

Tools for Instruction

Divide Positive and Negative Rational Numbers

Objective Divide positive and negative integers.

Division of positive and negative integers, like multiplication, can be challenging for students to comprehend. While the division operation itself usually does not cause difficulties, determining the sign of the quotient can be confusing.

Before students begin working on dividing positive and negative integers, they should have a solid comprehension of multiplying positive and negative integers. Multiplication and division are inverse operations, so the sign rules that apply for multiplication also apply to division. In this activity students will explore division problems with positive and negative numbers, using what they know about multiplication of positive and negative integers to help them determine signs of quotients. The rules that students learn for dividing integers apply to all rational numbers.

Step by Step 20–30 minutes

1 Review dividing positive numbers.

- Ask: *How are division and multiplication related?* Be sure the student understands that they are inverse operations and that they undo each other. It may help the student to think of a division problem as a multiplication problem with a missing product.
- Have the student divide $24 \div 8$, using the multiplication problem $8 \times ? = 24$.
- Ask: *Is the sign of the quotient positive or negative? How can thinking about multiplication help you decide?* (It is positive because if the product, 24 is positive, and one of the factors, 8, is positive, the other factor 3, also must be positive. A positive multiplied by a positive is a positive.)
- Ask: *When you divide a positive number by a positive number, what is the sign of the quotient?* (positive)

Support English Learners Some students may have difficulty with the term *inverse*. Point out that inverse means *opposite*.

2 Divide negative numbers.

- Have the student divide $-24 \div -8$ by first dividing the numbers and ignoring the signs. (3)
- Have the student then rewrite the division sentence as a multiplication sentence without giving the 3 a sign. Ask: *Is the sign of the quotient positive or negative? How does multiplication help you decide?* (The sign of the 3 is positive because to get a negative product, you have to multiply a positive by a negative, and -8 is negative.)
- Ask: *When you divide a negative number by a negative number, what is the sign of the quotient?* (positive)

3 Divide a positive by a negative.

- Have the student divide $24 \div -8$ by first dividing the numbers and ignoring the signs.
- Have the student rewrite the division as a multiplication problem without giving the 3 a sign. ($3 \times -8 = 24$)
- Lead the student to see that the sign of the 3 is negative. Ask: *You know the product is positive and one of the factors is negative, so what does the sign of the other factor have to be?* (negative)

Ask: What is the sign of the 3? (negative)

Ask: When you divide a positive number by a negative number, what is the sign of the quotient? (negative)

4 Divide a negative by a positive.

- Have the student divide $-24 \div 8$ by first dividing the numbers and ignoring the signs. (3)
- Ask the student to rewrite the problem as a multiplication problem without giving the 3 a sign. ($3 \times 8 = -24$)
- Ask: What do the signs of the factors need to be to get a negative product? (One has to be negative and one has to be positive.)
- Ask: When you divide a negative number by a positive number, what is the sign of the quotient? (negative)

5 Additional practice.

- Discuss with the student how the sign rules that apply to multiplying positive and negative integers also apply to division.
- Have the student make a chart that shows the sign of the quotient for each of the examples they worked through ($- \div - = +$, etc.)
- Have the student write several equations in which she divides numbers of same and different signs to practice recalling the correct sign of the quotient.

Check for Understanding

Have the student divide $-25 \div 5$. Then have her explain how she determined the sign of the quotient. (-5 ; When you divide numbers with different signs, the quotient is always negative.)

For the student who struggles, use the chart below to help pinpoint where extra help may be needed.

If you observe...	the student may...	Then try...
the student does not understand how a negative number can be divided	not completely understand the meaning of negative numbers.	providing contextual situations in which you would divide negative numbers. For example, if you owe each of 3 friends \$5, the \$5 you owe can be represented as -5 , and the total money you owe can be represented as $-\$15$. You can divide -15 by 3 to show what you owe each friend. $-15 \div 3 = -5$.