# Opposite Numbers

## Student Probe

What is the opposite of 10?
What is the opposite of -7?

Answers: -10, 7

## Lesson Description

This lesson uses a number line to help develop students' conceptual understanding of numbers and their opposites. After locating a number on a paper number line, students fold the number line at 0 to locate a number's opposite. Critical discussions to include are that the opposite of a number may be positive or negative, and the distance from a number to 0 is the same as the distance from that number's opposite to 0.

## Rationale

Students frequently confuse the mathematical meanings of subtraction, negative, and opposite. This is understandable since the same symbol is used to designate each one. For example, $6-7$ indicates subtraction, $6+(-7)$ indicates that 7 is a negative number and $-a$ means the opposite of $a$. $-a$ may actually be a positive number. The concept of the opposite of a number is the foundation for understanding many mathematical concepts such as additive inverse, addition and subtraction of integers, and absolute value. In order for a student to be mathematically successful, he/she must be fluent in the use of numerical and variable opposites.

## Preparation

Copy Opposite Number Worksheet and cut a strip for each student.
Provide markers/highlighters for each student.

## At a Glance

What: Recognize that every number has an opposite.

Common Core Standard: CC.6.NS.6a. 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. (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.

Mathematical Practices:
Attend to precision.
Look for and make use of structure.
Construct viable arguments and critique the reasoning of others.

Who: Students who do not know that every number has an opposite and who cannot locate numbers and their opposites on a number line.

Grade Level: 6

Prerequisite Vocabulary: number line, opposite

Prerequisite Skills: ordering numbers

Delivery Format: Individual or small group

Lesson Length: 15 to 30 Minutes

Materials, Resources, Technology: Number Line Lab Sheet, markers, highlighters

Student Worksheets: Opposite Number Worksheet (.pdf)

## Lesson

| The teacher says or does… | Expect students to say or do… | If students do not, then the teacher says or does… |
|---|---|---|
| 1. What is the opposite of going up a hill? | Going down a hill | Change the action to forward and backward or left and right. |
| 2. Numbers also have opposites like the examples we just discussed.<br><br>Take a look at your number line. What do you notice? | Answers may vary, but listen for, "It has negatives on it." | Prompt students, if necessary. |
| 3. Where do you see negative numbers outside of school? | Temperature, money, sea level, football yardage | Temperature, money, sea level, football yardage (discussion) |
| 4. What would negative temperature mean?<br>What would negative football yardage mean? | Temperatures that are below zero.<br>Loss of yardage. | Repeat with the other examples. |
| 5. What would be the opposite of gaining 10 yards on a football play?<br><br>Let's represent the loss as $-10$. | Losing 10 yards on a football play. | Prompt students, if necessary. Use other examples as needed. |
| 6. Mathematicians say that 10 and $-10$ are opposites. | | |
| 7. What would be the opposite of losing 6 yards on a football play?<br><br>Let's represent the loss as $-6$ and the gain as 6. | Gaining 6 yards on a football play. | Prompt students, if necessary. Use other examples as needed. |
| 8. What is the opposite of $-6$? | 6 | Repeat with other examples until students realize that the opposite of a number may be positive or negative. |

| The teacher says or does… | Expect students to say or do… | If students do not, then the teacher says or does… |
|---|---|---|
| 9. On your number line find 10.<br>Use your marker to draw a dot on the number 10.<br>Fold the number line along the dotted line at zero and crease the paper. Look through the paper and find the mark you made.<br>Where is the mark you made?<br>What number is your mark "on top of"?<br>What is the opposite of 10? | Model what the teacher is doing on their number lines.<br><br><br><br><br><br>10<br><br>$-10$<br><br>$-10$ | Model for the students. |
| 10. What is the distance from 0 to 10?<br>What is the distance from 0 to $-10$?<br><br>Do you think that the distance from a number to 0 and the distance from the opposite of the number to 0 will **ALWAYS** be the same?<br><br>Let's try some more examples and test our hypothesis. | 10<br><br>10<br><br><br>Answers may vary. (Do not correct students at this time. They will have opportunities to test and revise their hypothesis during the lesson.) | Count the spaces on the number line.<br>You may need to remind students that distance is always positive. |
| 11. Predict the opposite of $-5$.<br><br>Let's use our number lines to test the prediction. (Repeat the process in Steps 9-10 with -5. Monitor students as they work.) | 5 | If students predict -5, ask them to test it on their number lines. |
| 12. What is the opposite of $-5$? | 5 | Assist students who answer incorrectly. |

| The teacher says or does… | Expect students to say or do… | If students do not, then the teacher says or does… |
|---|---|---|
| 13. What is the distance from −5 to 0? | 5 | Count the spaces on the number line. |
| What is the distance from 5 to 0? | 5 | |
| Are the distances the same? | Yes | |
| 14. Let's try another number. (Repeat with a variety of numbers as needed, including numbers that students suggest.) | | |
| 15. What do you think the opposite of 0 will be? | Answers may vary, but listen for 0. | |
| Explain why you think that is the opposite of 0. (Let's test 0 on our number lines.) | (Explanations should include that 0 folds on top of itself, so it is its own opposite.) | |
| Ask for a volunteer to explain to their reasoning to the others. | | |
| Are the distances the same? What is the distance from 0 to 0? | Yes. The distance is 0. | |
| 16. After testing a lot of numbers, do you think the distance from a number to 0 and the distance from the opposite of the number to 0 will **ALWAYS** be the same? How do you know? | Yes. | |

| The teacher says or does… | Expect students to say or do… | If students do not, then the teacher says or does… |
|---|---|---|
| 17. Is the opposite of a number always negative? Give me an example? <br><br> Is the opposite of a number always positive? Give an example. <br><br> Can a number be its own opposite? Give an example. | Answers will vary. No. Example: the opposite of $-3$ is 3. <br> No. Example: the opposite of 4 is $-4$ <br><br> Yes. 0 is its own opposite. | Test students' examples on their number lines. |

## Teacher Notes:
1. Repeat the same dialogue using a variety of numbers, including negatives.
2. After the concept is mastered ask for opposites of numbers not included on the number lines.
3. It is important for students to physically fold the number lines and test their hypotheses. Resist "telling" students the answers.
4. The distance on a number line of a number from 0 will be the foundation of early definitions of absolute value. Make sure that idea is emphasized.

## Variations
1. Use counters instead of markers to show number location.
2. Use a dab of paint (colored gel glue, etc) to make mark. Fold paper and flatten. Open and visually see the number and its opposite.
3. Use a vertical number line.

## Formative Assessment
1. On your number line, show me the number 3 and its opposite.
   What is the distance from 3 to 0?
   What is the distance from $-3$ to 0?
2. What is the opposite of $-7$?
   What is the distance from $-7$ to 0?
   What is the distance from 7 to 0?
3. What is the opposite of 23?
   What is the distance from 23 to 0?
   What is the distance from $-23$ to 0?

# References

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