Topic: Number Line

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Genre: Math **Unit: Integers**
Grade Level: 6th grade **Estimated Duration: 1-2 single period**

Essential Question
(Domain 1: Planning and Preparation-Component 1c: Designing Coherent Instruction)

- How do we use the EV3 robot's number line program to help us understand the addition and subtraction of integer equations?

Background Knowledge

Background Summary:
Students are expected to have an understanding on how to solve basic one step equations. They will be introduced to the EV3 robot's number line program to solve simple integer equations.
Students will need to have some basic understanding of integers and their placement on a number line. They should be able to make connections between positive and negative integers on a number line and be able to program equations using the EV3 brick. The students should understand that integers are a set of whole numbers and number lines go on forever in both directions. Positive integers are the numbers to the right of zero and negative integers are the numbers to the left of zero. Zero is the origin point and is neutral. It is neither positive or negative.
This lesson can be used to reinforce or introduce integers as well as make cross curricular connections in Science. There are several questions in the worksheet that would flow nicely into a conversation on integers.

Lesson Objective:

- Students will be able to apply and extend previous understandings of numbers to the system of rational numbers.
- Students will be able to identify positive and negative integers.
- Students will understand how to complete simple equations by using a number line.
- Students will gain knowledge of how integers are used in real world situations.
- Students will understand the correlation between a number line and a thermometer.

Standards
(Domain 1: Planning and Preparation- Component 1a:Demonstrating Knowledge of Content and Pedagogy)

CCSS.MATH.CONTENT.6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
CCSS.MATH.CONTENT.6.NS.C.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
CCSS.MATH.CONTENT.6.NS.C.6.A Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.

Vocabulary **(Domain I: Planning and Preparation - Component 1e: Demonstrating Knowledge of Students.)**	**Prep Work/Materials** **(Domain 1 Planning and Instruction-Component 1e: Designing Coherent Instruction, Domain 3 Instruction-Component 3c: Instruction Engaging Students in Learning)**	**Cross Curricular Connection** **(Domain I: Planning and Preparation - Component 1a: Demonstrating Knowledge of Content and Pedagogy, Component 1b: Demonstrating Knowledge of Students.)**
negative positive integer number line origin absolute value inverse sum difference whole number	EV3 robot with gyroscope sensor laptop/iPad with Mindstorms Education version tape/sticker (mark start point) measuring tape number line	Mathematics Technology Engineering Science

Differentiation
(Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)

- Bodily kinesthetic learners - Number line floor construction and EV3 robot number line Hands on Activities
- Audio and Visual learners – Visual representation of activity in the Do Now. The observations collected throughout the activity. Brainpop.com video clip on adding and subtracting integers.
- ELL/Low reader - Guided notes printed for those who require them
- Technology- Utilizing Lego Mindstorms robot kit and digital program. See additional resources - Math Goodies Interactive Integer Football Game
- Enrichment: Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation using the EV3 number line program.
- Extended time for those who require it
- Small groups
- Individual attention from ICT teachers and paraprofessionals
- Resource room remediation for those who require

Procedure **(Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)**	**Student Engagement (Teacher Assessment)**
1) Introduce the problem of the day making a real world integer connection. The temperature at noon on a winter day was 8° C. At midnight, the temperature had dropped 15 ° C. What was the temperature at midnight? 2) Do Now:Reviewing integer vocabulary, basic number operations, *Reference: Worksheet 1* 2a) Watch quick video reviewing vocabulary terms and introducing addition and subtraction of integers. https://www.brainpop.com/math/numbersandoperations/addingandsubtractingintegers/ 3) Class Discussion - Have students find connections between today's problem of the day and a real world article about Global Warming. (NOTE: Previous homework assignment- read article and answer questions attached about Global Warming and Earth getting warmer) http://www.readworks.org/passages/earth-getting-warmer 4) Mini Lesson/Review - How can a number line be used to solve basic mathematical operations? Provide students with knowledge on how and why integers are relevant in our everyday world. Provide step by step directions for calculating addition and subtraction problems using a number line. 5)Demonstrate how to use the EV3 robot, switch between addition and subtraction program, and Number_Line_Unit Program to verify integer equations. Provide students with Student Data Collection Directions listed below. 6) In small groups, direct students to the correct program to sync their brick. *Number_Line_Unit Program* Complete activity and verify their Worksheet 1 and 2 answers. 7) Circulate and motivate students to complete the worksheets, record responses and use the number line activity to verify answers. Ask students key questions as well as to describe what they are observing, and documenting on both worksheets. 9) Extension: Students will make text to world connection, demonstrating how a thermometer can be used to solve integer operations. Students will create a	

slide thermometer and develop integer word problems to be solved by other groups in the class.

Student Data Collection Directions:

1. Collect materials (tape, measuring tape and EV3 kits)
2. Work in your cooperative learning groups and begin to construct your number line. Have each tape mark represent an integer and place it on the floor 4 inches apart from each other.
3. Label the tape marks from -10 to 10.
4. Mark a starting point on ground at the origin of 0, always start each program at the origin point.
5. Sync the EV3 Number_Line_Unit Program to your brick.
6. Solve the addition integer problems on Worksheet 1.
7. Have each member of the group run the Add Program to verify their answers in Worksheet 1.
8. After each answer verification, students will change the numbers on the brick.
9. Repeat steps 4 to 8 with the Subtract Program, record your answers on Worksheet 2.

Assessment *(Formative or Summative)* (Domain 1 Planning and Instruction- Component 1e: Designing Coherent Instruction, Domain 3 Instruction- Component 3c: Engaging Students in Learning, Domain 3 Instruction- Component 3d: Using Assessment in Instruction)	**Student Engagement (Teacher Assessment)**
Pre-assessment: (Do Now) Worksheet 1 - Timed 5 minutes Assessment will occur during lesson and after the lesson, by gauging understanding and mastery through student responses to lesson discussion as well as their answers to the in class activity worksheets. We will wrap up by answering the objectives; reviewing in class worksheets, and having the students summarize the lesson activity. Homework worksheet - Adding and Subtracting Integers KEY Questions: How are negative and positive numbers used in the real world? Explain. How can integers be represented by models? How is a thermometer like a number line? Explain.	

Additional Resources

Math Goodies Interactive Integer Football Game -
http://www.mathgoodies.com/games/integer_game/football.html

Thermometer and Integers Game-
http://www.education.com/activity/article/staying-above-0/