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Absolute value practice

Solving absolute value equations is as easy as working with regular linear equations. The only additional key step that you need to remember is to separate the original absolute value equation into two parts: positive and negative (±) components. Below is the general approach on how to break them down into two equations: In addition, we also need to keep in mind the following key points regarding the setup above: Key Points to Remember when Solving Absolute Value Equations Key Point #1: The sign of [latex]\left| x \right|[/latex] must be positive. For emphasis, [latex]\left| x \right| \to + \left| x \right|[/latex]. Key Point #2: The [latex]x[/latex] inside the absolute value symbol, [latex]\left| {\,\,\,\,\,} \right|[/latex], could be any expressions. Key Point #3: The [latex]a[/latex] on the right side of the equation must be either a positive number or zero to have a solution. Key Point #4: If the [latex]a[/latex] on the right side is a negative number, then it has no solution. Given the considerations above, there are instances where the right-hand side contains a variable. However, it could also be on the left, provided the opposite side has the absolute value expression. To solve such cases, we follow the standard procedure, but it’s imperative to validate each solution by plugging it back into the original absolute value equation. If the substitution yields a true statement, the answer we found is included in the solution set. If not, it’s excluded. See examples #8 and #9 to see the demonstrations of this concept in the practice problems below: Absolute Value Expressions Practice Problems with Answers Finally, there is another case that usually shows up when dealing with absolute value equations. That is, the equation contains absolute value expressions on both sides. Here’s the procedure how to work it out. Suppose we have the absolute value equation [latex]\left| {ax + b} \right| = \left| {cx + d} \right|[/latex] Then, the two expressions must either be equal to each other or be negatives of each other. [latex]ax + b = cx + d[/latex] or [latex]ax + b = – \left({cx + d} \right)[/latex] See examples #10 and #11 to see how it works in the practice problems found below: Absolute Value Expressions Practice Problems with Answers Examples of How to Solve Absolute Value Equations Example 1: Solve the absolute value equation [latex]\left| x \right| =\, – 5[/latex] . The absolute value of any number is either positive or zero. But this equation suggests that there is a number whose absolute value is negative. Can you think of any numbers that can make the equation true? Well, there is none. Since there’s no value of [latex]x[/latex] that can satisfy the equation, we say that it has no solution. In fact, the following absolute value equations don’t have solutions as well. Example 2: Solve the absolute value equation [latex] – \left| x \right| =\, – 5[/latex] . Don’t be quick to conclude that this equation has no solution. Although the right side of the equation is negative, the absolute value expression itself must be positive. But it is not, right? Key Point #1: The sign of [latex]\left| x \right|[/latex] must be positive. For emphasis, [latex]\left| x \right| \to + \left| x \right|[/latex]. What we need is to eliminate first the negative sign of the absolute value symbol before we can proceed. Observe that the given equation has a coefficient of −1. Divide both sides of the equation by this value to get rid of the negative sign. Since the absolute value expression and the number are both positive, we can now apply the procedure to break it down into two equations. Therefore, the solution to the problem becomes Therefore, the solution set is [latex]\{- 5,5\}[/latex]. You may verify our answers by substituting them back to the original equation. I’ll leave it to you. Example 3: Solve the absolute value equation [latex]\left| {x – 5} \right| = 3[/latex] . This problem is getting interesting since the expression inside the absolute value symbol is no longer just a single variable. Don’t worry; the set-up remains the same. Just be careful when you break up the given absolute value equation into two simpler linear equations, then proceed how you usually solve equations. Therefore, the solution set is [latex]\{2,8\}[/latex]. You may check the answers back to the original equation. Example 4: Solve the absolute value equation [latex]\left| { – 2x + 7} \right| = 25[/latex] . You may think that this problem is complex because of the [latex]–2[/latex] next to the variable [latex]x[/latex]. However, that shouldn’t intimidate you because the key idea remains the same. We have the absolute value symbol isolated on one side and a positive number on the other. Solving this is just like another day in the park! Break it up into the [latex]+[/latex] and [latex]-[/latex] components, then solve each equation. Therefore, the solution set is [latex]\{- 9,16\}[/latex]. Example 5: Solve the absolute value equation [latex]\left| { – 6x + 3} \right| – 7 = 20[/latex]. This one is not ready just yet to be separated into two components. Why? It is because the absolute value symbol is not by itself on one side of the equation. If you look at it, there is a [latex]-7[/latex] on the left side that must be eliminated first. Once we get rid of that, then we should be okay to proceed as usual. Eliminate the [latex]-7[/latex] on the left side by adding both sides by [latex]\color{blue}7[/latex]. Now, we have an absolute value equation that can be broken down into two pieces. Therefore, the solution set is [latex]\{-4,5\}[/latex]. Example 6: Solve the absolute value equation [latex] – 7\left| {9\, – 2x} \right| + 9 =\, – 12[/latex]. The absolute value expression is not isolated yet. Eliminate the [latex]+9[/latex] first and then the [latex]-7[/latex] which is currently multiplying the absolute value expression. Now, let’s split them into two cases, and solve each equation. Therefore, the solution set is [latex]\{3,6\}[/latex]. Example 7: Solve the absolute value equation [latex]\left| {{x^2} + 2x – 4} \right| = 4[/latex]. This is an interesting problem because we have a quadratic expression inside the absolute value symbol. I hope you don’t get distracted by how it looks! If you’re faced with a situation in which you’re not sure how to proceed, stick to the basics and things that you already know. We don’t care about the “stuff” inside the absolute value symbol. As long as it is isolated, and the other side is a positive number, we can definitely apply the rule to split the equation into two cases. In fact, the only difference between this problem from what you’ve been doing so far is that you will be solving quadratic equations instead of linear equations. We can verify that our four answers or solutions are [latex]x = – \,4[/latex], [latex]-2[/latex], [latex]0[/latex], and [latex]2[/latex], by graphing the two functions and looking at their points of intersections. Therefore, the solution set is [latex]\{-4,-2,0,2\}[/latex]. Take a quiz: Absolute Value Equations Quiz You might also like these tutorials: Tags: Intermediate Algebra, Lessons This quiz will put your skills in solving absolute value equations to the test. This quiz contains a total of ten (10) multiple-choice questions. To pass, you’ll need a score of 70% or higher. Good luck! Note: This quiz has no time limit, so you can spend as much time as you need on each question. Review: Solving Absolute Value Equations Tags: Algebra Quizzes, Math Quizzes Show Mobile Notice Show All Notes Hide All Notes Mobile Notice You appear to be on a device with a "narrow" screen width (i.e. you are probably on a mobile phone). Due to the nature of the mathematics on this site it is best viewed in landscape mode. If your device is not in landscape mode many of the equations will run off the side of your device (you should be able to scroll/swipe to see them) and some of the menu items will be cut off due to the narrow screen width. For problems 1 – 5 solve each of the equation. \(\left| {4p - 7} \right| = 3\) Solution \(\left| {2 - 4x} \right| = 1\) Solution \(6u = \left| {1 + 3u} \right|\) Solution \(\left| {2x - 3} \right| = 4 - x\) Solution \(\displaystyle \left| {\frac{1}{2}z + 4} \right| = \left| {4z - 6} \right|\) Solution For problems 6 & 7 find all the real valued solutions to the equation. \(\left| {{x^2} + 2x} \right| = 15\) Solution \(\left| {{x^2} + 4} \right| = 1\) Solution |−1914|= \left|-19\frac{1}{4}\right|= −1941= These signs in the exercises refer to the concept of "absolute value",In absolute value we don't have "negative" or "positive", instead we measure the distance from point 0,In other words, we always "cancel out" the negative signs.In this exercise, we'll change the minus to a plus sign, and simply remain with 19 and a quarter.And that's the solution! Page ID45456 Exercise \(\PageIndex{A}\) \(\bigstar \) Solve the following absolute value equations. \(|x−5| = 8\) \(|x−2| = 4\) \(|x+4| = 3\) \(|x+2| = 11\) \(|x+2|−3 = 4 \) \(|4−x|+5 = 12\) \(2|x−7|+5=9\) \(3|x+5| = 6\) \(3|x−4|−4=8\) \(4|x−1|+2=10\) \(3|x−4|+2=11\) \(3|4x−5|−4=11\) \(3|x+2|−5=4\) \(|2x−3|−4=1\) \(|3x−5|−1=6\) \(|5x−4|−3=8\) \(|4x−3|−5=2\) \(−2|x−3|+8=−4\) \(−2|3−2x| = −6\) \(|3x−4|+5=7\) \(|4x+7|+2=5\) \ (|34x−3|+7=2\) \(|35x−2|+5=2\) \(|12x+5|+4=1\) \(|4x−1|−3=0\) \(|14x+3|+3=1\) Answers to odd exercises: 1. \(x = −3\) or \(x = 13\) 3. \(x = −7 \) or \(x = −1\) 5. \(x = −9 \) or \(x = 5\) 7. \(x=5\) or \(x=9\) 9. \(x=8,\space x=0\) 11. \(x=7, \, x=1\) 13. \(x=1, \,x=−5\) 15. \(x=4, \space x=−\dfrac{2}{3}\) 17. \(x=−1,\space x=\dfrac{5}{2}\) 19. \(x = 0\) or \(x = 3\) 21. \(x=−1, \,x=−\dfrac{5}{2}\) 23. no solution 25. \(x=1, \,x=−\dfrac{1}{2}\) \(\bigstar \) Solve the following absolute value equations. \(−3 \left| \dfrac{x}{2}−4 \right|+4=−5\) \(\left| \dfrac{2}{3}x−4\right|-11=3\). \(\left| \dfrac{x}{3}−\dfrac{1}{4}\right| = \dfrac{1}{12}\) \(\left| \dfrac{x}{4}−\dfrac{1}{2}\right|= \dfrac{2} {3}\) \(\left| \dfrac{3}{4}x−5\right|- 9=4\) \(\left| \dfrac{5}{6}x+6 \right|=8\) \(|x+2| = \dfrac{1}{3}x+5\) \(|x−3|=5−\dfrac{1}{2}x\) \(|x−2| = \dfrac{1}{3}x+2\) \(|x+4| = \dfrac{1}{3}x+4\) \(|4x+3|=|2x+1|\) \(|3x−2| = |2x−3|\) \(|6−x|=|3−2x|\) \(|6x−5|=|2x+3|\) \(|5x−1|=|2x+3|\) \(|7x−3|=|3x+7|\) \(|6x−5|=|3x+4|\) \(3|x+2|−5 = |x+2|+7\) \ (4−3|4−x| = 2|4−x|−1\) Answers to odd exercises: 31. \(x=14, \,x=2\) 33. \(x = \frac{1}{2}, \; x = 1\) 35. \(x = \frac{-32}{3}, \; x = 24\) 37. \(x = \frac{9}{2}, \; x = \frac{-21}{4} \) 39. \(x = 0\), \(x = 6\) 41. \(x=−1, \,x=−\frac{2}{3}\) 43. \(x=−3, \,x=3\) 45. \(x=−\frac{2}{7}, \; x=\frac{4}{3}\) 47. \(x=3, x=\frac{1}{9}\) 49. \(x = 3, \; x = 5\) B: Absolute Value Linear Inequalities (I) Exercise \(\PageIndex{B}\): Absolute Value Linear Inequalities I \(\bigstar \) Solve. State the solution in interval notation and graph the solution set on the number line. \(|x| < 5\) \(|x| ≤ 2\) \(|x + 3| ≤ 1\) \(|x − 7| < 8\) \(|x − 5| < 0\) \(|x + 8| < −7\) \(|2x − 3| ≤ 5\) \(|3x − 9| < 27\) \(|5x − 3| ≤ 0\) \(|10x + 5| < 25 \) \ (\left| \dfrac { 1 } { 3 } x - \dfrac { 2 } { 3 } \right| \leq 1 \\[4pt]\) \(\left| \dfrac { 1 } { 12 } x - \dfrac { 1 } { 2 } \right| \leq \dfrac { 3 } { 2 }\) \(|x| > 1\) \(|x + 2| > 8\) \(|x − 7| ≥ 11\) \(|x + 5| ≥ 0\) \(|x − 12| > −4\) \(|2x − 5| ≥ 9\) \(|2x + 3| ≥ 15\) \(|4x − 3| > 9 \) \(|3x − 7| ≥ 2 \) \(\left| \dfrac { 1 } { 7 } x - \dfrac { 3 } { 14 } \right| > \dfrac { 1 } { 2 } \\[4pt] \) \(\left| \dfrac { 1 } { 2 } x + \dfrac { 5 } { 4 } \right| > \dfrac { 3 } { 4 }\) Answers to odd exercises: 51. \((- 5,5)\); 53. \([- 4 , - 2]\); 55. \(\emptyset\); 57. \([- 1,4]\); 59. \(\left\{ \frac { 3 } { 5 } \right\}\); 61. \([- 1,5]\); 63. \((- \infty , - 5] \cup [5 , \infty)\); 65. \((- \infty , - 10) \cup (6 , \infty)\); 67. \(\mathbb { R }\); 69. \((- \infty , - 2] \cup [7 , \infty)\); 71. \(\left(- \infty , - \frac { 3 } { 2 } \right) \cup (3 , \infty)\); 73. \((- \infty , - 2) \cup (5 , \infty)\); C: Absolute Value Linear Inequalities (II) Exercise \(\PageIndex{C}\): Absolute Value Linear Inequalities II \(\bigstar \) Solve. State the solution in interval notation and graph the solution set on the number line. \(|3 (2x − 1)| > 15\) \(|3 (x − 3)| ≤ 21\) \(−5 |x − 4| > −15\) \(−3 |x + 8| ≤ −18\) \(6 − 3 |x − 4| < 3\) \(5 − 2 |x + 4| ≤ −7\) \(1+ |2x + 5| > 12\) \(2 + |3x − 7| ≤ 9\) \(|2x + 25| − 4 ≥ 9\) \(|3 (x − 3)| − 8 < −2\) \(2 |9x + 5| + 8 > 6\) \(3 |4x − 9| + 4 < −1\) \(5 |4 − 3x| − 10 ≤ 0\) \(6 |1 − 4x| − 24 ≥ 0\) \(3 − 2 |x + 7| > −7\) \(9 − 7 |x − 4| < −12\) \(|5 (x − 4) + 5| > 15\) \(|3 (x − 9) + 6| ≤ 3\) \(7 − |−4 + 2 (3 − 4x)| > 5\) \(9 − |6 + 3 (2x − 1)| ≥ 8\) \(12 + 4 |2x − 1| ≤ 12\) \(3 − 6 |3x − 2| ≥ 3\) \(\dfrac{1}{2} |2x − 1| + 3 < 4\) \(2 \left| \dfrac{1}{2} x + \dfrac{2}{3} \right| − 3 ≤ −1\) \(\left| \dfrac { 1 } { 3 } (x + 2) - \dfrac { 7 } { 6 } \right| - \dfrac { 2 } { 3 } \leq - \dfrac { 1 } { 6 }\) \(\left| \dfrac { 1 } { 10 } (x + 3) - \dfrac { 1 } { 2 } \right| + \dfrac { 3 } { 20 } > \dfrac { 1 } { 4 }\) \(\dfrac { 3 } { 2 } - \left| 2 - \dfrac { 1 } { 3 } x \right| < \dfrac { 1 } { 2 }\) \(\dfrac { 5 } { 4 } - \left| \dfrac { 1 } { 2 } - \dfrac { 1 } { 4 } x \right| < \dfrac { 3 } { 8 }\) Answers to odd exercises: 81. \((- \infty , - 2) \cup (3 , \infty)\); 83. \((1,7)\); 85. \((- \infty , 3) \cup (5 , \infty)\); 87. \((- \infty , - 8) \cup (3 , \infty)\); 89. \((- \infty , - 19] \cup [- 6 , \infty)\); 91. \(\mathbb { R }\); 93. \(\left[\frac { 2 } { 3 } , 2 \right]\); 95. \((- 12 , - 2)\); 97. \((- \infty , 0) \cup (6 , \infty)\); 99. \(\left(0 , \frac { 1 } { 2 } \right)\); 101. \(\frac { 1 } { 2 }\); 103. \(\left(- \frac { 1 } { 2 } , \frac { 3 } { 2 } \right)\); 105. \([0,3]\); 107. \((- \infty , 3) \cup (9 , \infty)\); Was this article helpful? Recommended articles Students will learn how to solve equations using absolute value. A sample problem is solved and two practice problems are provided. Ten problems are provided. Example Problem: If the domain is the set of signed numbers, find the solution set for: |x| = 23 Students will solve the equations using absolute value. Ten problems are provided. Example exercises: 1) Find the value of the number expression |-11| 2) Simplify: |(12-11|+|-35| Students demonstrate their proficiency solving equations using absolute value. Ten problems are provided. A good way to see where your class is at with this skill. Three problems are provided, and space is included for students to copy the correct answer when given. This lesson breaks it down like: solving for - ⎟35 + - 25⎟ First term is 35 and the second term is -25. Students will determine the absolute value of a series of operations that they need to process. Ten problems are provided. Put everything together to get this rolling in the right direction. This worksheet reviews how to process complex operations that include this skill to get into the next level. Students demonstrate their proficiency with working with this skill. Ten problems are provided. Three problems are provided, and space is included for students to copy the correct answer when given. Students will solve the absolute value equations and check their work. A sample problem is solved and two practice problems are provided. Students gain experience solving equations that include this skill and checking their work. Ten problems are provided. Students will first solve the AV equations and then check their work. Ten problems are provided. This worksheet offers a wide array of problems that include the use of this skill and helps them expand on to the next level. Students demonstrate their proficiency solving these types of equations and checking their work. Ten problems are provided. Students will solve for the variable in different types of equations and check their work. Three problems are provided, and space is included for students to copy the correct answer when given. This worksheet explains how to find the end result of a given expression. A sample problem is solved. This problem is worked through top to bottom: Look at the given expression carefully. Here, we have a negative 60 and a positive 26. Subtract 60 from 26. This worksheet will have you combining a bunch of different operations. We are working on the same skill with just more reps to get our brain muscles in shape. Students will practice finding the end value of a series of expression. Eight problems are provided. Students demonstrate skill finding the absolute value of a given expression. Three problems are provided. To find the absolute value of any number just "forget the minus sign", if present inside the modulus sign. If there is no negative sign in front of the number inside the modulus sign then its absolute value will be same as the number i.e. modulus of any positive number is remain unchanged. To find the modulus of any number whether it is positive or negative its output will be positive (Consider only the inner expression of modulus). We draw operation outside of the symbols and see what students do with them. More work on guess what skill? I would take a look at each of the questions that are available here. Students demonstrate skill solving absolute value questions. Three problems are provided. Students will find the resulting value of these expressions. Ten problems are provided. More practice problems for you to work through. Students will find the absolute value in these intermediate-level problems. Eight problems are provided. Another set of problems for you to cruise through. Ten problems are provided. Students will gain proficiency in finding the outcome of these intermediate-level problems. Ten problems are provided. This worksheet explains how to find two numbers whose absolute value is equal to the given value. A sample problem is solved. Students will review and practice finding two numbers whose absolute value is equal to the given value. A sample problem is solved and two practice problems are provided. Students will find the indicated absolute values to complete the chart. Ten problems are provided. Students will compare two integers and write the difference between the two. Ten problems are provided. Students will practice finding the two numbers whose absolute value is equal to the given value. Eight problems are provided. Students demonstrate show well they can do with this work. Three problems are provided. |−1914|= \left|-19\frac{1}{4}\right|= −1941= These signs in the exercises refer to the concept of "absolute value",In absolute value we don't have "negative" or "positive", instead we measure the distance from point 0,In other words, we always "cancel out" the negative signs.In this exercise, we'll change the minus to a plus sign, and simply remain with 19 and a quarter.And that's the solution! The absolute value of a number is the distance between the number and zero on the number line. Opposites are numbers that have the same absolute value, for example (5, and -5). When we solve an absolute value equation such as |x| = 5, there are two solutions: x = 5 or x = -5. Test Objectives Demonstrate a general understanding of absolute valueDemonstrate the ability to solve a compound equation with "or"Demonstrate the ability to solve an absolute value equation The specifications for the manufacture of a ball bearing requires a diameter of 3.52 cm with an allowable margin of error of at most 0.05 cm. Write and solve an absolute value equation representing the maximum and minimum allowable diameter.