



Pearl Diver Teacher Guide

The *Pearl Diver* is available on iTunes U (search "Math Snacks") and at www.mathsnacks.org

Pearl Diver is a fun game that can be played on the computer, the iPad, an iPhone or an iPod. Learn the number line while diving for pearls amidst shipwrecks and sunken ships. This game is perfect for students in grades 3–8 who need to practice locating points on a number line. The number line starts out going from 1 to 10, but by the end the number line goes from -5 to 5 with whole numbers, fractions, mixed numbers and decimals scattered throughout. The "Sushi Round" offers the player a chance to use their approximation skills when they are asked to cut the deadly eel in halves, thirds, quarters etc. So put on your diving mask and jump in!

Time Required: 1 Gaming Sessions: 40 minutes; Bonus Activity: 30 minutes

Learning Objectives:

After playing *Pearl Diver* and engaging in at least one of the recommended bonus activities, students will be able to:

- Find positive and negative whole numbers, fractions, mixed numbers and decimals on a number line.
- Visualize equivalent representations of commonly used fractions.
- Identify fractions as part of unit wholes.
- Compare and order fractions while finding their approximate locations on the number line.

Vocabulary: Halves, thirds, fourths, sixths, mixed number, fraction, decimal, equivalent number, negative number, whole number, approximation, number line.

Vocabulary in Spanish: por la mitad, en dos partes, mitades, tercios, cuartos, sextos, sextas, números mixtos, fracción, decimal, número equivalente, número negativo, número entero, aproximación, línea numérica

Materials and Technology required:

- Access to computers and the Internet

Common Core State Standards Covered

Standard	Standard Description
2.MS.2	Measure the length of an object twice, using length units of different lengths for the two measurements; describes how the two measurements relate to the size of unit chosen.
3.NF	Develop understanding of fractions as numbers.
3.NF.2	Understand a fraction as a number on the number line; represent fractions on a number line diagram.
4.MD	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
4.NF	Understand decimal notation for fractions, and compare decimal fractions.
4.NF.7	Compare two decimals to hundredths by reasoning about their size....
4.NF.8	Perform operations with multi-digit whole numbers and with decimals to hundredths.
5.NBT	Add, subtract, multiply and divide decimals to hundredths, using concrete models or drawings or strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Common Core State Standards Covered (continued)

Standard	Standard Description
6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values...;use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6.NS.6	Understand a rational number as a point on the number line. Extend the number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates
6.NS.6a	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of a number is the number itself, e.g. $-(-3) = 3$, and 0 is its own opposite.
6.NS.7	Understand ordering and absolute value of rational numbers.
6.NS.7a	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
6.NS.7b	Write, interpret, and explain statements of order for rational numbers in real-world contexts.

Preliminary Preparation

1. Please play the game so that you understand the game mechanics and how the math concepts are taught during gameplay. The games are intended to be a fun way for students to learn and you will learn along with them.
2. Secure the proper number of computers, iPods or iPads for each student to play the game.
3. If you are using a computer lab, make sure *Pearl Diver* is open on all computers before taking the class to the computer lab. Students will only need to log in and start playing. This will maximize game playing time in the lab. If you are using iPads or iPods, please make sure that *Pearl Diver* is downloaded on all devices.

Game Session 1 (40 minutes)

Note: There is no need to *teach* the number line before going to the computer lab. It works best if students experience the game first. It is also important to encourage students to talk and discuss while they are playing the game. Keep the sound at a manageable level, but do not have students mute the sound.

1. Give students a blank piece of paper and ask them to draw a number line on it. Do not provide any other directions. Once they are done, have them put the drawing to the side.
2. Allow students to play the game for 15–20 minutes.
3. Have students pause the game, and lead a discussion with the students about the gameplay. (Limit discussion to 10 minutes.)
 - What do you like about this game?
 - What are some things that make this game challenging?
 - Can anyone give classmates hints about how to defeat their opponent?
 - What math do you see in this game so far?
 - What recommendations do you have about getting a high score on the Sushi Round?
4. After the discussion, allow students to continue to play the game for an additional 20 minutes.
5. Once students have finished playing for 40 minutes, ask the students the following questions.
 - Have you ever seen a number line with fractions or decimals on it?
 - What clues did you use when you were trying to find the fractions/decimals on the number line?
 - What are some strategies you used to place negative numbers on the number line?

Encourage students to play *Pearl Diver* at home.

Bonus Activity and Discussion Questions

View the *Math Snacks Animation Number Rights*, available at www.mathsnacks.org

Animation Discussion Questions:

- What do you think the animation is about?
- How is the animation related to *Pearl Diver*?
- What does it mean when she says, "Zero is the hero of the number line"?
- Why do you think a number line is useful?

Human Number Line

1. Divide students into groups of 8–10 students
2. Make cards or signs on index cards or copy paper with the following numbers:
0, $\frac{1}{4}$, 2.5, -5, $-\frac{5}{8}$, -2, $\frac{3}{2}$, 4, $-\frac{1}{3}$, -2
3. Give each group the same set of numbers and ask them to line up from smallest to largest. Have the groups compare their results. Discuss any discrepancies, if they exist.
4. Once the order is agreed upon, have the whole class decide what the number line should look like. Have them give you a lower bound, an upper bound and make sure benchmark numbers are evenly spaced. Draw the basic number line on the overhead or on the board and have each student place their number on the number line.
5. Assign new numbers and repeat the activity. This can be made increasingly difficult by adding fractions, mixed numbers and decimals. It is not necessary to give each group the same numbers this time. In fact, having students do this activity with different numbers will lead to a rich discussion.
6. Have students line up and then have them create an appropriate number line and place their numbers on that number line to share with the class.

Number Rights Learner Guide:

Have students complete the *Number Rights Learner Guide*

The Bow (Tie it all together to bring out the main ideas)

1. Take out the number line you drew at the beginning of class. After doing these activities, would you change anything about your number line? If so, what?
2. Can number lines be drawn in different ways or do they always look the same?
(Answer: It depends on the scale of the numbers)
3. Can you think of real world examples of where you see number lines?
(Answer: Timelines, rulers, maps, highways, coordinate grids, thermometers, etc.)

Encourage students to keep playing *Pearl Diver* at home. Encourage them to try to get through all levels of the game.