Unit Ordering Fractions: Day 1: Number Lines

Grade 7

MO 15 min A 30 min C/D 15 min 60 min	**Math Learning Goals** Students will: • Connect the meaning of the denominator of a fraction to the number of equal partitions between 0 and 1 on a number line • Represent fractions on a number line, using benchmarks to check precise and approximate placements, in order to compare and order the fractions	**Materials** • smart notebook file: Number Lines or • BLM 1.1
Minds On…	**Whole Class → Guided Activity** Construct a number line from 0 to 1 on the board. Tell students that they will be placing the fractions ½, ¼, 2/4, ¾, 3/8, 1/5, 16/20, 2/3 on the number line. Have a student select one of the fractions to label on the number line in the appropriate location. Probe their understanding using the following prompts: • Why did you select that fraction to place? • What was your reasoning for placing it where you did? • What strategy might you use to decide if the fraction is closer to 0, 1/2 or a whole number? • What was _____ doing as s/ he figured out where to place 4/5? How was that reasoning helpful? • How is finding the halfway point helpful? Are there other benchmark fractions that were helpful to you? Continue with different students until all fractions are placed. It may be necessary to remind students that they should be dividing the number line into the same number of spaces as the denominator and that it may be useful to consider benchmarks to help place unusual fractions.	Adapted from: Comparing and Ordering Number Lines: http://illuminations.nctm.org/LessonDetail.aspx?id=L784
Action!	**Small Group → Practice Activity** Using large pieces of paper,students create three same length number lines, labeled as indicated in BLM 1.1. Ask students to place the corresponding fractions on the number line. They must be prepared to justify their thinking as to why they placed it there. Probe student thinking with the following prompts: • How did you decide where it went? • Is there a unit fraction that would help you place this fraction more accurately? • Is your fraction more than 1 or less than 1? • Compare your number lines with a different group. Explain your reasoning why you placed the fractions where you did. • What strategies did you use to decide where the fraction should be placed?	
Consolidate Debrief	**Whole Class → Anchor Chart** Record student responses to: What are some rules or tips for placing rational numbers on a number line? Add the key terms (to the right) as the students share it: **Individual → Math Journal** In your math journal, draw a number line and place the given numbers on it. Justify why you placed them where you did. Be sure to use appropriate math language. • benchmark fractions (1/2, 1/3, 2/3, ¼, ¾, 1 whole)	• denominator • numerator • decimals • proper fraction • improper fraction • greater than • less than • benchmark fractions
	Home Activity or Further Classroom Consolidation	

BLM 1.1: Number Lines

Label each of your number lines as shown below and place the corresponding fractions accordingly.

First number line

0_____1

Show where these fractions are located and be prepared to explain your reasoning.
All students: ½, 2/3, 4/5, ¼
Your choice: 17/20, 3/18, 16/35, 36/92

Second number line

0_____1_____

Show where these fractions are located and be prepared to explain your reasoning.
All students: 8/10, 3/8, 1/5 , 6/4
Your choice: 29/83, 13/18, 57/92

Third number line

0_____10

Show where these fractions are located and be prepared to explain your reasoning.
All students: 8/4, 10/4, 15/2, 50/10, ½, ¾
Your choice: 33/8

Unit Ordering Fractions: Day 2: Number Lines with Decimals

Grade 7

MO 10 min A 40 min C/D 10 min 60 min	**Math Learning Goals** Students will: • Connect the meaning of the denominator of a fraction to the number of equal parts between 0 and 1 into which a number line is partitioned • Represent fractions on a number line, using benchmarks to check precise and approximate placements in order to compare and order the fractions	**Materials** • fraction strips • fraction towers/circles • base ten blocks • number lines • hundred board • money
Minds On…	**Individual → Match Activity** Students use 0.5, 0.75, 0.25, 1.0, 3/4, ½, 1, ¼ To match the fractions with their equivalent decimal representations. Probe student thinking using the following prompts: • Why did you put those two together? • How do you know they have the same value? / or they represent the same amount? • Explain a connection to money or to a manipulative. **Pairs → Activity** Students place the previous set of fractions and decimals on a number line labelled from 0 to 1. Probe student thinking using the following prompts: • What was your reasoning for placing the numbers there? • What strategy might you use to decide if the decimal card is closer to 0 or 1? • What was ____ doing as s/he figured out where to place 0.75? How did that reasoning help ____? • How is finding the halfway point helpful?	Comparing and Ordering Number Lines: http://illuminations.nctm.org/LessonDetail.aspx?id=L784
Action!	**Pairs → Activity** Consider whether it is more appropriate to pair students as: strong/strong and weak/weak, or weak/strong for this activity. Provide pairs with a copy of BLM 2.1. Circulate and ask probing questions where you detect misunderstanding, confusion, or lack of detail. Encourage early finishers to try a second choice in question 2. Decide whether or not there is value in whole class discussion of question 1. **Whole Class → Malk Learning Community** Ask an appropriate pair to present their thinking about question 2A, encouraging classmates to question statements and illustrations they do not understand. Repeat for 2B and 2C.	Note that all fractions in 2A and 2B are all equivalent, but not so in 2C. An implementation trajectory for Math Talk Learning Community can be found at http://www.edugains.ca/resources/LeadingChange/KeyDirectionsandFrameworks/MathTalkLearningCommunityResearchSynopsis.pdf
Consolidate Debrief	**Individual → Exit Card** Record your response to the following prompt. You will be asked to hand this in before leaving. Frank now thinks that ¼, 0.5 and 4/16 would all be placed in the same location on the number line. Do you agree or disagree? Explain your thinking in more than one way. This can be assessed using the following criteria. Does the student: • understand that the three numbers do not all represent the same amount? • convert between fractions and decimals? • use manipulatives and/or diagrams to support their thinking? • make connections to benchmarks and/or real life situations (e.g. money, ½)? •	
	Home Activity or Further Classroom Consolidation	

BLM 2.1: Decimals and Fractions on the Number Line

1.

Place the following numbers on the number line above.

a) 0.9
b) 0.2
c) 0.4
d) 9/10
e) 7/10

2. Choose one of the following questions, and answer it in the space below.

A. Frank says that 6/12, 2/4, and 0.5 can all be represented in the same place on our number line. Do you agree/disagree? Why?

B. Frank says that 9/12, ¾ and 0.75 can all be represented in the same place on our number line. Do you agree/disagree? Why?

C. Frank says that 0.666, 2/3 and 32/45 can all be represented in the same place on our number line. Do you agree/disagree? Why?

Unit Ordering Fractions: Day 3: Number Lines - multiple number systems Grade 7

MO 20 min A 30 min C/D 10 min 60 min	**Math Learning Goals** Students will: • reason as they place fractions and decimals on a number line • connect different representations of the same number • communicate their rationale, including their use of benchmark numbers	**Materials** • fraction strips • fraction towers/circles • base ten blocks • number lines • hundred board • money
Minds On… •	**Whole Class → Matching Activity** Each student receives one card and circulates amongst classmates to match the numerical value of their representation to three other students in the room. Once completed correctly, each group will have a hundreds grid, fraction card, decimal number and hundredths card representing the same number. **Small Groups → Discussion** Once groups have been formed, students share the card they have and everything they notice about their card. Sentence starters include: • I think my card belongs here because … • I see how my representation connects to _____'s card because … • My representation is the similar to _____'s because … • My representation is different than _____'s since … • Something I noticed about all four representations is …	Cards can be found on page 51 of The Guide to Effective Instruction (Vol. 6); 7 sets makes a class of 28 in groups of 4; see pg. 59-63 in the Guide for more details.
Action! •	**Pairs → Activity** Provide students with a set of cards (BLM 3.1). Have them place each card on a number line. Inform them that they will be required to justify their reasoning. Circulate to support and extend student understanding using the following types of questions: • Which number representations do you know and recognize? • What strategies could you use to place the other ones? • How can you use benchmarks to help you place some of the other ones? • Which representations show the same amount? • Is there a fraction that is close to 1? • Is there a fraction that is close to 0?	
Consolidate Debrief •	**Independent → Math Journal** Create 6 different representations with two that don't belong. Explain which representations go together and why.	
	Home Activity or Further Classroom Consolidation	

BLM 3.1 Number Line Cards

$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{9}{10}$
0.33	0.59	1%	10%
0.45	90%	100%	$\frac{80}{100}$
$\frac{4}{10}$	your choice:	your choice:	your choice:

$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{9}{10}$
0.33	0.59	1%	10%
0.45	90%	100%	$\frac{80}{100}$
$\frac{4}{10}$	your choice:	your choice:	your choice:

Unit Ordering Fractions: Day 4: Grade 7

60 min	**Math Learning Goals** Students will: • Investigate relationships amongfractions, decimals and percentages • reason about the connection between the intervals on the number line and the denominator	**Materials**
Minds On… •	**Individual → Math Journal** Students respond to this prompt: "What is the relationship between fractions, decimals and percentages?"	Comparing and Ordering Number Lines: http://illuminations.nctm.org/LessonDetail.aspx?id=L784
Action! •	**Pairs → Activity** Instruct students to draw two number lines and then place the numbers in the proper place. a) 0, 1, 50%, 75%, 4/8, 0.50, 0.25, 40% b) 0, 50%, 2, 1.05, 1.10, 13%, 25%, 1/3, 9/10, 84%, 1.9 , 0.6 If students are struggling it may be helpful to ask them what strategies they have used in previous lessons to order numbers and to determine equivalency between the different number systems (fractions, decimals and percentages).	
Consolidate Debrief •	**Whole Class → Anchor Chart** Create an anchor chart which highlights key properties of each number system (e.g., % means 'out of 100', 0.5 is read 'five tenths' so it is a fraction with a denominator of 10) and outlines strategies for comparison/conversion between fractions, percentages and decimals.	
Practice	**Home Activity or Further Classroom Consolidation** Students complete BLM 4.1.	

BLM 4.1 Converting Between Number Systems

Fraction	Percent	Decimal
$\frac{1}{8}$		
	49 %	
		.03
	75%	
		.22
$\frac{7}{10}$		
	66%	
		.6