Unit 7
Fractions and Decimals

Grade 7

Lesson Outline

Big Picture

Students will:

- explore fraction relationships;
- develop an understanding of strategies related to addition and subtraction of fractions (proper, improper, and mixed);
- explore multiplication of fractions through repeated addition;
- explore division of whole numbers by simple fractions;
- understand the percent/decimal/fraction relationship;
- solve problems involving whole number percents, fractions, and decimals;
- add, subtract, multiply, and divide decimals;
- investigate experimental probabilities and compare to theoretical probabilities and independent events.

Day	Lesson Title	Math Learning Goals	Expectations
1	Fraction Puzzles	• Explore/review fractional parts of geometric shapes. • Order fractions.	7m11, 7m15 CGE 3c, 5a, 5e
2	Adding Fractions	• Investigate adding fractions using manipulatives.	7m11 CGE 3b, 3c, 5a
3	Adding Fractions with Different Denominators	• Add fractions by connecting concrete to symbolic. • Recognize the need for and find equivalent fractions with common denominators.	7m11, 7m12 CGE 4b, 5e
4	Exploring Fractions Using Relational Rods	• Explore fractions using relational rods.	7m24 CGE 3c, 4a
5	Adding and Subtracting Fractions Using Relational Rods	• Add and subtract fractions using relational rods.	7m24 CGE 2c, 3b, 3c, 5e
6	Subtracting Fractions Using Equivalent Fractions	• Develop strategies for subtracting fractions using equivalent fractions with common denominators. • Add and subtract fractions.	7m24 CGE 4e, 5g
7	Adding and Subtracting Fractions	• Demonstrate understanding and skills while performing operations with fractions.	7m24 CGE 2b, 3c
8	Exploring Fractions Further	• Explore repeated addition of fractions and addition and subtraction of mixed numbers.	7m24, 7m25 CGE 3b, 4f, 5a
9	Dividing Whole Numbers by Fractions Using Concrete Materials *(lesson not included)*	• Divide whole numbers by simple fractions using concrete materials, e.g., divide 3 by $\frac{1}{2}$, using fraction strips.	7m18
10	Summative Assessment *(lesson not included)*	• Demonstrate understanding of fractions and operations with fractions on an open-ended, problem-solving task.	7m11, 7m19, 7m24, 7m25 CGE 2b, 3c, 4f

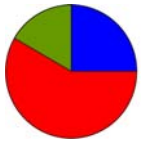
Day	Lesson Title	Math Learning Goals	Expectations
11	Fractions and Decimals	• Explore the relationships between fractions and decimals.	7m15, 7m27 CGE 2c, 3c
12	Decimals *(lesson not included)*	• Compare and order decimals to hundredths, using a variety of tools, e.g., number lines, relational rods, base-ten materials, calculators. • Determine whether a fraction or a decimal is the most appropriate way to represent a given quantity, e.g., I would use a fraction to express part of an hour, saying "quarter hour" instead of ".25 of an hour." • Add and subtract decimals.	7m11, 7m15, 7m23 CGE 2c, 3e
13	Mental Math and Decimals *(lesson not included)*	• Use a variety of mental strategies to add and subtract decimals, e.g., use the distributive property. • Divide whole numbers by decimal numbers to hundredths using concrete materials.	7m19, 7m23 CGE 3c, 4b
14	Multiplying Decimals *(lesson not included)*	• Multiply decimal numbers to thousandths by one-digit whole numbers, using concrete materials, calculators, estimation, and algorithms. • Solve problems involving the multiplication of decimal numbers.	7m18, 7m20 CGE 3e, 4b
15	Dividing Decimals *(lesson not included)*	• Divide whole numbers by decimal numbers to hundredths, using concrete materials, e.g., base-ten materials to divide 4 by 0.8. • Divide decimal numbers to thousandths by one-digit whole numbers, using concrete materials, estimation, and algorithms, e.g., estimate $16.75 \div 3$ as $18 \div 3 \approx 6$, then calculate, predicting an answer slightly less than 6. • Solve everyday problems involving division with decimals.	7m18, 7m20 CGE 3a, 3c
16	Solving Multi-Step Problems Involving Decimals *(lesson not included)*	• Solve multi-step problems involving whole numbers and decimals. • Justify solutions using concrete materials, calculators, estimation, and algorithms. • Use estimation when solving problems involving decimals to judge the reasonableness of a solution, e.g., A book costs $18.49. The salesperson tells you that the total price, including taxes, is $22.37. How can you tell if the total price is reasonable without using a calculator?	7m21, 7m22 CGE 2b, 3c
17	Summative Assessment of Decimals *(lesson not included)*	• Demonstrate an understanding of decimals and operations with decimals.	
18	Percent *(lesson not included)*	• Investigate and represent the relationships among fractions, decimals, and percents. • Identify common uses of percents, fractions, and decimals. • Estimate percents visually, e.g., shade 60% of a rectangle, and mentally, e.g., 3 out of 11 hockey players missed practice means approximately 25% were absent.	7m15, 7m22, 7m27 CGE 2b, 2c, 3e
19	Solving Percent Problems with Concrete Materials *(lesson not included)*	• Solve problems that involve determining whole-number percents, using concrete materials, e.g., base-ten materials, 10×10 square.	7m28 CGE 2b, 2c, 3e

Day	Lesson Title	Math Learning Goals	Expectations
20	Finding the Percent of a Number *(lesson not included)*	• Solve problems that involve determining the percent of a number, e.g., CDs are on sale for 50% of the regular price. What is the sale price of a $14.98 CD? Relate the percent to fraction and decimal versions, e.g., The CD is half price. • Estimate to judge the reasonableness of the answer. • Solve problems that involve determining whole-number percents with and without calculators.	7m22, 7m28 CGE 3c, 3e
21	Connecting Fractions to Percent *(lesson not included)*	• Determine what percent one number is of another, e.g., 4 out of 16 shapes are hearts. What percent are hearts? • Connect this type of problem to converting a fraction to a percent, e.g., 4 out of 16 = $\frac{4}{16}$ = 25%.	7m15, 7m28 CGE 3c, 3e
22	Using Percent to Make Comparisons *(lesson not included)*	• Use percent to make comparisons, e.g., $\frac{23}{31}$ students won ribbons in one class and $\frac{20}{29}$ won in the other class. Which had the better performance? • Pose and solve comparison problems using a calculator.	7m28 CGE 3e
23	Using Percent to Find the Whole *(lesson not included)*	• Calculate the size of the whole when a percentage of the whole is known, e.g., 6 students in a class have juice for snack. If that is 20% of the class, how large is the class? • Relate to probability e.g., if 20% of the students have juice, what is the probability that a student chosen at random will have juice?	7m27, 7m28, 7m84 CGE 2b, 2c
Term 3			
24	Using Tables and Lists to Determine Outcomes *(lesson not included)*	• Determine all possible outcomes of an event using a chart, table, or systematic list, e.g., If you threw three coins simultaneously, what are all the possible combinations of heads and tails? • Determine all possible sums when rolling two number cubes.	7m85 CGE 2c, 3e
25	Probability *(lesson not included)*	• Distinguish between theoretical probability and experimental probability. • Express probability as a fraction, decimal, and percent. • Calculate probability of specific outcomes using Day 24 charts and tables, e.g., what is the probability of three coin flips being HHH?	7m27, 7m85, 7m86 CGE 3c, 3e
26	Designing Games and Experiments *(lesson not included)*	• Understand the connections between percent and probability by: – designing a fair game (each player has a 50% chance of winning), e.g., Two players take turns rolling one numbered cube. If the number is odd, player A scores a point. If the number is even, player B scores a point. – designing an experiment where the chance of a particular outcome is 1 in 3, e.g., use a bag of 2 red and 4 green balls.	7m84 CGE 2c, 3c, 4b, 4c
27	Making Predictions Based on Probability *(lesson not included)*	• Make predictions about a population given a probability, e.g., if the probability of catching a fish at the conservation is 30%, how many students in our class of 28 will catch a fish, if we all go to the conservation to fish?	7m84 CGE 3c, 3e
28	Tree Diagrams *(lesson not included)*	• Understand that two events are independent when one does not affect the probability of the other, e.g., rolling a number cube, then flipping a coin. • Determine all possible outcomes for two independent events by completing tree diagrams, e.g., spinning a three-section spinner two consecutive times; rolling a number cube, then spinning a four-section spinner.	7m85 CGE 3c

Day	Lesson Title	Math Learning Goals	Expectations
29	Probability of a Specific Event *(lesson not included)*	• Determine the probability of a specific outcome from two independent events using tree diagrams, e.g., when flipping a coin and then rolling a number cube, what is the probability of getting a head and an even number?	7m85 CGE 3a
30	Comparing Theoretical and Experimental Probability *(lesson not included)*	• Perform a simple probability experiment. • Compare theoretical probability with the results of the experiment using both a small sample (individual student results) and a large sample (the combined results from all students in the class). • Understand that probability results can be misleading if an experiment has too few trials.	7m86 CGE 2e, 3c
31	Applications of Probability in the World *(lesson not included)*	• Examine everyday applications of probability, e.g., batting averages, goalie statistics, weather forecasts, opinion polls. • Research and report on probabilities expressed in fraction, decimal, and percent form.	7m27, 7m83 CGE 3c, 4c, 4e, 4f

Unit 7: Day 1: Fraction Puzzles

Grade 7



Math Learning Goals

- Explore/review fractional parts of geometric shapes.
- Order fractions.

Materials

- pattern blocks
- overhead pattern blocks
- BLM 7.1.1, 7.1.2, 7.1.3, 7.1.4
- 2 or 3 large imperial socket wrench sets in cases

Assessment Opportunities

Minds On…

Whole Class → Solving a Problem

Students solve an area fraction puzzle:

- With your pattern blocks build two different triangles each with an area that is one-half green and one-half blue.

Students share their solutions, using the overhead pattern blocks.

Discuss whether rearranging the blocks makes the solution "different."

See Continuum and Connections Fractions in LMS library.

Virtual pattern blocks are available at: http://arcytech.org/java/patterns/patterns_j.shtml

Action!

Pairs → Problem Solving

Students complete questions 1 to 5 on BLM 7.1.1, using pattern blocks. They show the graphic solution, labelling each colour with the appropriate fraction of the whole triangle (BLM 7.1.2).

Students complete questions 1 to 5 (BLM 7.1.3) individually. Pairs of students take turns, completing question 6, using an imperial set of socket wrenches.

Curriculum Expectations/Demonstration/Marking Scheme: Assess students' understanding of equivalent fractions and ordering fractions.

Briefly review the meaning of *parallelogram* (blue or beige block) and *trapezoid* (red block).
Some methods students may use include physical size of each socket, ordering of the sockets could also be accomplished using equivalent fractions, converting to decimals, or measuring in millimetres.

Consolidate Debrief

Whole Class → Sharing/Discussion

Pairs of students share their solutions to an area puzzle using the overhead pattern blocks and explain how they know their solution is correct.

Discuss possible answers to question 5 on the student worksheet (BLM 7.1.1).

Several different pairs of students share their solutions, even if the solution is merely another arrangement of the same pattern blocks. This allows more students to be recognized and reinforces multiple solutions and explanations.

Discuss the various methods students used to solve the socket set problem.

Students explain why they placed a certain socket between two others.

Concept Practice

Home Activity or Further Classroom Consolidation

Complete worksheet 7.1.4.

Provide a tangram pattern.

7.1.1: Pattern Block Area Fraction Puzzles

Name:
Date:

Use pattern blocks to solve each of the area fraction puzzles below. Draw each solution on pattern block paper. Label each colour with its fraction of the whole shape.

1. Build a parallelogram with an area that is $\frac{1}{3}$ green, $\frac{1}{3}$ blue, and $\frac{1}{3}$ red.

2. Build a parallelogram with an area that is $\frac{1}{8}$ green, $\frac{1}{2}$ yellow, $\frac{1}{8}$ red, and $\frac{1}{4}$ blue.

3. Build a trapezoid with an area that is $\frac{1}{10}$ green and $\frac{9}{10}$ red.

4. Rebuild each of the puzzles above in a different way.

5. Explain why it is not possible to build a parallelogram with an area that is one-half yellow, one-third green, and one-quarter blue.

Pattern Block Area Fraction Puzzles

Name:
Date:

Use pattern blocks to solve each of the area fraction puzzles below. Draw each solution on pattern block paper. Label each colour with its fraction of the whole shape.

1. Build a parallelogram with an area that is $\frac{1}{3}$ green, $\frac{1}{3}$ blue, and $\frac{1}{3}$ red.

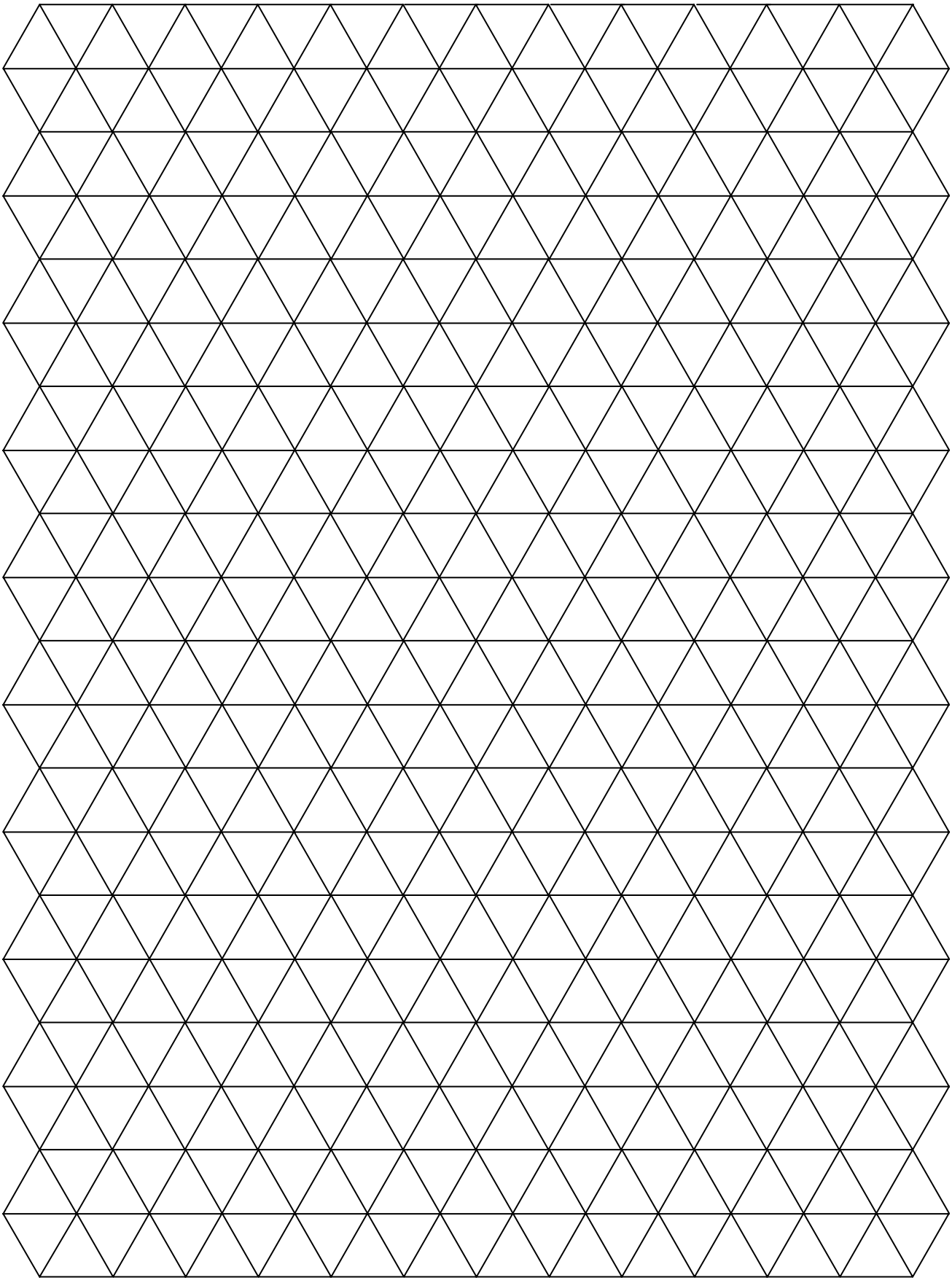
2. Build a parallelogram with an area that is $\frac{1}{8}$ green, $\frac{1}{2}$ yellow, $\frac{1}{8}$ red, and $\frac{1}{4}$ blue.

3. Build a trapezoid with an area that is $\frac{1}{10}$ green and $\frac{9}{10}$ red.

4. Rebuild each of the puzzles above in a different way.

5. Explain why it is not possible to build a parallelogram with an area that is one-half yellow, one-third green, and one-quarter blue.

7.1.2: Pattern Block Paper



7.1.3: Socket to You!

Name:
Date:

1. $\frac{20}{32}$ is an equivalent fraction for $\frac{5}{8}$. Write two more equivalent fractions for $\frac{5}{8}$.

2. Write two equivalent fractions for $\frac{3}{4}$.

3. Circle which is larger: $\frac{3}{8}$ or $\frac{3}{16}$. Explain how you know.

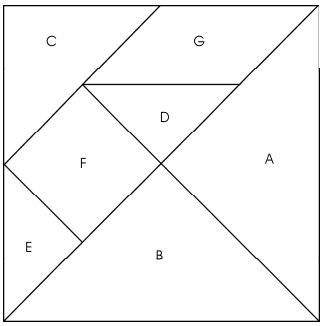
4. Circle which is smaller: $\frac{7}{16}$ or $\frac{9}{16}$. Explain how you know.

5. Circle the fraction that fits between $\frac{7}{16}$ and $\frac{9}{16}$. Verify your answer using a method of your choice.

   $\frac{13}{32}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{1}{2}$ $\frac{5}{8}$ $\frac{3}{4}$ $\frac{19}{32}$

6. Often mechanics use socket wrench sets with openings measured in fractions of an inch.
   These fractions are stamped on the fronts of the sockets.
   Arrange the sockets from smallest to largest.
   Explain how you decided on the order you chose.
   Check by placing the sockets in the case.

7.1.4: Area with Tangrams



Name:
Date:

1. Use your tangram pieces to complete the table. Consider the area of D to be one square unit.

Tangram Piece	Calculated Area of Tangram Piece	Fraction of the Entire Set (by Area)
A		
B		
C		
D	1 unit ^{2}	
E		
F		
G		

2. What fraction of part D is E?

3. What fraction of part A is C?

4. What fraction of part B is C?

5. If the area of C is 4 cm^2, find the area of each of the other parts.

6. If the area of F is 3 cm^2, find the area of each of the other parts.

	Calculated Area	Calculated Area
A		
B		
C	4 cm ^{2}	
D		
E		
F		3 cm ^{2}
G		

Unit 7: Day 2: Adding Fractions

Grade 7

Math Learning Goals

- Investigate combinations of fractions using manipulatives.

Materials

- pattern blocks
- overhead pattern blocks
- BLM 7.2.1

Assessment Opportunities

Minds On…

Whole Class → Introducing Problems

Using pattern blocks, students show that $\frac{1}{6}+\frac{1}{2}=\frac{2}{3}$. Several students share their methods.

Students show that $\frac{1}{3}+\frac{1}{3}=\frac{2}{3}$ and share which pattern block they chose to represent one whole.

Demonstrate the use of different pattern blocks to represent one whole.

One way: Using the hexagon as one whole, the triangle can be one-sixth, three triangles (or the trapezoid) can be one-half, and together they form four-sixths (two-thirds).

Action!

Pairs → Exploration

Students answer several questions involving combining fractions that can be modelled with pattern blocks. For example, $\frac{1}{2}+\frac{5}{6}$; $\frac{1}{3}+\frac{1}{6}$; $\frac{1}{3}+\frac{5}{6}+\frac{4}{3}$.

Students explain each solution, and identify which pattern block they used to represent the whole.

Fractions, both proper and improper, that have denominators of 2, 3, or 6 work well with pattern blocks.

Consolidate Debrief

Whole Class → Sharing/Discussion

Students demonstrate their strategies to add fractions using overhead pattern blocks.

Discuss the idea of equivalent fractions with common denominators as it relates to the pattern blocks, e.g., using smaller blocks helps to combine fractions with different denominators.

For example, to add $\frac{1}{2}+\frac{5}{6}$, students may choose to use the hexagon as the one whole. They would use the trapezoid to represent $\frac{1}{2}$ and five triangles to represent $\frac{5}{6}$. To combine the fractions, students need to express the answer in triangles (one whole and two triangles, or one- and two-sixths, which can be simplified to one and one-third using the blue rhombi).

Students should use a variety of methods to determine the common denominator.

Curriculum Expectations/Demonstration/Checklist: Assess students' ability to add fractions using manipulatives.

As students explore and discuss they gain a deeper understanding of equivalent fractions and of the algorithm for determining a common denominator.

Concept Practice

Home Activity or Further Classroom Consolidation

Complete the worksheet, Combining Fractions (7.2.1).

For virtual pattern blocks and related activities see: http://math.rice.edu/~lanius/Patterns/

7.2.1: Combining Fractions

Name:
Date:

Use pattern blocks to solve each problem. Record your solutions on the pattern block paper. Include the symbolic fractions as well as the drawings.

1. Show that:
   a) $\frac{1}{6}+\frac{1}{6}=\frac{1}{3}$ b) $\frac{1}{6}+\frac{2}{3}=\frac{5}{6}$ c) $\frac{1}{6}+\frac{1}{3}+\frac{1}{2}=1$

2. Add $\frac{1}{6}$ and $\frac{1}{3}$.

3. Add $\frac{1}{2}+\frac{2}{3}$.

4. Show three different ways of adding three fractions to get two wholes.

5. Show that $\frac{2}{3}+\frac{1}{6}$ is less than 1. How much less than 1 is this sum?

Combining Fractions

Name:
Date:

Use pattern blocks to solve each problem. Record your solutions on the pattern block paper. Include the symbolic fractions as well as the drawings.

1. Show that:
   a) $\frac{1}{6}+\frac{1}{6}=\frac{1}{3}$ b) $\frac{1}{6}+\frac{2}{3}=\frac{5}{6}$ c) $\frac{1}{6}+\frac{1}{3}+\frac{1}{2}=1$

2. Add $\frac{1}{6}$ and $\frac{1}{3}$.

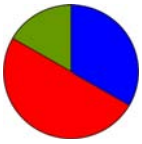
3. Add $\frac{1}{2}+\frac{2}{3}$.

4. Show three different ways of adding three fractions to get two wholes.

5. Show that $\frac{2}{3}+\frac{1}{6}$ is less than 1. How much less than 1 is this sum?

Unit 7: Day 3: Adding Fractions with Different Denominators

Grade 7



Math Learning Goals

- Add fractions by connecting concrete to symbolic.
- Recognize the need for and find equivalent fractions with common denominators.

Materials

- BLM 7.3.1, 7.3.2
- pattern blocks

Assessment Opportunities

Minds On…

Whole Class → Teacher Directed Instruction

Some students share their solutions to question 3 from the previous day's Home Activity ($\frac{1}{2} + \frac{2}{3}$) using overhead pattern blocks.

Record the symbolic form of each solution, i.e., the fractions. Discuss how to get the solution without using pattern blocks.

Through questioning, students consider the use of equivalent fractions with a common denominator, in this case, 6. They may determine the common denominator in different ways.

1 whole

$\frac{1}{2}$

$\frac{2}{3}$

Action!

Pairs → Think/Pair/Share

Students think individually about solving each of the questions from the Home Activity, Day 2, using equivalent fractions with a common denominator. Then with a partner, they discuss their strategies for finding equivalent fractions with a common denominator. Pairs share their strategies with a small group and/or the whole class.

Curriculum Expectations/Observation/Checklist: Assess students' understanding of addition of fractions with common denominators.

Consolidate Debrief

Whole Class → Note Making

Create a note together that outlines the process for adding fractions using equivalent fractions with a common denominator. Include the multiples method of finding common denominators.

Students determine the steps to follow in the process.

Students work independently on differentiated practice, based on the teacher's observations in Action (see BLM 7.3.1, 7.3.2).

BLM 7.3.2 shows scaffolding.

Home Activity or Further Classroom Consolidation

Complete the worksheet, Adding Fractions with Different Denominators, and the practice questions.

Differentiated Concept Practice

Provide student with appropriate practice questions.

7.3.1: Adding Fractions with Different Denominators

Name:
Date:

1. Use multiples to find three common denominators for the following pair of fractions:

   $\frac{1}{2}, \frac{5}{8}$

   Multiples of 2:

   Multiples of 8:

   My three common denominators are _____, _____, and _____.

2. Find a common denominator for the following fraction pairs:

   a) $\frac{1}{4}, \frac{2}{3}$ Common denominator: _____

   b) $\frac{3}{5}, \frac{3}{8}$ Common denominator: _____

   Rewrite each pair with a common denominator using equivalent fractions.

3. Rewrite each of the following expressions using equivalent fractions with a common denominator. Add the fractions.

   a) $\frac{1}{3}+\frac{1}{5}$

   b) $\frac{5}{6}+\frac{1}{4}$

   c) $\frac{3}{5}+\frac{1}{8}$

7.3.2: Adding Fractions with Different Denominators

Name:
Date:

1. Use multiples to find two common denominators for the following pair of fractions.

   $\frac{1}{2}, \frac{5}{8}$

   Multiples of 2: 2, 4, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

   Multiples of 8: 8, 16, ___, ___, ___, ___, ___, ___, ___, ___

   My two common denominators are _____ and _____.

2. Find a common denominator for the following fraction pairs.

a) $\frac{1}{4}, \frac{2}{3}$	b) $\frac{3}{5}, \frac{3}{8}$
4: 4, ___, ___, ___, ___, ___, ___, ___	5: ___, ___, ___, ___, ___, ___, ___, ___
3: 3, ___, ___, ___, ___, ___, ___, ___	8: ___, ___, ___, ___, ___, ___, ___, ___
Common denominator: _____	Common denominator: _____
$\frac{1}{4} \times \frac{\_\_}{\_\_} = \frac{\_\_}{\_\_}$	$\frac{3}{5} = \frac{\_\_}{\_\_}$
$\frac{2}{3} \times \frac{\_\_}{\_\_} = \frac{\_\_}{\_\_}$	$\frac{3}{8} = \frac{\_\_}{\_\_}$

3. Rewrite the following expression using equivalent fractions with a common denominator. Add the fractions.

   a) $\frac{1}{3} + \frac{1}{5}$

   3: ___, ___, ___, ___, ___, ___, ___

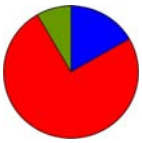
   5: ___, ___, ___, ___, ___, ___, ___

   $\frac{1}{3} = \frac{\_\_}{\_\_}$ $\frac{1}{5} = \frac{\_\_}{\_\_}$ → $\frac{\_\_}{\_\_} + \frac{\_\_}{\_\_} = \frac{\_\_}{\_\_}$

   b) $\frac{5}{6} + \frac{1}{4}$

Unit 7: Day 4: Exploring Fractions Using Relational Rods

Grade 7



Math Learning Goals

- Explore fractions using relational rods.

Materials

- overhead relational rods
- sets of relational rods
- BLM 7.4.1, 7.4.2, 7.4.3

Assessment Opportunities

Minds On…

Whole Class → Introducing the Problem

As pairs of students follow along with their own sets of relational rods, place the blue and black overhead relational rods together to form one whole (BLM 7.4.2). Students decide how they would determine the value of a particular coloured rod in relation to this blue-black whole.

Invite a student to demonstrate that the brown rod (8 units) is one-half of the blue-black whole (16 units).

Repeat with the dark green rod. Students determine the fractional value of the dark green rod in relation to the blue-black whole. Write this relation as a fraction ($\frac{6}{16} = \frac{3}{8}$).

Guide their thinking with questions:

- What rod(s) may represent one unit for this whole?
- How many units is the dark green rod? Students use other rods to determine equivalent fractions in lowest terms.

If students have not worked with relational rods before, some time should be allocated to exploration. They may benefit from some discussion of "unit" in the rods.

If sets of relational rods are not readily available, use BLM 7.4.1.

Action!

Pairs → Exploration

Students explore the fractional value of each of the relational rods relative to the blue-black whole.

Students organize their work in a table to clearly show how they have determined the fractional value of all of the coloured rods in relation to the blue-black whole and their relationships to each other (fractions less than one only). See BLM 7.4.3.

Curriculum Expectations/Observation/Mental Note: Assess students' understanding of equivalent fractions.

Consolidate Debrief

Whole Class → Sharing/Discussion

Students share the reasoning they used to determine the fractional value for each coloured rod in relation to the blue-black whole and to each other. Several different pairs share their strategies.

Pairs share their methods for organizing the information to show the relationships among the rods.

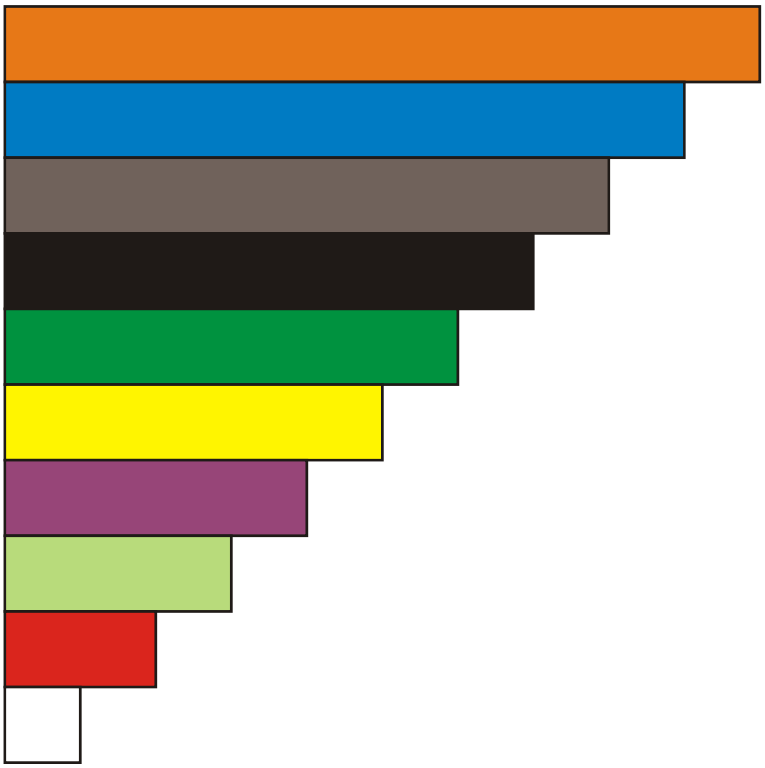
Home Activity or Further Classroom Consolidation

Concept Practice

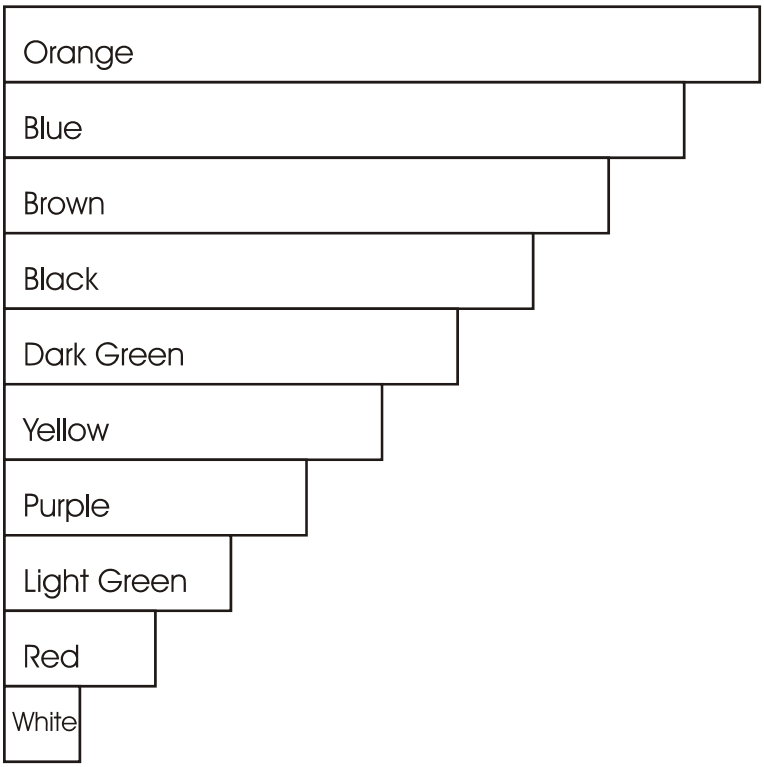
Complete practice questions.

Provide students with appropriate practice questions.

7.4.1: Template for Relational Rods



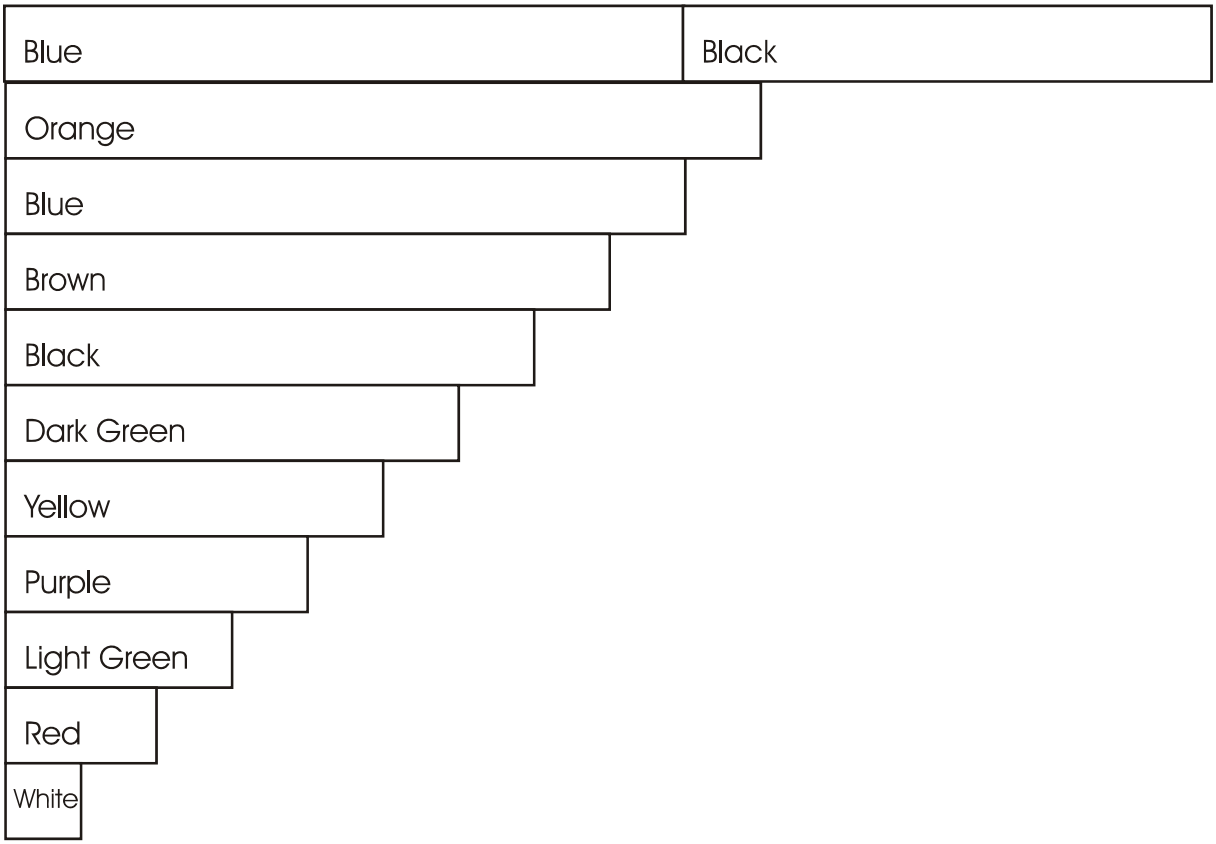
Teachers may want to print the coloured rods on acetate and cut them apart to use on the overhead transparency.



Students can colour the rods as indicated and cut them apart to make their own set of relational rods.

7.4.2: Relational Rods as a Fraction of One Blue-Black Whole

Name:
Date:



Write the value of each coloured rod as a fraction of the blue-black rod. Simplify any fraction that is not in lowest terms.

7.4.3: Fractions Using Relational Rods

	White	Red	Light Green	Purple	Yellow	Dark Green	Black	Brown	Blue	Orange
White										
Red										
Light Green										
Purple			$\frac{3}{4}$							
Yellow										
Dark Green										
Black										
Brown	$\frac{1}{8}$									
Blue										
Orange								$\frac{4}{5}$		
Blue/ Black	$\frac{1}{16}$									

Unit 7: Day 5: Adding and Subtracting Fractions Using Relational Rods Grade 7

Math Learning Goals

- Add and subtract fractions using relational rods.

Materials

- sets of relational rods
- BLM 7.5.1

Assessment Opportunities

Minds On…

Whole Class → Review

Discuss strategies that different students used for expressing one rod as a fraction of another.

Action!

Pairs → Game

Play one game as a whole class.

Students work with the relational rods to create and complete addition and subtraction problems (BLM 7.5.1).

They use various strategies to prove that their statement is correct – modelling with the rods, using symbolic manipulation and equivalent fractions, using a calculator.

This would allow for some reinforcement of appropriate language and problem-solving skills.

Curriculum Expectations/Demonstration/Anecdotal Note: Assess students' ability to add and subtract fractions, using relational rods and equivalent fractions.

Consolidate Debrief

Whole Class → Discussion

Each pair of students shares one addition or subtraction expression they created for the class to solve.

Discuss students' strategies for solving, e.g., using rods, mentally, finding equivalent fractions with a common denominator.

Application
Reflection
Exploration

Home Activity or Further Classroom Consolidation

- Create a new game that would require the use of relational rods to add or subtract fractions, e.g., purple-brown whole.

OR

- Create a new whole based on two or more rods combined (not blue-black). Find the fractional value that each rod is of the whole.

OR

- Complete the practice questions about determining equivalent fractions.

Assign these tasks to specific groups of students based on their skill levels.

Provide students with appropriate practice questions involving equivalent fractions.

7.5.1: Fraction Game with Relational Rods

Name:
Date:

Work with a partner.

Use the worksheet 7.4.2: Relational Rods as a Fraction of One Blue-Black Whole to help you with the fractional value of each rod.

1. One partner randomly selects 5 rods from the set and lays them out on the table. The other partner chooses from these, 2 rods to add and subtract.

2. Individually, create two addition-of-fractions equations and two subtraction-of-fractions equations using the rods. Record your equations using the colours as well as the fractional values in terms of the blue-black rod.
   For example,

   Addition

dark green	+	purple	=	orange
$\frac{6}{16}$ blue-black	+	$\frac{4}{16}$ blue-black	=	$\frac{10}{16}$ blue-black

   Use equivalent fractions to reduce to:

$\frac{3}{8}$ blue-black	+	$\frac{1}{4}$ blue-black	=	$\frac{5}{8}$ blue-black

   Subtraction

orange	–	purple	=	dark green
$\frac{10}{16}$ blue-black	–	$\frac{4}{16}$ blue-black	=	$\frac{6}{16}$ blue-black,

   Use equivalent fractions to reduce to:

$\frac{5}{8}$ blue-black	–	$\frac{1}{4}$ blue-black	=	$\frac{3}{8}$ blue-black

3. Compare your two sets of equations.
   - For each equation hat is common, check the answer using another method. If it is correct award your team 2 points.
   - For each equation that is different, explain your solution to your partner. When you agree on the correct equation, check the answer. If it is correct, award you team 1 point.
   - No points are awarded for incorrect equations.

4. Record each person's score for that round.

5. For each round, take turns, randomly selecting 5 rods from the set.

6. Play continues until one person reaches 20 points.

Unit 7: Day 6: Subtracting Fractions Using Equivalent Fractions

Grade 7

Math Learning Goals

- Develop rules for subtracting fractions using equivalent fractions with common denominators.
- Add and subtract fractions.

Materials

- BLM 7.6.1, 7.6.2
- relational rods
- pattern blocks

Assessment Opportunities

Minds On…

Whole Class → Game

Play the concentration game with the class (BLM 7.6.1, 7.6.2).

Consider including visual representations of the fractions on the game board, e.g., coloured rods, pattern blocks.

Action!

Whole Class → Notemaking

Students summarize their understanding of subtracting fractions using equivalent fractions with a common denominator.

Work together to pose questions, create examples related to the questions, and work the examples. Students add to their notes. Highlight different methods that students have developed for determining equivalent fractions and for subtracting fractions.

Students develop the steps in the process, including as much detail as they require.

Alternatives to this whole-class activity include working in pairs or small groups or creating poster notes. Make manipulatives available.

Consolidate Debrief

Individual → Practice

Students work independently to add and subtract fractions by completing assigned questions. Make manipulatives available.

Curriculum Expectations/Quiz/Marking Scheme: Assess students' ability to add and subtract fractions, using a variety of tools.

Home Activity or Further Classroom Consolidation

- Complete the practice questions.

OR

- Create a card game based on fractions.

Application
Concept Practice
Reflection
Skill Drill

Provide students with appropriate practice questions.

7.6.1: A Concentration Game (Teacher)

A	B	C	D
E	F	G	H
I	J	K	L
M	N	O	P

7.6.2: Instructions for the Concentration Game (Teacher)

This game can be used to introduce a topic or to help students consolidate a concept. Choose only one concept for each game.

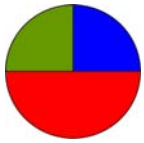
For example:
- equivalent fractions
- fractions in simplest form
- converting between fractions and decimals, decimals and percent, or fractions and percent
- converting between mixed numbers and improper fractions

To prepare the game:
Randomly write eight fractions in different boxes on an acetate copy of the game board. In the remaining eight boxes, write the match to the original eight. Cut out and number 16 paper squares to hide the contents of each box as the game is projected on the overhead screen. Label the blank squares that you use to cover the boxes.

To play the game:
The class forms two teams. A student from the starting team requests that two boxes be uncovered. The student tells if there is a match. If the two items revealed match, the team gets a point. If not, the boxes are covered again and a student from the next team gets a turn. Play continues until all matches have been found.

Note: Students can work in pairs to quietly discuss the correctness of the match. This may also reduce self-consciousness for some students.

Alternate playing suggestions:
- If a team makes a match, they get another turn.
- All students must have at least one turn before anyone can take a second turn.
- To prevent students from automatically saying that everything revealed is matching, the team loses a point if a student declares an incorrect match.



Math Learning Skills

- Demonstrate understanding and skills while performing operations with fractions.

Materials

- BLM 7.7.1, 7.7.2

Assessment Opportunities

Minds On…

Whole Class → Review/Four Corners

Students go to the corner where the question they are most interested in discussing is posted, e.g., adding fractions, subtracting fractions, equivalent fractions, using manipulatives to understand fractions. In this corner students discuss their understanding. Visit each corner and ask relevant questions and redirect the discussion, as needed.

Refer to *Think Literacy: Mathematics, Grades 7–9*, pp. 106–109.

Action!

Individual → Applying Understanding

Students work independently to complete the Fraction Flag task (BLM 7.7.1). Students may measure using a ruler or use manipulatives to cover the area. They may use any of the manipulative materials they have been using to add and subtract fractions, if they choose.

For some students, the flag could be superimposed on grid paper (or grid paper on acetate could be used) to provide an additional option for counting squares to determine area.

Curriculum Expectations/Application/Checkbric: Assess students' ability to apply their understanding of fractions.

Consolidate Debrief

Whole Class → Sharing

Students share their strategies for completing the task.

Home Activity or Further Classroom Consolidation

Exploration Reflection

Create your own flag using fractional sections. Include solutions.

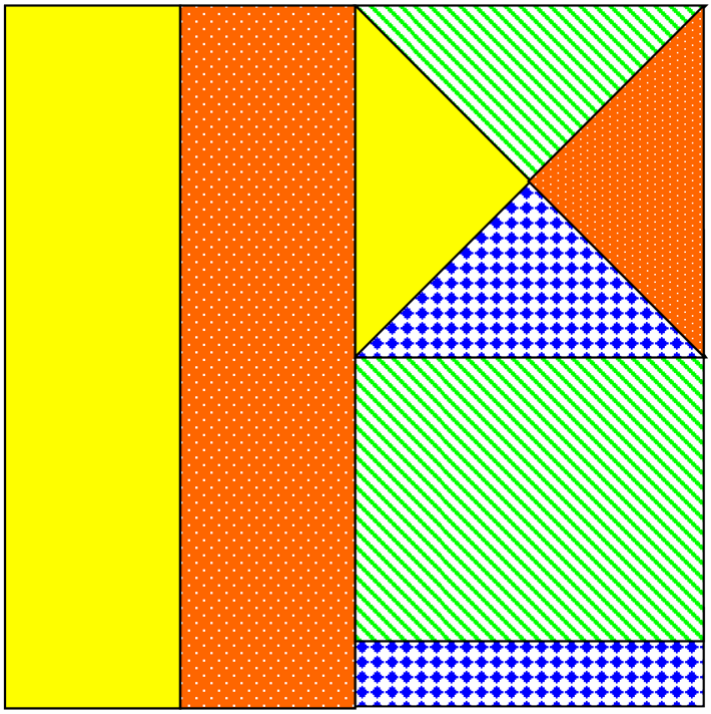
See BLM 7.7.2. Post flags in the classroom.

7.7.1: Fraction Flag

Name:
Date:

The flag to the right was designed with four colours.

1. Determine the fraction of the flag that is:
   a. Orange
   b. Blue
   c. Yellow
   d. Green

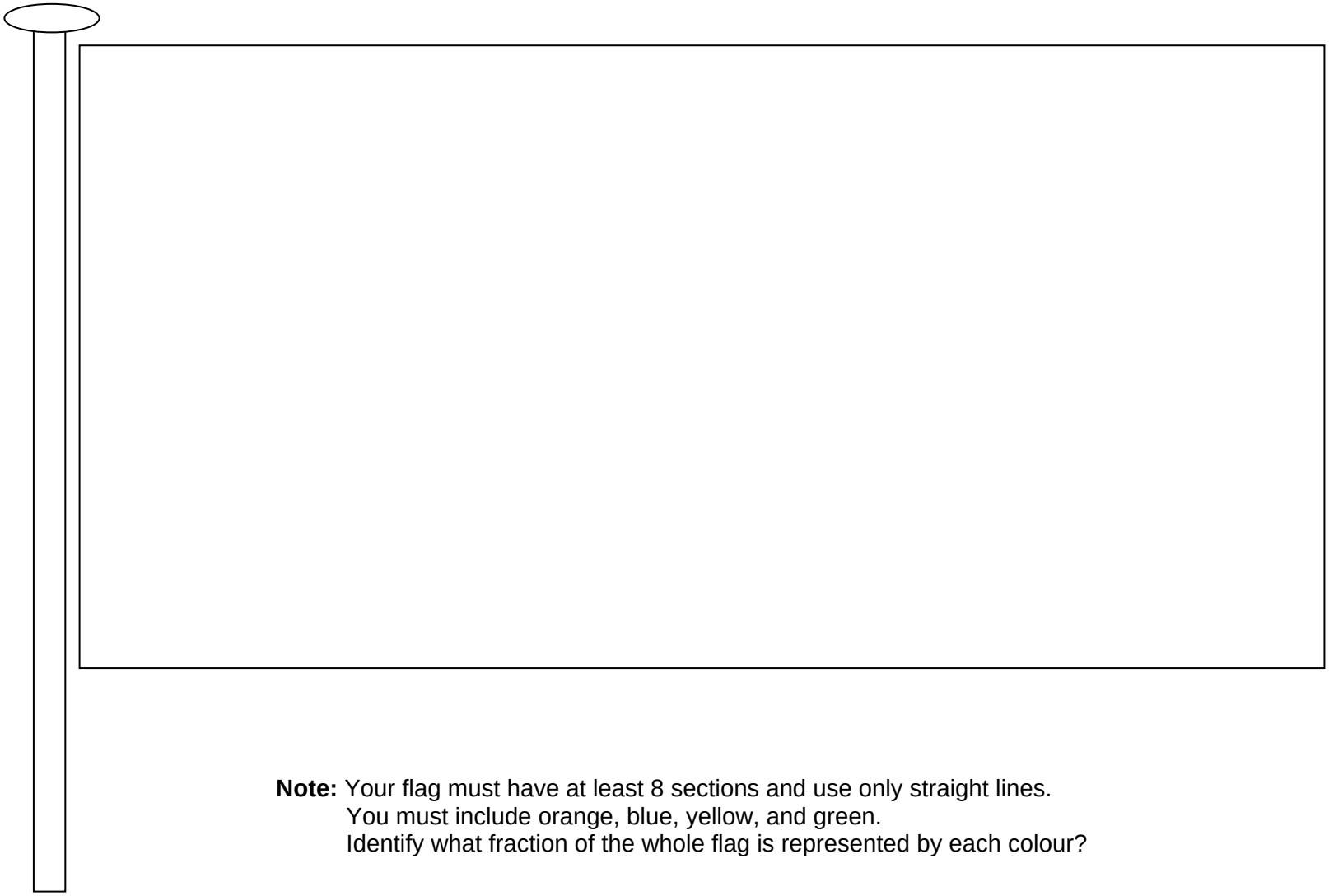


2. What fraction of the flag is not green?
   Explain your reasoning.

3. How much more of the flag is orange than blue? Show all of your work.

7.7.2: Create Your Own Fraction Flag

_____'s Fraction Flag **Date: _____**

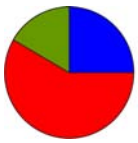


Note: Your flag must have at least 8 sections and use only straight lines.
You must include orange, blue, yellow, and green.
Identify what fraction of the whole flag is represented by each colour?

orange = _____ blue = _____ yellow = _____ green = _____

Unit 7: Day 8: Exploring Fractions Further

Grade 7



Math Learning Goals

- Explore repeated addition of fractions and addition and subtraction of mixed numbers.

Materials

- BLM 7.8.1, 7.8.2
- overhead manipulatives

Assessment Opportunities

Minds On…

Whole Class → Introducing the Problems

Identify and describe types of fractions and operations with fractions that have not been addressed (mixed numbers, multiplication and division of fractions, etc.). Focus on mixed fractions. Students can build the fractions with manipulatives, as well as represent them symbolically.

Have manipulatives available for students to use to add and subtract mixed fractions.

Action!

Pairs → Exploration

Students develop solutions for the various fraction problems (BLM 7.8.1).

Students can use manipulatives of their choice.

Problem Solving/Application/Checklist: Assess students' ability to solve problems involving the addition and subtraction of fractions.

Students should consult with their partner before they ask for assistance.

Consolidate Debrief

Whole Class → Sharing

Students share the strategies they used to solve the problems, providing a complete explanation of how they attempted the solution and how they can prove their solution is correct.

Record the different methods students used and lead them to see that there is more than one valid strategy, e.g., $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}$ is the same as $6\times\frac{2}{3}$.

Have overhead manipulatives available.

Application
Concept Practice

Home Activity or Further Classroom Consolidation

Complete worksheet 7.8.2, Food Fractions.

7.8.1: Fraction Party Problems

Solve the following problems involving fractions. Show or explain your strategies.

1. A recipe for Pink Party Punch calls for $4\frac{2}{3}$ cups of raspberry juice, $3\frac{1}{4}$ cups of ginger ale, and $2\frac{1}{2}$ cups of raspberry sherbet. How many cups of punch will the recipe make?

2. Sam filled 6 glasses with $\frac{2}{3}$ L of juice in each glass. How many litres of juice did he use?

3. Xia has 16 metres of rope. She cuts off $\frac{1}{6}$ of the rope to use as a skipping rope for a party activity. How long is Xia's skipping rope?

4. Tyson cut some bagels in half and some apples into eighths. At the end of the party, there were 5 pieces of bagel and 11 slices of apple left. How many bagels and how many apples were not eaten?

7.8.2: Food Fractions

Solve the following problems involving food and fractions. Show and/or explain the strategies you used.

1. Three people shared a mega nutrition bar.
   Which of the following statements are possible? Explain your reasoning.

   a. Greg ate $\frac{3}{8}$ of the bar, Gursharan ate, $\frac{1}{4}$ and Mo ate $\frac{1}{2}$.

   b. Greg ate $\frac{1}{5}$ of the bar, Gursharan ate $\frac{3}{10}$, and Mo ate $\frac{1}{2}$.

   c. Greg ate $\frac{1}{3}$ of the bar, Gursharan ate $\frac{1}{2}$, and Mo ate $\frac{1}{6}$.

   d. Greg ate $\frac{1}{6}$ of the bar, Gursharan ate $\frac{1}{4}$, and Mo ate $\frac{1}{3}$.

2. Ms. Legume wants to use $\frac{1}{3}$ of her garden for lettuce and $\frac{1}{2}$ for beans.
   What fraction of the garden does she have left for each of her carrots and her peas if they both are to get the same amount of space?

Unit 7: Day 11: Fractions and Decimals

Grade 7

Math Learning Goals

- Explore the relationship between fractions and decimals.

Materials

- BLM 7.11.1, 7.11.2

Assessment Opportunities

Minds On…

Whole Class → Review and Introduce New Problem

Ask students to think of any two fractions that are "really close." Record a few of their suggestions on the board.

Challenge them to choose one pair of fractions from the board and to find two numbers that are between the two listed. Ask what types of numbers they might use to solve this problem. Identify that they could use fractions or decimals.

Action!

Pairs → Problem Solving

Students find two numbers between one pair of fractions listed on the board. Pairs develop their own strategies and methods independently, share their solutions to the problem, and their reasoning in finding the two numbers. If they use decimals, they should make the connection to fractions.

Communicating/Observation/Anecdotal Note: Assess students' ability to communicate their thinking using correct mathematical language.

Two methods to change a fraction to a decimal on a calculator are:

- divide the numerator by the denominator
- enter the fraction using the fraction key ($a\frac{b}{c}$), press ENTER, then press the fraction key again

Consolidate Debrief

Whole Class → Sharing

Some discussion around the connection between fractions and decimals and how to use a calculator to convert fractions to decimals would be useful. Include number systems, common relationships that students are familiar with, and applications/appropriateness of each in daily contexts.

The definition of *multiple* may need to be reviewed with students.

Pairs → Practice

Reinforce understanding of the fraction-decimal relationship (BLM 7.11.1).

Concept Practice
Exploration
Reflection

Home Activity or Further Classroom Consolidation

Create three determine-the-decimal questions. Each one should have either two or three clues and all the clues should be needed to determine the decimal.

Complete the practice questions.

Provide students with appropriate practice questions for exploring the relationship of fractions to decimals.

7.11.1: Determine the Decimal

Determine the mystery decimal number from the clues listed.

1. The decimal is…
   - Clue #1: greater than $\frac{1}{8}$
   - Clue #2: less than $\frac{1}{5}$
   - Clue #3: a multiple of $\frac{1}{20}$
2. The decimal is…
   - Clue #1: between $\frac{2}{5}$ and $\frac{3}{5}$
   - Clue #2: greater than $\frac{1}{2}$
   - Clue #3: a multiple of 0.11
3. The decimal is…
   - Clue #1: a multiple of $\frac{3}{4}$
   - Clue #2: between 2 and 3
4. The decimal is…
   - Clue #1: less than $\frac{7}{8}$
   - Clue #2: greater than $\frac{3}{4}$
   - Clue #3: a multiple of 0.17
5. The decimal is…
   - Clue #1: greater than $\frac{4}{5}$
   - Clue #2: a multiple of 0.22
   - Clue #3: less than 1
6. The decimal is…
   - Clue #1: between $\frac{1}{5}$ and $\frac{6}{10}$
   - Clue #2: closer to $\frac{1}{4}$ than to one-half
   - Clue #3: a multiple of $\frac{1}{10}$
7. The decimal is…
   - Clue #1: multiple of $\frac{1}{2}$
   - Clue #2: closer to 6 than to 3.5
   - Clue #3: not a whole number

7.11.2: Determine the Decimal Answers (Teacher)

Determine the mystery decimal number from the clues listed.

1. The decimal is… (0.15)
   - Clue #1: greater than $\frac{1}{8}$
   - Clue #2: less than $\frac{1}{5}$
   - Clue #3: a multiple of $\frac{1}{20}$

2. The decimal is… (0.55)
   - Clue #1: between $\frac{2}{5}$ and $\frac{3}{5}$
   - Clue #2: greater than $\frac{1}{2}$
   - Clue #3: a multiple of 0.11

3. The decimal is… (2.25)
   - Clue #1: a multiple of $\frac{3}{4}$
   - Clue #2: between 2 and 3

4. The decimal is… (0.85)
   - Clue #1: less than $\frac{7}{8}$
   - Clue #2: greater than $\frac{3}{4}$
   - Clue #3: a multiple of 0.17

5. The decimal is… (0.88)
   - Clue #1: greater than $\frac{4}{5}$
   - Clue #2: a multiple of 0.22
   - Clue #3: less than 1

6. The decimal is… (0.3)
   - Clue #1: between $\frac{1}{5}$ and $\frac{6}{10}$
   - Clue #2: closer to $\frac{1}{4}$ than to one-half
   - Clue #3: a multiple of $\frac{1}{10}$

7. The decimal is… (5.5)
   - Clue #1: multiple of $\frac{1}{2}$
   - Clue #2: closer to 6 than to 3.5
   - Clue #3: not a whole number