Operations with Negative Numbers on the ISEE

Middle and Upper Level

LESSON GOAL: Simplify expressions and solve problems that include negative numbers.

ISEE Middle-Level Problem: A set of 6 numbers has a mean of 7. What additional number must be included in this set to create a new set with a mean that is 2 less than the mean of the original set?

A) -2 B) -7 C) -12 D) -25

While this may seem like only an advanced average problem at first glance, you'll notice that all the answer choices are negative. This is also a negative number problem.

Rules of Operations with Negative Numbers

Addition: To add two negative numbers, add the numbers the same way you would add two positive numbers, and then add a negative sign to the sum. $-7 + -8 = -15$

If one number is positive and one number is negative, subtract the numbers the way you would subtract two positives. Then add the sign (+ or -) of the number with the higher absolute value (further from zero).

$7 + (-8) \rightarrow 8 - 7 = 1$ $|-8| > |7| \therefore 7 + (-8) = -1$

Subtraction: Any subtraction problem can be turned into an addition problem; subtracting a positive is the same as adding a negative. $3 - 7 = 3 + (-7) = -4$

To subtract a larger positive from a smaller positive number, find the difference and then add a negative sign.

$3 - 7 = 3 + (-7) = -4$ $10 - 17 = -7$

Subtracting a negative number is the same as adding a positive number. To subtract a negative, change the two minus signs into a plus sign and then add.

$3 - (-7) = 3 + 7 = 10$ $-7 - (-3) = -7 + 3 = -4$

Multiplication and Division: When multiplying and dividing negative numbers, it doesn't matter whether the positive or negative number has a higher absolute value, the same rules apply:

positive x *positive* = *positive* 6 x 8 = 48	*positive* ÷ *positive* = *positive* 48 ÷ 8 = 6
positive x *negative* = *negative* 6 x −8 = −48	*positive* ÷ *negative* = *negative* 48 ÷ −8 = −6
negative x *positive* = *negative* −6 x 8 = −48	*negative* ÷ *positive* = *negative* −48 ÷ 8 = −6
negative x *negative* = *positive* −6 x −8 = 48	*negative* ÷ *negative* = *positive* −48 x −8 = 6

The solution: Using the procedure for advanced averages, we can calculate that we need the total score to go from 42 (6 × 7) to 35 (7 × 5). To get from 42 to 35 by adding, we'll need to add -7. The answer is B.

Helpful tip: When you calculate with negative numbers, think about whether your answer makes sense. If it doesn't, you might be forgetting or mixing up a negative sign.