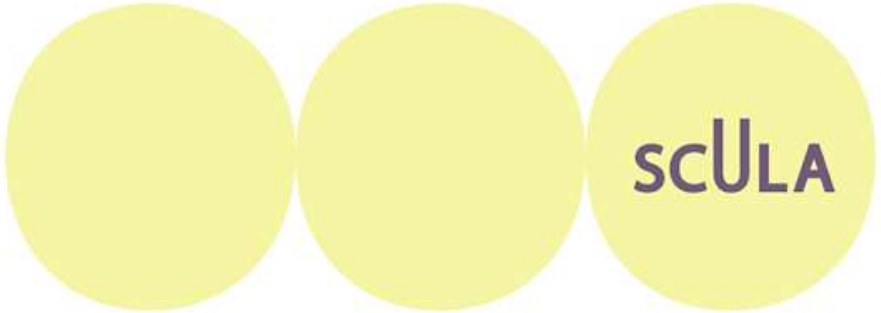
SAT MATH SECTION

Absolute Value

Absolute value problems will mostly be embedded in other functions and equations problems.

- Definition of Absolute Value
- Absolute Value in an equation
- Inequalities and Absolute Value



What Is Absolute Value?

The Absolute Value of a number is its distance from zero (on the number line). Thus, an absolute value is always positive. We indicate absolute value by putting two bars around the number.

Example:

- | 9 | is read as “the absolute value of 9.” Because 9 is 9 spaces from zero on the number line, the absolute value is 9.
- | -4 | is read as “the absolute value of -4.” Because -4 is 4 spaces from zero on the number line, the absolute value is 4.

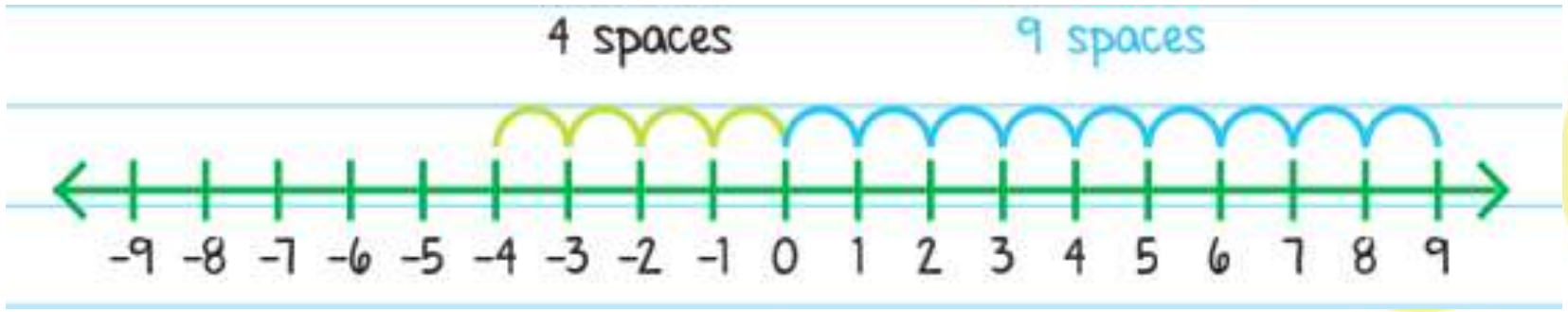
What you need to understand is that when given the absolute value, you are given two possibilities. It is either that the expression inside the absolute value is positive or negative.

In other words: | X - 8 | = 4

Means that: X - 8 = 4 OR X - 8 = -4

Notice there's no need to do anything to "X - 8?"

The value of x - 8 changes because it can be either positive OR negative.



SCULA

Example: **Solve for w, given that 12 + | w - 4 | = 30.**

STEP 1: Isolate the expression within the absolute value brackets: 12 + | w - 4 | = 30 meaning that **| w - 4 | = 18**

STEP 2: Remove the absolute value brackets and solve the equation for 2 different cases.

CASE 1 : w - 4 = 18 → w = 22

CASE 2 : w - 4 = - 18 → w = -14

STEP 3: Check to see whether each solution is valid by putting each one back into the original equation and verifying that the two sides of the equation are equal.

Example :

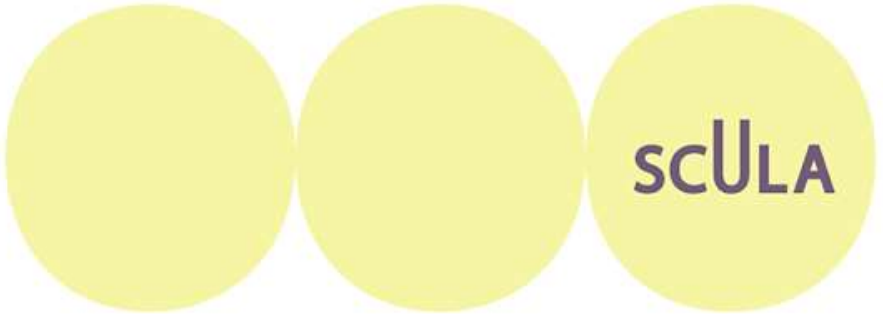
Solve for n, given that $|n + 9| = 3 - 3n$

A. {-3}

B. {3}

C. {-3,3}

D. {0}



Isolate the expression within the absolute value brackets and consider both cases.

Step 1: $| n + 9 | - 3n = 0$

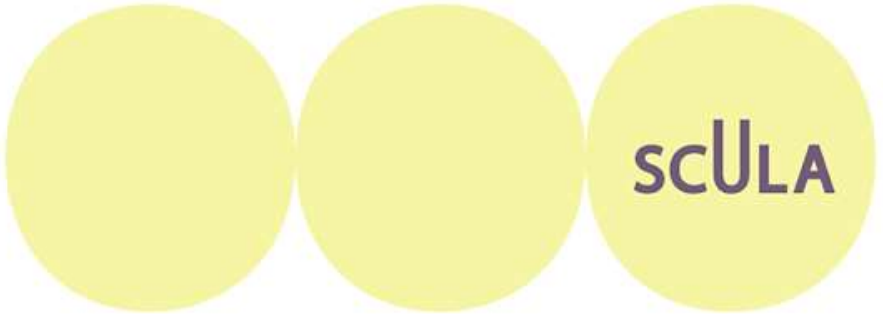
Step 2:

CASE 1: N + 9 IS POSITIVE

$n + 9 = 3 + 3n \rightarrow n = 3$

CASE 2: N + 9 IS NEGATIVE

$n + 9 = - (3 + 3n) \rightarrow n = -3$



Step 3: The first solution, $n = 3$, is valid because $|(3) + 9| - 3(3) = 12 - 9 = 3$.

However, the second solution, $n = -3$, is not valid because $|n + 9| = 3 + 3n$ does not hold true when $n = -3$.

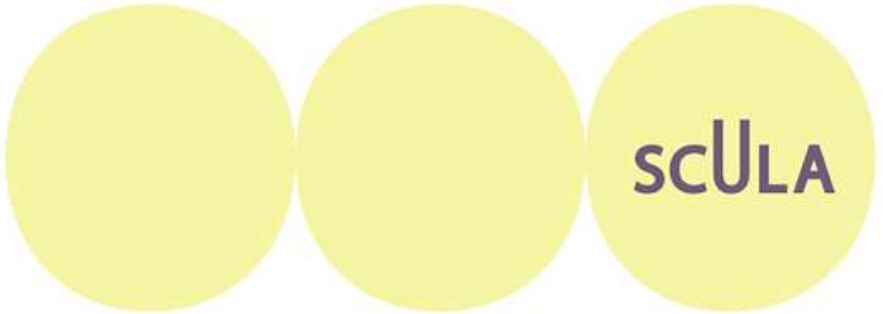
Let's check:

LHS: $|n + 9| = |(-3) + 9| = 6$

RHS: $3 + 3n = 3 + 3(-3) = -6$

Therefore, the sides are not equal and therefore $n = -3$ is not a solution. It's imperative we perform the third step for all absolute value questions.

The correct answer is B.



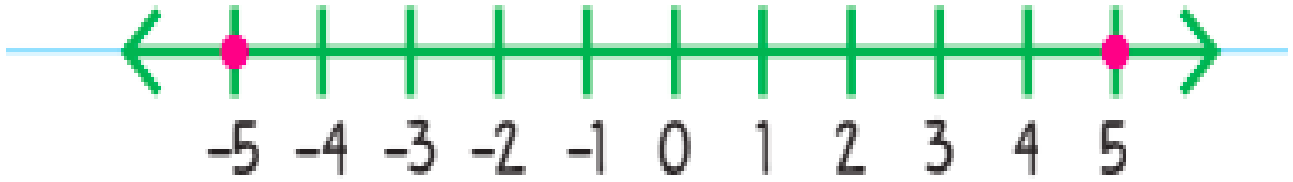
Inequalities and Absolute Value

Many students have a total freak out when they see something like this:

| X - 3 | > 6

To understand the concept, it is helpful to try to visualize the problem with a number line.

For a simple equation such as | x | = 5, the graph of the solutions looks like this:

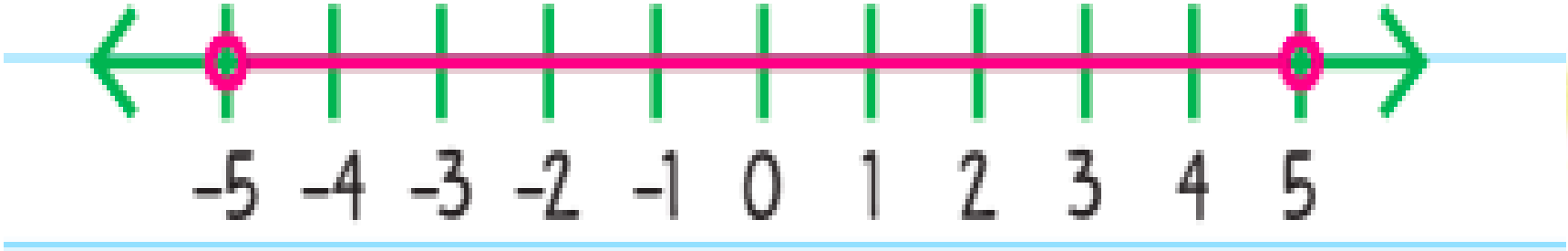


When absolute value is used in an inequality, the unknown generally has

more than two possible solutions. Indeed, for a simple inequality

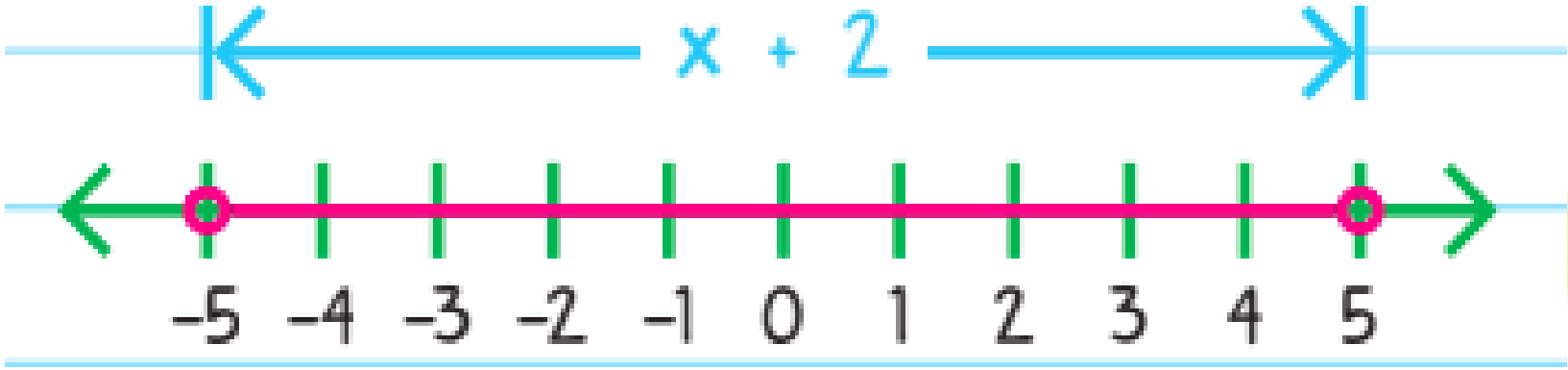
such as $|x| < 5$, a simple way understand this inequality is to say “x must

be less than 5 units from zero on the number line.”



If we consider |x +2| < 5 we will proceed in the same way.

x + 2 must be less than 5 units away from zero on the number line. We cannot stop there - we must graph for x alone. How does the " + 2 " change our graph? It forces us to shift the entire graph by 2, because the absolute value expression will be equal to zero when x = - 2. Thus, the graph for x alone will look like this:



Important Case :

Let's consider the following question :

For which of the following values of x is $|3x-2| < 0$

A- 5

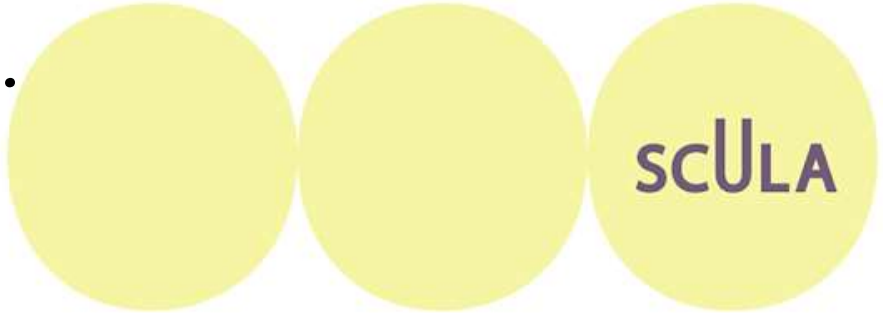
B- $\frac{2}{3}$

C- There is no such value of x.

The SAT will try to trick you by adding $\frac{2}{3}$ to the answer choices which is a solution for $3x - 2 = 0$.

However, the absolute value is NEVER negative.
It can only be positive or equal to 0.

The correct answer is C



We need to expand and combine like terms as usual :

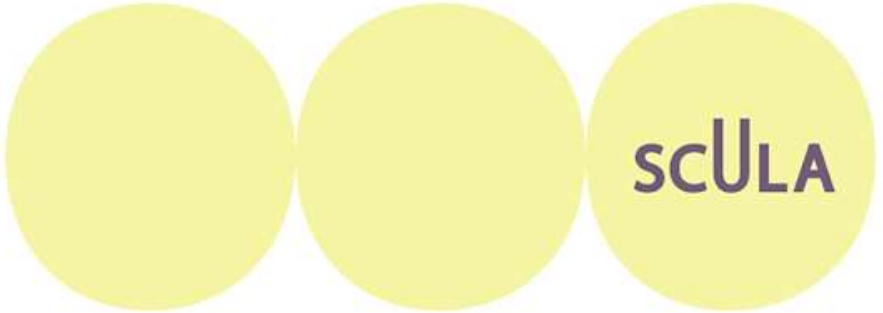
$S = (4 + i)(5 - 2i)$

$S = 20 - 8i + 5i + 2$

$S = 22 - 3i$

Therefore, the answer is B

Remember the SAT will only require you to manipulate the product of two complex numbers.



How to solve an inequality with the absolute value?

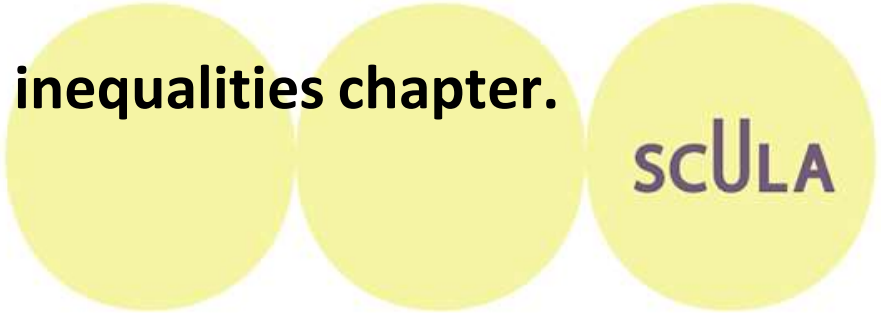
We can also solve these types of problems algebraically. Recall that equations involving absolute value require you to consider two scenarios:

- One where the expression inside the absolute value brackets is positive
- Where the expression is negative

Let's consider this inequality : $|X-3| > 6$

You get: $X - 3 > 6$ OR $X - 3 < -6$

Then you solve the inequality as we discussed in the inequalities chapter.



PRACTICE

https://drive.google.com/file/d/1ELSJPBaFH9w3eaQWQjeQU7VRgLw5Zvfk/view?usp=drive_link

THANK YOU!

DO YOU HAVE ANY QUESTIONS?