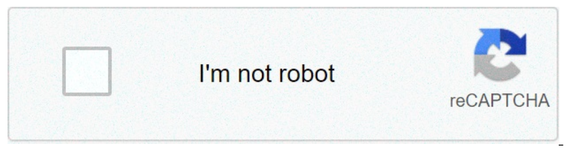

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Absolute value inequalities ppt

Solving Absolute Value Inequalities AII.4a – The student will solve, algebraically and graphically, absolute value equations and inequalities. Graphing calculators will be used for solving and for confirming the algebraic solution. Situation • The Frito-Lay plant has strict standards when it comes to bagging their products. The weight of the chips in a snack-size bag must be within 0.15 ounces of the advertised size of 1.75 ounces in order to be sent to the store shelf. • What is the maximum acceptable weight for a snack-size bag of Doritos? • What is the minimum acceptable weight for a snack-size bag of Doritos? 1.9 oz. 1.6 oz.Situation • How can we mathematically represent all the acceptable weights? • What is the expected weight? • How far are the max./min. values from the expected value? • We are looking for all values within 0.15 oz. of 1.75. How can we express this mathematically? • ABSOLUTE VALUE!! 1.75 oz. 0.15 oz.Situation • 0.15 is the 'distance' we can be from 1.75. Representing this mathematically we get… • |x – 1.75|= 0.15 • And the solutions would be … • {x | x = 1.6, 1.9} • But wait, we wanted ALL the solutions within 0.15 of 1.75. Can't a bag weigh 1.7 oz. or 1.89 oz. and still be sold? A 2 oz. or a 1.5 oz. bag would not be sold. How can we change our representation to show ALL solutions?Situation • Our bags cannot be more than 0.15 oz. from 1.75 oz., thus they must be less than or equal to 0.15 oz. from 1.75. So our equation should really be an inequality. • |x – 1.75|≤0.15 • 1.60 oz. ≤x ≤ 1.90 oz. • Fito-lay will sell 1.75 ounce bags of Doritos that weigh between 1.60 ounces and 1.90 ounces. Tolerance Problems • Problems such as these are called tolerance problems. Though we strive for things to be exact, we accept a certain level of 'give or take' about our desired value. This give or take is easily represented by the concept of absolute value. Try this one: • A cereal manufacturer has a tolerance of 0.75 ounce for a box of cereal that is supposed to weigh 20 ounces. • Write an absolute value inequality to represent this expression. Tolerance Problems • A cereal manufacturer has a tolerance of 0.75 ounce for a box of cereal that is supposed to weigh 20 ounces. • We must be within a 'distance' 0.75 oz. from 20 oz. • |x - 20|≤ 0.75 • What is the range of acceptable weights for this cereal? • 19.25 oz. ≤x ≤ 20.75 oz. Tolerance Problems • A cereal manufacturer has a tolerance of 0.75 ounce for a box of cereal that is supposed to weigh 20 ounces. • Equation: |x - 20|≤ 0.75 • Range of acceptable weights: 19.25 oz. ≤x ≤ 20.75 oz. • The cereal manufacture will sell 20 ounce boxes of cereal that weight between 19.25 and 20.75 ounces. Tolerance Problems • The circumference, C, of a regulation size men's basketball is 29.75 inches. To be used in a district game, the circumference can be no more than .25 in. from the regulated value. Give the range of possible circumferences and represent them using an absolute value inequality. • 29.5 ≤ C ≤ 30; |C – 29.75|≤ .25Solving Absolute Value Inequalities • Let's think through solving the last inequality: |C – 29.75|≤ .25 • Our ideal circumference was 29.75. • We cannot be more than .25 away from that value. • But we want to include the values between 29.75 and the end points. 29 30Solving Absolute Value Inequalities |C – 29.75|≤ .25 Our two inequalities are … C– 29.75 ≤.25 and C– 29.75≥ -.25 Why is this ≥? Since we are moving -.25, we are moving to the left on the number line and our values are greater than the lower/left end point. 29 30Solving Absolute Value Inequalities |C – 29.75|≤ .25 Our two inequalities are … C– 29.75 ≤.25 and C– 29.75≥ -.25 Why do we say and? Our basketball must meet both constraints on its circumference. It has to be less than .25 above 29.75 AND greater than .25 below 29.75. 29 30Solving Absolute Value Inequalities |C – 29.75|≤ .25 C– 29.75 ≤.25 and C– 29.75≥ -.25 Adding 29.75 to both sides of both inequalities we get … C≤ 30 and C≥ 29.5 or {C|29.5 ≤ C≤ 30}Solving Absolute Value Inequalities The house at 458 Elm Street is suspected to have a gas leak. Seven houses on either side of 458 were evacuated. Which homes on Elm St. did not need to evacuate? Represent mathematically the house numbers of the homes that did not need to evacuate (assuming all the houses are numbered chronologically).Solving Absolute Value Inequalities Houses that did not need to evacuate needed to be _____ seven houses from 458. |x - 458|> 7 x – 458 > 7 or x – 458 < -7 Why do we use OR here? Can the same house be to the left and right of 458? No, we either have a house number greater than 458 (to the right, +7 steps from 458) or less than 458 (to the left, -7 steps from 458) greater than Why not ≥?Solving Absolute Value Inequalities The house at 458 Elm Street is suspected to have a gas leak. Seven houses on either side of 458 were evacuated. Which homes on Elm St. did not need to evacuate? |x - 458|> 7 x – 458 > 7 or x – 458 < -7 x > 465 or x < 451 Any home on Elm St. with a house number less than 451 or greater than 465 did not need to evacuate. Take a look at the big picture! • We set up absolute value inequalities in a similar way to how we set up AV equations. But with inequalities we need to be mindful of the inequality symbol. • When we set up the two inequalities based on our distance, we need to make sure the inequality symbols are correctly representing the direction the solutions will go (are we greater than or less than those end values?). Take a look at the big picture! • Absolute value inequalities also introduce the option of AND or OR situations. As with determining distance, you must isolate the absolute value expression BEFORE you can determine which type it is. • It is the inequality symbol that determines the type of problem. • An absolute value inequality is actually a way to represent a compoundinequality, (two inequalities combined by the words 'and' or 'or'). How do you determine what kind of inequality you are working with? • If you have < or or >, you are dealing with an 'or' statement. • "Greator" • Think of the house problem. Our house numbers sat outside a middle range. A house cannot have a number greater than 465 and also less than 451. 450 460 470How do you determine what kind of inequality you are working with? • If you have > or >, you are dealing with an 'or' statement. • The graph of the compound inequality containing 'or'only has to satisfy one of the conditions of the inequality. • The graphs can go in opposite directions, or overlap • If the inequalities do overlap in an 'or' situation, the solution is all reals.'Or' Inequalities – special case • Solve |3x – 1|> -5 • Since our inequality symbol is >, we have an 'or' inequality. • What is our distance? • Can we have a negative distance? • Is this a no solution problem? -5 NO!!'Or' Inequalities – special case • Solve |3x – 1|> -5 • Is this a no solution problem? • No, the inequality says we are GREATER than -5. Absolute value always gives us a positive value, and positives are always greater than negatives. • Since the AV expression will always give us a positive, and any positive number is greater than -5, our solution for this, and any similar problem, will always be (all real numbers). 'Or' Inequalities – special case • Solve |3x – 1|> -5 • But if we needed/wanted to solve the inequality algebraically: |3x – 1|> -5 3x– 1> -5 or 3x– 1< 5 3x> -4 or 3x< 6 x> -4/3or x< 2 • Since the intervals overlap, the solution is: R. -2 -1 0 1 2Examples: • Solve: |x+ 3| > 5 • Is this an 'and' or 'or' statement? • What is the distance? • x + 3 has to be greater than 5 steps from zero. So x + 3 has to be greater than 5 OR less than -5. x + 3 > 5 or x+ 3 < -5 x> 2 or x < -8 GreatOR Than -8 -4 0 4 8 2 8 Examples: Solve:|x+ 3|< 5 Is this an 'and' or 'or' inequality? Distance: less than 5 steps from zero. x+ 3 will be less than 5 AND x+ 3will be greater than -5. x+ 3 < 5 and x+ 3 > -5 x< 8 and x> 2 We can often write our solutions to 'and' inequalities as a compound inequality: 2 < x < 8Inequalities are Tricky… • When separating your AV inequality into two inequalities, you have to pay attention to your signs and symbols! • Examine the last two examples: |x+ 3|< 5 |x+ 3| > 5 x+ 3 < 5 and x+ 3 > -5 x+ 3 > 5 or x+ 3 < -5 • What rule/generalization can you make? • On the second equation you must not only negate the right hand side, but also reversethe direction of the inequality symbol.-8 Examples: Solve: |2x + 4| > 12 2x + 4 > 12 or 2x + 4 < -12 2x > 8 or 2x < -16 x > 4 or x < -8 x < -8 or x > 4 What is our distance from zero? Is this an 'and' or an 'or' inequality? 4 0Examples: Solve: 2|4 - x| ≤10 |4 - x| ≤5 4 - x≤ 5 and 4 - x≥ -5 - x≤ 1 and - x≥ -9 x ≥ -1 and x≤ 9 -1 ≤x≤ 9 What is our distance from zero? We must first isolate the AV Is this an 'and' or an 'or' inequality? Why did the inequality symbols reverse? 10 0Another way to look at 'And' Inequalities |4 - x| < 5 Since this is an 'and' inequality, we know 4 – x will be sandwiched between two values (±5). We can use a compound inequality to solve it: -5 < 4 - x < 5 -9 < -x < 1 9 > x > -1 -1 < x < 9* - 4 - 4 - 4 -1 -1 -1 * We always write intervals and compound inequalities with the smallest value on the left.-4 3 Examples: |2x + 1| ≥ 7 2x + 1 ≥ 7 or 2x + 1 ≤ -7 2x ≥ 6 or 2x≤ -8 x ≥ 3 or x≤ -4 We can still use set notation: {x|x≤ -4 orx ≥ 3} What is our distance from zero? Is this an 'and' or an 'or' inequality?Solving by Graphing • We can solve inequalities by graphing just like we can equations. • Solve |2x + 1| ≥ 7 by using graphing. • What do equations do we need to graph? • y = |2x + 1| • y = 7Solving by Graphing • Solve |2x + 1| ≥ 7 by using graphing. • Your image should be: using the standard window.Solving by Graphing: • Solve |2x + 1| ≥ 7 by using graphing. • We want to know where |2x + 1| is greater than or equal to 7. • Start with where |2x + 1| equals 7. • x = -4, 3 • Where is |2x + 1| greater than 7? • Where x < -4 and where x > 3-4 3 Solving by Graphing: • Solve |2x + 1| ≥ 7 by using graphing. • Thus our solution is {x | x ≤ -4 or x ≥ 3} • Notice how this compares to the number line graph.-4 3 Solving by Graphing: • Now solve |2x + 1| < 7 by using graphing. • Start with where |2x + 1| equals 7 (even thought these values will not be in our solution set). • x = -4, 3 • Where is |2x + 1| less than 7? • Between -4 and 3 • So our solution is • {x | -4 < x < 3} Why? Below 7