LINEAR INEQUALITIES IN ONE VARIABLE
(MAT 1190 SUPPLEMENTARY MATERIAL)

1. INTRODUCTION

Solving linear inequalities is the same as solving linear equations with one exception:

- when you multiply or divide an inequality by a negative value, it changes the direction of the inequality.

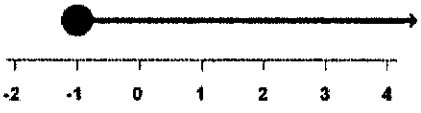
Example 1. Solve and graph the solution of the inequality

$$-2x + 7 \leqslant 9.$$

Solution.

$$\begin{aligned} & -2x + 7 \leqslant 9 \\ \Longrightarrow\ & -2x \leqslant 2 && \text{Subtract 7 from both sides} \\ \Longrightarrow\ & x \geqslant -1 && \text{Divide both sides by } -2\text{, change direction of sign.} \end{aligned}$$

Hence $x \geqslant -1$, which graphically is given by



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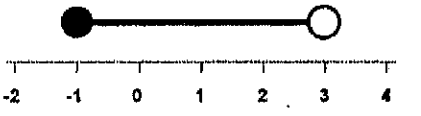
Example 2. Solve and graph the solution of the inequality

$$-9 < 3(x - 2) \leqslant 3.$$

Solution.

$$\begin{aligned} & -9 < 3(x-2) \leqslant 3 \\ \Longrightarrow\ & -9 < 3x - 6 \leqslant 3 && \text{Distribute the 3 into the parenthesis} \\ \Longrightarrow\ & -3 < 3x \leqslant 9 && \text{Add 6 to all three parts} \\ \Longrightarrow\ & -1 \leqslant x < 3 && \text{Divide all three parts by 3.} \end{aligned}$$

Hence $-1 \leqslant x < 3$, which graphically is given by



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2. Solving Linear Inequalities

Solve each of the following inequalities. Give both the inequality and graph the solution.

1. $2x - 6 < 2$	**2.** $3 - 4x > 5$	**3.** $-x \geqslant -8$
4. $-3x + 1 > 0$	**5.** $4x + 2 < 6x + 8$	**6.** $-2 \leqslant x + 1 < 4$
7. $-5 \leqslant 4x - 1 < 15$	**8.** $5 < \frac{1}{2}x < 6$	

Solutions

Note: The graphical portion of the solution is not shown.

1. $x < 4$	**2.** $x < -\frac{1}{2}$	**3.** $x \leqslant 8$
4. $x < \frac{1}{3}$	**5.** $x > -3$	**6.** $-3 \leqslant x < 3$
7. $-1 \leqslant x < 4$	**8.** $10 < x < 12$	

3. Applied Problems

1. Your quiz grades are 78, 72, 87, and 90. What score on the fifth quiz will make your average quiz grade at least 82?
2. The velocity of an object fired directly upward is given by $V = 80 - 32t$, where t is in seconds. When will the velocity be between 16 and 32 feet per second?
3. You have just been given a new job in sales. You have two salary options. You can receive a straight salary of \$500 per week (no commission option) or you can receive a salary of \$200 per week plus 5% of your weekly sales (commission option). What dollar amount of product must you sell each week in order for the commission option to be the better deal?

Solutions

1. The fifth quiz must be greater than or equal to 83.
2. The velocity will be between 32 and 64 feet per second between 0.5 seconds after launch and 1.5 seconds after launch.
3. You must sell more than \$6,000 each week.

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