Date: 12.12.2013
Teacher: Gülhan Can
Number of Students: 20
Grade Level: 6
Time Frame: 80 minutes

Integers and Absolute Value

1. Goal(s)
- The students will understand the concept and absolute value of integers.

2A. Specific Objectives (measurable)
- Students will link real life situations with integers in such examples: air temperature, profit and loss, below/above sea level etc.
- Students will compare integers by placing the integers on the number line.
- Students will use absolute value to tell the distance of an integer from zero.

2B. Ministry of National Education (MoNE) Objectives
- Tam sayıları açıklar.
- Mutlak değerin anlamını açıklar.
- Tam sayıları karşılaştırır ve sıralar.

2C. NCTM-CCSS-IB or IGCSE Standards:
- Identify and use natural numbers, integers (positive, negative and zero). (IGCSE)

3. Rationale
- The purpose of this lesson is to prepare the ground for operations with integers and to provide an understanding about the concept of *distance* thanks to absolute value.
- The students will appreciate the integers surrounding them. Additionally the students will make connections with other disciplines. For example, particularly in science lessons, they will learn about electron, proton and neutron which make sense of to be negative, positive, and neutral.

4. Materials
- For an exploration activity, the students will need 20 worksheets for *worksheet1*, and 20 worksheets for *worksheet2*.

- A projector and a computer will be used to reflect the worksheets on the board.

5. Resources
   - Matematik 6. Sınıf Ders Kitabı (MEB Yayınları)
   - Matematik 6. Sınıf Öğrenci Çalışma Kitabı (MEB Yayınları)
   - http://tr.wikipedia.org/wiki/Tam_say%C4%B1

6. Getting Ready for the Lesson (Preparation Information)
   - During the activity, worksheets must be distributed respectively. After finishing *worksheet1*, the second will follow it (it will take approximately 12 minutes for each worksheet).
   - Each student will have his/her own worksheet; the students will study individually for *worksheet1* and they will study in pairs for *worksheet2* with their desk mates.
   - Additionally, a checklist will be used while monitoring the students during the activity.
   - A sample of the worksheets and the checklist are placed at the end of this plan.
   - Prepare 20 pieces of paper for students. Ask the students to write their names on the papers and put it on the desk as you can see; explain you want it to call them with their names. Approaching the end of the class, ask the students to write a reflection of the class with a few sentences on these pieces of paper and gather them.

7. Prior Background Knowledge (Prerequisite Skills)
   - The students have already known natural numbers and the operations with natural numbers. They are able to solve word problems with natural numbers.

Lesson Procedures

Transition: I think everybody knows to count up to ten in this classroom, am I right?

8A. Engage (3 minutes)
   - After raising the question and taking the answer "Yesss!!", say them "OK. Then we will play a mini-game. When I flick, we are all counting together backwards one by one from ten, right?" After being sure that you gain the attention of the students, flick and begin to count backward from ten with the students to encourage them on counting; but do not say anything anymore when you come to *three*. Let the students to count back from three on their own. The students will most probably stop at *zero*.
   - Then say "Why did you stop? Are the numbers finished?" Even anybody realizes about negative integers (some of them might be heard about it from their older siblings, they may estimate from their observations in real life etc.), do not make any comment and tell the class

to keep this game in their minds.

Transition: Now, let's look at the board. Do you know what it is?

B. Explore (15 minutes)

- Draw a number line on the board. After taking the answer that it is a number line, ask them what the natural numbers are (the students have already learned it at the last class), then placed the natural numbers on the number line.
- Raise a question "What is the meaning of these arrows at two tips of the number line?" and use leading questions to make the students answer. For example ask about the biggest natural number. The students will realize that the meaning of the arrows is infinity. Use the right part of the number line and construct your questions according to natural numbers. After that, make the students realize about the arrow which is at the left tip of the number line. Ask "Does it also mean infinity?" wait for a while and let them to consider about the question, and then take the responses.
- Tell the students to think about the mini-game again and imagine their selves on the tenth floor of a skyscraper. Ask the students which floors they will see when they are going down in the elevator. The students will realize the numbers are the same with the mini-game (10,9, …, 0).
- Ask them what happens if they want to go so on, is it possible? They will most probably mention about car parks, or some other stores etc. below the ground floor. Say them "Nice observations! Then can you remember the numbers which is written in the elevator, under zero (ground floor)?" Take the responses which are -1, -2, etc.
- Raise another question "Where else did you come across more such examples?" and let them to think and give some examples such as air temperature and thermometers, profit and loss, below/above sea level etc.

Transition: So, we obtained a big set! Come on, let's add them to the number line!

C. Explain (35 minutes for integers and activity part + 20 minutes for absolute value explaining and exercises)

- Explain them that you obtained negative numbers as a new thing. So first explain the places of the negative numbers according to *zero*. They must be placed -1, -2, and so on at the left part of *zero,* respectively. Utilize from the examples that you have already used in the exploration part.
- After adding the negative numbers on the number line, tell them the symbol of the integers, *Z* comes from the word *Zahlen.* It means numbers in Germany. And construct the set of integers from positive integers, negative integers and zero: $Z= Z^{+} \cup \{0\} \cup Z^{-}$.
- Give the students that zero is neither positive nor negative, as an attention. Additionally remind the students if there is no sign in front of a number, it means this number is a positive number.
- Distribute the worksheets respectively. Tell them they will have 15 minutes for this worksheet. For the first one, the students will study individually. It will be helpful to evaluate the students' understanding one by one and use the checklist. During the worksheet1, monitor

the students and support them if they need help. After each student finishes the worksheet, utilize from your checklist and clarify the misconceptions even on the board.

- Then tell the students that they will work in pairs and they will have 10 minutes for this one. Distribute the following worksheet and follow the same steps as you do during the first one.
- Link this part of the lesson with a new topic; *absolute value*. Draw a number line on the board and place *zero* on it. Stand in front of zero, then walk three steps both to the left and right side, mark three units both at the left and right parts on the number line. And make students realize that the number of the steps is the same in both directions. By using this example, match this concept with absolute value and explain it is the mathematical expression of this situation. Express $|3| = |-3| = 3$.
- Similarly, show the distances are equal for both 6 and -6; 10 and -10, and so on.
- Ask the students about $|0|$ and then explain it is zero. Remind the students, except zero, the absolute value of any integers is always positive.
- Use a quick questioning-answering part as an exercise of the topic. Questions are like that:
  Q1: Which number has the same absolute value with -53? (+53)
  Q2: True-False part:
  The absolute value of -412 is -412. (F)
  The absolute value of +99 is 99. (T)
  -13 and +13 have the same absolute value. (T)
  Every integer has a positive absolute value. (F) (Remind the absolute value of zero)
  Q3: (reflect the slide on the board) Fill in the blanks by using the appropriate one of these symbols: <, >, =
  $|-10| \ldots |+10|$, $|-2| \ldots |-3|$, $|-5| \ldots |-7|$, $|-3| \ldots |+2|$, $|0| \ldots 0$, $|9| \ldots |5|$

Transition: You all do well and I have some starred questions for you.

D. Extend (5 minutes)

- Use one or two of these extra questions if any student(s) or the whole class finish the work early.
  Q1: Write the set of the numbers whose absolute values are smaller than four/seven/eleven etc.
  Q2: A diver dives into 35m at 08:00 and dives into 47m at 11:00. According to this knowledge, which diving is closer to the surface of the sea?

Transition: Thank you for this nice lesson, class. Lastly, I want you to write a few sentences as a reflection of this class.

E. Evaluate (3 minutes)

- The checklist has already used during the activity while monitoring students individually and as a group.
- At the end of the lesson, want them to write a few sentences on the papers that you have already distributed it to write their names on at the beginning of the lesson. Explain what you expect them to write: "Thank you for this nice lesson, class. Lastly, I want you to write a few sentences as a reflection of this class. For example, what was the most interesting mathematical idea in this class according to you? Or, have you learned/liked something new in this class. Please feel free if you want to add any other things about today's class."

9. Closure & Relevance for Future Learning

- Summarize the class briefly. Say that integers and absolute value will be used in operations. Then ask if they remember anything about *ratio and proportion*. Give some clues that the next topic will be ratio and proportion.

10. Specific Key Questions:

- What is a number line? (Knowledge)
- Can you list me any other examples (about negative integers) that you faced in real life? (Knowledge)
- Can you explain the meaning of the arrows at the tips of the number line? (Comprehension)
- Can you show natural numbers/negative integers on the number line? (Application)
- Can you classify integers (as positive, negative or zero)? (Analysis)
- What happens if I go on counting at the right/left part of zero? (Analysis)
- Which one is bigger/smaller 2 or 5/ -2 or -5/ $|-2|$ or $|+5|$ etc.?
- Can you construct a number line with integers? (Synthesis)
- Can you assess an absolute value always positive? (Evaluation)

11. Modifications

- During the lesson, if students have difficulty to link their prior knowledge with the new topic, use much more exercises and real life problems to make sense of it.
- If some students do well, use extended problem which is stated in the extension part. While they were investigating, ask leading questions to them and want them to justify their answers with a few sentences. Remember to use praises, appreciate, and encourage them.
- For struggling students, pay attention to be a more successful student academically to help them in the group work.

Grade6_Checklist_Integers

Names	Exercise1	Exercise2	Exercise3
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Etkinlik 1:

1- Aşağıdaki ifadeleri birer tam sayı olarak yazınız.
   a. Sıfırın altında 5 °C
   b. Deniz seviyesinin 500 m üstü
   c. Sayı doğrusunda sıfırın 12 birim solu
   d. 25 TL zarar
   e. 35 TL kâr
   f. Cüzdanınızdaki 10 TL
   g. 1200 m derinlik
   h. 2345 m yükseklik
   i. 20 TL borç

2- Aşağıdaki tabloyu, verilen tam sayılara uygun olarak, günlük hayatta karşılaşılabilecek durumları yazarak doldurunuz.

Sayı	Durum
-2	
+3	
-11	
-21	
+9	
-4	
-113	

3- Aşağıdaki verilen ifadelerin tam sayı değerleri neler olabilir? Bulduğumuz değerleri sayı doğrusu üzerinde gösterelim.

   a. Buzun erime sıcaklığı:
   b. İnsan vücudunun sıcaklığı:
   c. Ankara'da kış mevsiminde bir gece sıcaklığı:
   d. İzmir'de kış mevsiminde bir gece sıcaklığı:

KIŞ GELDİ...

Aşağıdaki tabloda bazı illerin Aralık ayı ortalama sıcaklıkları verilmiştir.

İller	Sıcaklık
Erzurum	**-10 °C**
Çorum	**+2 °C**
Kars	**-3 °C**
Ankara	**+1 °C**
İzmir	**+10 °C**
İstanbul	**+7 °C**
Uşak	**0 °C**

1- Tablodaki + ve – işaretleri ne anlama geliyor?

2- Tabloya göre en soğuk il ve en sıcak ili bulunuz.

3- Tabloya göre ortalama sıcaklığı en düşük olan ilden en yüksek olan ile