

Lesson Plan

Module:	Number Lines		
Teaching Hours:	3 X 40 minutes		
Grade Level/Age Range:	Grades 5-6 (10-12 years old)		
Brief Description:	The module engages students with double number lines. Students engage in identifying and representing the rule of corresponding number lines verbally and symbolically.		
Design Principles:	Inquiry		
	Situatedness		
	Digital tools		
	Embodiment		
	<ul style="list-style-type: none"> - Meaningful: Build on students' intuitive knowledge and daily life experiences with real-life scenarios - Embodiment: Perceptual-motor (action-perception) experiences with noticing the correspondence between the two number-lines, grounding the understanding of the relation between the involved quantities with concrete actions - Inquiry based learning: explore qualitative and quantitative relations (additive, multiplicative, linear) - Digital: tablet devices equipped with appropriate apps - Didactical phenomenology / situatedness: the correspondence of values from data sets (left and right number lines) is recorded, tabularized and mathematized 		
Functional Thinking:	Input – Output		
	Covariation		
	Correspondence		
	Object		
Learning Goals:	<ul style="list-style-type: none"> ✓ Conceptualize arithmetic operations as functions in an implicit way ✓ Conceptualize functions as a correspondence relation between the values in the two number lines ✓ Notice, generalize and express additive, multiplicative and linear relations ✓ Use functional expressions to model real-life scenarios 		

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Activities

Exploration

Students work in pairs on the GeoGebra app on their tablet devices, drag the slider to get different values on the left and observe what happens in the right axis. Students fill in the tables and explain how dragging the point in the left number-line changes the way the point in the right number-line moves for each task. Students could engage in making a hypothesis whether it is possible to drag the red point in the right number – line.

Useful questions: How dragging the right point in the left number – line changes the way the right point in the right number – line moves?

Furthermore, students are anticipated to engage in finding how does the point in the right number – line change, when the point in the left number – line varies by one unit. They are also asked to find the correspondence between the values of the two number lines, either in the left number – line or in the right number line and compare the movement of the green arrow in the two tasks.

Suggested tools/materials: Tablet device, GeoGebra App, Students Handouts

Estimated duration: 30 minutes

Activity 1.

Students are asked to explore the app in the GeoGebra, drag the slider to get different values on the left and observe what happens in the right axis. Then, they are encouraged to fill in the tables shown below and explain for each task how dragging the right point in the left number-line changes the way the right point in the right number-line moves. Students explain how dragging the point in the left number – line changes the way the point in the right number – line moves.

Furthermore, students are anticipated to engage in finding how does the point in the right number – line change, when the point in the left number – line varies by one unit. Then, they asked to find the correspondence between the values of the two number lines, either in the left number – line or in the right number line and compare the movement of the green arrow in the three tasks.

Suggested tools/materials: Tablet device, GeoGebra App, Students Handouts

Estimated duration: 30 minutes

Activity 2.

Students rely on the given input-output values to fill in the tables using numbers and even symbols (task a). They are also asked to fill in their own tables with input-output values (task b). It is anticipated that the teacher asks them to express the rule that corresponds the input with the output values (verbally and symbolically). Furthermore, students are asked to correspond the input values with the correct output values (task c).

Suggested tools/materials: Students Handouts

Estimated duration: 20 minutes

Activity 3.

Students are asked to find the rule of every number – line and write it on their handouts verbally and symbolically. Then, students are encouraged to suggest one real – life scenario that can be modelled by each task and explain what each number – line model in each task.

Suggested tools/materials: Students Handouts, GeoGebra App

Estimated duration: 30 minutes

Assessment

1. Match the scenarios with the matching double number line.

- a. In a math test, for each correct answer students got 2 points. If John got 56 points, how many correct answers did he have?
- b. The building A has a height of x meters. How tall will building B be if it is 4 meters higher than building A?
- c. A phone company has prepared a new calling package, in which there is a fixed charge of €1 and a charge of €2 per call hour.
- d. In a math competition, all students received 1 point for their participation and two points for each correct answer they gave. If Joanna had a total of 99 points, how many correct answers did she get?
- e. Alice has €4 more than Anne. If Anne has X euros, how many euros does Alice have?
- f. In a basketball game, the "Rocket" team scored 39 two-point baskets. How many points did the "Rocket" team score at the end of the game?

Digital Tools:

Exploration, Activity 3:

<https://www.geogebra.org/m/vgexwzxp>



Activity 1:

<https://www.geogebra.org/m/b4rv4f3c>

