Solving Linear Inequalities

The principles for solving inequalities are similar to those for solving equations. Principles for Solving Inequalities For any real numbers a, b, and c:

The Addition Principle for Inequalities: If a < b is true, then a + c < b + c is true.

The Multiplication Principle for Inequalities: If a < b and c > 0 are true, then ac < bc is true. If a < b and c < 0 are true, then ac > bc is true. Similar statements hold for a > b.

NOTE: When both sides of an inequality are multiplied by a negative number, we must reverse the inequality sign.

Compound Inequalities

When two inequalities are joined by the word and or the word or, a compound inequality is formed. A compound inequality like -3 < 2x + 5 and 2x + 5 < 7 is called a conjunction, because it uses the word and. The sentence -3 < 2x + 5 < 7 is an abbreviation for the preceding conjunction.

Graphing One-Variable Inequality using the TI calculator.

Find the domain of the function.

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Solve and graph the solution set.

142/24. \(3 - x \leq 2\) or \(x + 2 \geq 5\)

143/35. \(3x - y \leq 0\) or \(x - y = 0\)

143/36. \(3x - y \leq 0\) or \(x - y = 0\)

143/38. \(3x - 1 < -5\) or \(3x - 1 > 5\)

143/40. \(5x + 11 \leq -4\) or \(5x + 11 \geq 4\)

143/43. Moving Costs. Acme Movers charges $100 plus $30 per hour to move a household across town. Hank’s Movers charges $55 per hour. For what lengths of time does it cost less to hire Hank’s Movers?

143/45. Investment Income. Dillon plans to invest $7500, part at 4% simple interest and the rest at 5% simple interest. What is the most that he can invest at 4% and still be guaranteed at least $325 in interest per year?

143/47. Investment Income. A university invests $600,000 at simple interest, part at 6%, half that amount at 4.5%, and the rest at 3.5%. What is the most that the university can invest at 3.5% and be guaranteed $24,600 in interest per year?

143/48. Income Plans. Achal can be paid in one of two ways for the furniture he sells:

Plan A: A salary of $900 per month, plus a commission of 10% of sales;

Plan B: A salary of $1200 per month, plus a commission of 15% of sales in excess of $8000.

For what amount of monthly sales is plan B better than plan A if we can assume that Achal’s sales are always more than $8000?
143/43. Information Technology. The equation $y = 31.7x + 487$ estimates the amount that small and midsize businesses spend, in billions of dollars, on information technology, where $x$ is the number of years after 2007 (Source: IDC SMB Research). For what years will the spending be more than $775$ billion?

143/50. Income Plans. Tori can be paid in one of two ways for selling insurance policies: Plan A: A salary of $750$ per month, plus a commission of $10\%$ of sales; Plan B: A salary of $1000$ per month, plus a commission of $8\%$ of sales in excess of $2000$. For what amount of monthly sales is plan A better than plan B if we can assume that sales are always more than $2000$?

143/46. Investment Income. Gina plans to invest $12,000$, part at $4\%$ simple interest and the rest at $6\%$ simple interest. What is the most that she can invest at $4\%$ and still be guaranteed at least $650$ in interest per year?

143/49. Investment Income. A foundation invests $50,000$ at simple interest, part at $7\%$, twice that amount at $4\%$, and the rest at $5.5\%$. What is the most that the foundation can invest at $4\%$ and be guaranteed $2660$ in interest per year?