Sets are collection of objects

Set Notation \{\}

Elements of the set, members of the set are inside of set notation.

\(A = \{1, 2, 3, 4\}\) \(\begin{array}{l}
\text{Finite} \\
1 \in A \quad \text{is an element of set } A \\
8 \notin A \quad \text{is not an element of } A.
\end{array}\)
\[ A = \{ \text{John, Jill, Jen, Jack} \} \]
\[ B = \{ \text{Mike, Moe, Mary} \} \]

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**Operations with Sets**

1. **Intersection** \( \cap \) only common elements
2. **Union** \( \cup \) all elements repeated or not.

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\[ A = \{ 2, 4, 6 \} \quad B = \{ 6, 8, 10, 12 \} \]

\[ A \cup B = \{ 2, 4, 6, 8, 10, 12 \} \]

Elements of \( A \), \( B \), or Both.

\[ A \cap B = \{ 6 \} \]

Only common elements

\[ A = \{ 1, 3, 5, 7, 9 \} \quad B = \{ 2, 4, 6, 8, 10 \} \]

Find

\[ A \cup B = \{ 1, 2, 3, \ldots, 10 \} \]

Do not say

\[ A \cap B = \{ \} \quad \text{Empty Set} \]

\[ \{ \emptyset \} \]
working with inequalities:

\[ 2(x-7) + 4 \leq 4x + 20 \]

\[ 2x - 14 + 4 \leq 4x + 20 \]

\[ 2x - 10 \leq 4x + 20 \]

\[ 2x - 4x \leq 20 - 10 \]

\[ -2x \leq 30 \]

Divide by -2

\[ x \geq -15 \]

1. Set-Builder notation

\[ \{ x \mid x \geq -15 \} \]

2. Graphing

3. Interval Notation

\[ [ -15, \infty ) \]

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Solve \(-4 \leq 3x + 5 < 26\)

Isolate \(x\) in the middle.

\[-4 - 5 \leq 3x < 26 - 5 \]

\[-9 \leq 3x < 21 \]

\[-3 \leq x < 7\]

1. S.B.N.

\[ \{ x \mid -3 \leq x < 7 \} \]

2. Graphing

3. Interval

\[ [-3, 7) \]
Solve: \[ 2 \leq -2x - 6 \leq 14 \]

\[ 2 + 6 \leq -2x \leq 14 + 6 \]
\[ 8 \leq -2x \leq 20 \]
\[ \frac{8}{-2} \geq x \geq \frac{20}{-2} \]
\[ -4 \geq x \geq -10 \]

\[ \{ x | -10 \leq x \leq -4 \} \]

\[ -10 \leq x \leq -4 \]

\[ \text{Graph} \]

\[ \text{S.B.N.} \]

\[ \text{I.N.} \]

Inequalities with OR

1) Solve each one.
2) Graph them on the same number line system.
3) Final ans is all the regions that are shaded.

\[ 3x - 2 \leq -11 \quad \text{OR} \quad -2x + 3 < -15 \]
\[ 3x \leq -9 \quad \text{OR} \quad -2x < -18 \]
\[ x \leq -3 \quad \text{OR} \quad x > 9 \]

\[ \{ x | x \leq -3 \quad \text{OR} \quad x > 9 \} \]

\[ \text{I.N.} \]

\[ (-\infty, -3] \cup (9, \infty) \]
Solve
\[ 2(x+3)-10 \leq 6 \quad \text{OR} \quad -3x + 7 < 19 \]

\[ 2x + 6 - 10 \leq 6 \]
\[ 2x - 4 \leq 6 \]
\[ 2x \leq 10 \]
\[ x \leq 5 \quad \text{OR} \quad x > -4 \]

\[ -3x < 19 - 7 \]
\[ -3x < 12 \]

S.B.N. \( \mathbb{R} \) Real numbers
\[ \{ x \mid x \in \mathbb{R} \} \quad \text{I.N.} \ (-\infty, \infty) \]

Inequalities with AND
1. Solve each one.
2. Graph them on the same number line system.
3. Final ans is \textcolor{red}{\textit{only}} the overlap region.

\[ 2x - 7 \geq -11 \quad \text{AND} \quad 3(x+4) - 1 < 32 \]
\[ 2x \geq -4 \quad \text{AND} \quad 3x + 21 < 2 \]
\[ x \geq -2 \quad \text{AND} \]
\[ x < 7 \]

S.B.N. \( \{ x \mid -2 \leq x < 7 \} \)
I.N. \( [-2, 7) \)
Solve

\[3x - 7 > 2(x - 1) - 5\] \hspace{1cm} \text{AND} \hspace{1cm} -2x + 14 \geq 18

\[3x - 7 > 2x - 2 - 5\] \hspace{1cm} \text{AND} \hspace{1cm} -2x \geq 18 - 14

\[3x - 7 > 2x - 7\] \hspace{1cm} \overline{\text{Overlap}}

\[x > 0\] \hspace{1cm} \text{AND} \hspace{1cm} \overline{x \leq -2}

\[\overline{\text{No Solution}}\]

\[\overline{\text{there is no overlap.}}\]

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Graph & Shade:

1. \(y \geq 3\) \hspace{1cm} \text{Horizontal line}

2. \(x < -4\) \hspace{1cm} \text{Vertical line}

3. \(y \geq \frac{2}{3}x - 2\)
Graph & Shade:
\[
\begin{cases}
3x - 4y \geq 8 \\
x > -2
\end{cases}
\]

Tip: write in Slope-Intercept Form.

-4y \geq -3x + 8
\Rightarrow y \leq \frac{3}{4}x - 2

Zero Slope $\Rightarrow y = b$

No Slope $\Rightarrow x = a$

Due Tuesday

S & 4

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Graph

$f(x) = 4$
Constant Function
$y = 4$ H.L.

$g(x) = -3x + 4$
Linear Function
$y = -3x + 4$
$m = -3 = \frac{-3}{1}$

$g(x) = -3x + 4$
Graph \( f(x) = (x-2)^2 + 1 \)

Square Function

\( x - 2 = 0 \Rightarrow x = 2 \) Starting Point

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Graph \( f(x) = |x+3| - 2 \)

Abs. Value Function

\( x + 3 = 0 \Rightarrow x = -3 \) Starting Point

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>1</td>
</tr>
<tr>
<td>-5</td>
<td>0</td>
</tr>
<tr>
<td>-4</td>
<td>-1</td>
</tr>
<tr>
<td>-3</td>
<td>-2</td>
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<tr>
<td>-2</td>
<td>-1</td>
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<tr>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Absolute Value Equations $|ax+b|=k$

NO Solution when $k<0$

Otherwise Solve

$ax+b=k$ or $ax+b=-k$

Solve $|2x-3|=5$

$2x-3=5$ or $2x-3=-5$

$2x=8$ or $2x=-2$

$\boxed{x=4}$ or $\boxed{x=-1}$

$\{ -1, 4 \}$
Solve

\[ |3x+4| = -8 \]
\[ \emptyset \]

Always make sure that Abs. Value is totally isolated.

\[ |3x+4| = 8 \]
Solve
\[ 3x+4 = 8 \quad \text{or} \quad 3x+4 = -8 \]
\[ 3x = 4 \quad \text{or} \quad 3x = -12 \]
\[ x = \frac{4}{3} \quad \text{or} \quad x = -4 \]
\[ \{ -4, \frac{4}{3} \} \]

Solve
\[ -2|x+6| + 4 = -10 \]
\[ -2|x+6| = -14 \]
\[ |x+6| = 7 \]
\[ x+6 = 7 \quad \text{or} \quad x+6 = -7 \]
\[ x = 1 \quad \text{or} \quad x = -13 \]
\[ \{-13, 1\} \]

\[ \text{Isolate First} \]
\[ \text{Take away 4, Divide by -2.} \]
\[ |ax+b| = |cx+d| \]

Solve:
\[ ax+b = cx+d \quad \text{or} \quad ax+b = -(cx+d) \]

Solve:
\[ |2x+7| = |x-9| \]

\[ 2x+7 = x-9 \quad \text{OR} \quad 2x+7 = -(x-9) \]

\[ 2x-x = -9-7 \]
\[ x = -16 \quad \text{OR} \quad 2x+7 = -x+9 \]
\[ 3x = 2 \]
\[ x = \frac{2}{3} \]

\[ \{-16, \frac{2}{3}\} \]

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\[ |x+8| = |x-8| \]

Solve:
\[ x+8 = x-8 \quad \text{or} \quad x+8 = -(x-8) \]

\[ x+8 = -x+8 \]
\[ 2x = 0 \]
\[ x = 0 \]

\[ \emptyset \]

Due Thursday
Project 1.