOK Level	Bloom's Original/Revised
72	Motivation Station	**Fraction Problems** $\frac{2}{3}+\frac{3}{6}=1\frac{1}{6}$; $\frac{2}{4}+\frac{5}{8}=1\frac{1}{8}$ $\frac{9}{12}-\frac{1}{3}=\frac{5}{12}$; $\frac{2}{6}+\frac{1}{2}=\frac{5}{6}$ $\frac{4}{6}-\frac{1}{2}=\frac{1}{6}$; $\frac{4}{5}-\frac{1}{3}=\frac{7}{15}$ $\frac{1}{2}-\frac{1}{8}=\frac{3}{8}$; $\frac{1}{2}-\frac{2}{10}=\frac{3}{10}$ $\frac{3}{4}+\frac{5}{6}=1\frac{7}{12}$; $\frac{5}{8}+\frac{5}{12}=1\frac{1}{24}$	1	Application/Apply

Name _____

Standard 6.NS.5

1. The elevation of Mount Rushmore is 1745 meters above sea level. What number represents this situation?

2. A plane flies at an altitude of 23,000 feet. What number describes this situation?

What does 0 feet mean in this situation?

3. Amber has a checking account balance of –$53.40. Explain what this means.

What would a value of $0 mean in this situation?

4. At 5:00 a.m. the temperature was 12° below zero. What number represents the temperature at 5:00 a.m.? Explain your answer.

5. The city of Kano in Nigeria is located at a latitude of 12° north of the equator. What number can be used to represent this situation?

What would a negative value mean in this situation?

What would a value of 0 mean in this situation?

6. Write a situation to describe each number.

–12

+23.5

–1.75

0

$2\frac{3}{4}$

Words for the Wise

negative number | opposite numbers | positive number | quantity | zero

Name _____

Unit 11 Partner Practice

Standard 6.NS.5

1. The low temperature on Tuesday was 17 degrees below zero. The high temperature on Wednesday was 9 degrees above zero. Which number represents the temperature on Wednesday?

A 17

B 9

C −9

D −17

2. Which of the following situations could be represented by the number −5.5? Select **all** that apply.

A Mercy's account was debited $5.50.

B The scale showed a gain of 5.5 pounds.

C Veronica received an allowance of $5.50.

D Jose removed $5\frac{1}{2}$ feet from the rope length.

E The temperature dropped 5.5° before sunrise.

3. The Falcons running back lost 8 yards on a play. Which **best** describes a resulting play of 0 yards?

A The running back lost another 8 yards.

B The running back is in the middle of the field.

C The running back gained 8 yards instead of losing 8 yards.

D The running back did not gain or lose any yardage on the play.

4. Amy made a deposit of $150.60 on Monday and a withdrawal of $25 on Tuesday. Which number represents the transaction Amy made on Monday?

A −150.6

B −25

C 25

D 150.6

5. Check Yes or No if the following situations can be represented by the number −10.

		Yes	No
A	Gena received $10 for her birthday.	☐	☐
B	The temperature dropped 10°F after the thunderstorm.	☐	☐
C	A shark swims 10 feet below sea level.	☐	☐
D	The bank removed $10 from Jorge's account to pay for the service charges.	☐	☐

6. Mrs. Callahan drives 6 miles east to work. Mrs. Callahan's trip is represented by the number +6. Which **best** represents a negative value for this situation?

A Mrs. Callahan drives 2 miles north to the mall.

B Mrs. Callahan drives 3 miles south to the library.

C Mrs. Callahan drives 4 miles west to the gas station.

D Mrs. Callahan drives 5 miles east to the football field.

Name _____

Standard 6.NS.5

Unit 11 Independent Practice

1. Julia spent $8, and her sister earned $8. Which number can be used to represent Julia's activity?

A 8

B 0

C −8

D −16

2. Which statement **cannot** be described by a negative number?

A Savvy withdraws money from her savings account.

B Laurie climbs stairs every day to get to her office.

C A fish swims below the surface of the water.

D Jonathan loses weight.

3. A company posts a loss of $220.88 on Thursday, a profit of $399.16 on Friday, and breaks even on Saturday. Which numbers represent the company's daily earnings for the week? Select **all** that apply.

A −399.16

B −220.88

C −0

D 0

E 220.88

F 399.16

4. Danielle deposits $40 into her savings account. Then she withdraws $25 and deposits $10. Which numbers correctly represent the changes in Danielle's account?

A −40, +25, +10

B +40, −25, +10

C +40, −25, −10

D −40, −25, −10

5. A hiker in Colorado reaches an elevation of 14,110 feet above sea level. A snorkeler in Hawaii swims at a depth of 12 feet below sea level. What number **best** represents the snorkeler's position in the water?

A −14,110

B −12

C 12

D 14,110

6. In the game of golf, par is the predicted number of times a golfer will need to hit the ball to complete a hole. A negative score indicates the golfer takes fewer swings than predicted to complete the hole. A positive score indicates the golfer takes more swings than predicted to complete the hole. What does a score of zero represent in golf?

A The golfer passes on the hole.

B The golfer misses the hole after 10 swings.

C The golfer uses the exact number of swings predicted to complete the hole.

D There is not enough information given to determine what a score of zero represents in golf.

Name _____

Unit 11 Assessment

Standard 6.NS.5

1. Which situation can be represented by a positive number? Select **all** that apply.

A money earned on a part-time job

B amount of money paid for car repairs

C points scored during a basketball game

D number of people arriving for a sporting event

E number of yards lost by a receiver during a football game

2. A 9-inch candle burns until it is 4 inches shorter. Which number can be used to represent the change in the height of the candle?

A −4

B 4

C 5

D 9

3. A store currently has 13 customers inside shopping. Five more customers arrive and 3 leave. Then, 7 customers leave and two arrive. Which set of numbers **best** describes the changes in the number of customers in the store?

A +5, −3, +7, +2

B −5, +3, +7, −2

C −5, +3, −7, +2

D +5, −3, −7, +2

4. Audrey is following a new weight-loss plan. She uses positive and negative numbers to represent the number of pounds she loses and gains each week. The chart shows her weight-loss record for one month.

Audrey's Weight Loss

Week	Change
1	−3.4
2	−0.9
3	0
4	+1.1

What does the value 0 represent in week 3?

A Audrey did not weigh during week 3.

B Audrey did not gain or lose weight during week 3.

C Audrey did not record her weight loss during week 3.

D Audrey did not follow the weight-loss plan during week 3.

5. For each number shown, describe a situation that could be represented by the value.

a. −11

b. +250

c. −19.75

Name _____

Standard 6.NS.5

For each statement shown, there are two additional related statements. Circle the related statement that is written correctly. Then, rewrite the other related statement to make it correct.

a. The temperature was 8 degrees below zero on Monday.

The temperature on Monday can be represented by the number –8.

On Monday, the temperature was –8 degrees below zero.

b. The submarine dove to a depth of 170.25 feet below the surface of the water.

The depth of the submarine is 170.25 feet below sea level.

The depth of the submarine can be represented by the number 170.25.

c. Marla has a balance of $225.58 in her checking account.

A withdrawal of $225.58 is represented by the same number as the balance in Marla's checking account.

The balance in Marla's checking account can be represented by the number 225.58.

Journal

Describe a situation that can be represented by the number –2.5. Explain what zero represents in the situation.

_____

_____

_____

_____

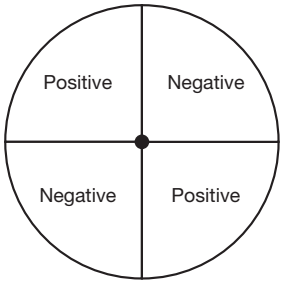
Name _____

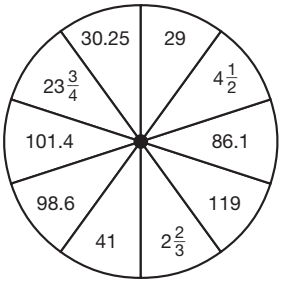
Unit 11 Motivation Station

Standard 6.NS.5

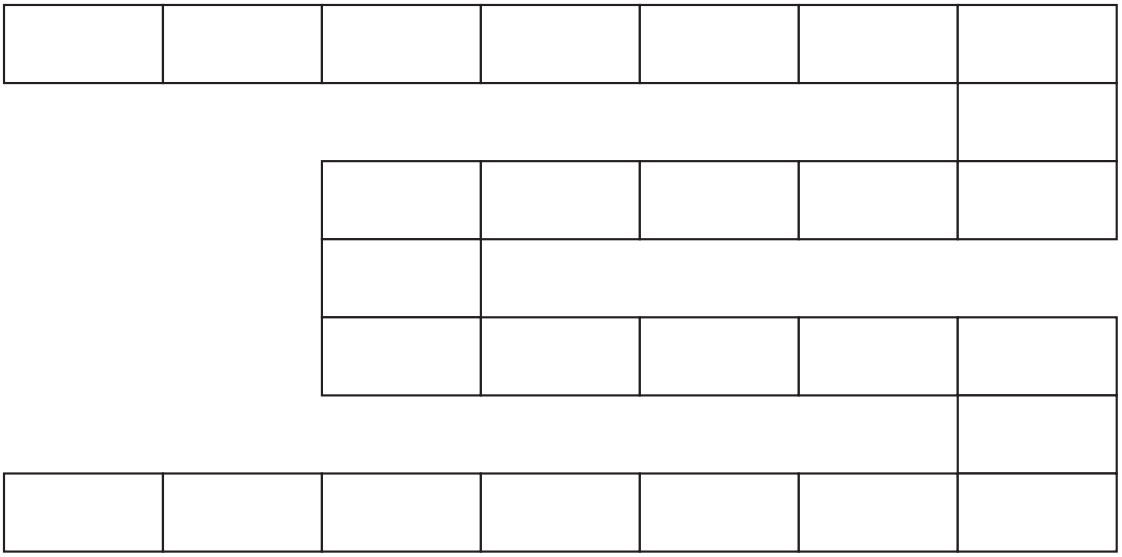
Make a Statement

Play "Make a Statement" with a partner. Each pair needs a game board, a paper clip to use with the spinners, and a number cube. Each player needs a sheet of paper, a pencil, and a different colored token. Player 1 rolls the number cube and spins both spinners. Player 1 writes a statement on his/her sheet of paper using the information from the spinners. For example, if "negative" and "30.25" are spun, a statement might be "The weather outside was unbearable at 30.25 degrees below zero." If the statement is written correctly, player 1 advances his/her token on the game board a number of spaces equal to the number rolled. If the statement is written incorrectly, player 1 loses a turn. The first person to reach FINISH wins.





START



FINISH

Connections

Locate three examples of positive or negative numbers in newspapers or magazines. Cut out the examples and attach them to a sheet of paper. For each, describe the opposite of the number in the example and what zero represents in the situation. For example, if the example number is a decrease in stock market values of 625 points, the opposite is an increase of 625 points and zero would represent no change in the market.