

Section 4.2

Compound Inequalities

What Grade Do I Need On the Final Exam?

A common question heard on college campuses is:
“What do I need to get on the last exam in order to earn an A in this course?”

In the Exercise Set for this section, we will encounter a student that is no longer aiming for a grade of A, but rather has shifted her focus to a grade of B.

We will use a compound inequality to see what range of grades on the final exam will result in an overall course grade of B.



Exam	Grade
#1	70
#2	75
#3	87
#4	92
#5	



First Steps:

- Take comprehensive notes** from your instructor’s lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 4.2 of your textbook which begins on page 265.
- Complete the *Concept and Vocabulary Check* on page 271 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Find the intersection of two sets.

✓ *Solved Problem #1*

- Find the intersection: $\{3, 4, 5, 6, 7\} \cap \{3, 7, 8, 9\}$

The intersection of two sets, is the set of elements that are common to both sets.

Elements 3 and 7 are common to both sets.

$$\{3, 4, 5, 6, 7\} \cap \{3, 7, 8, 9\} = \{3, 7\}$$

Pencil Problem #1

- Find the intersection: $\{1, 2, 3, 4\} \cap \{2, 4, 5\}$

Objective #2: Solve compound inequalities involving *and*.

✓ Solved Problem #2

2a. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$x + 2 < 5 \text{ and } 2x - 4 < -2$$

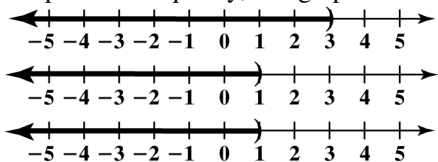
Solve each inequality.

$$x + 2 < 5 \quad \text{and} \quad 2x - 4 < -2$$

$$x < 3 \qquad 2x < 2$$

$$x < 1$$

Graph each inequality, and graph the intersection.



The solution set is $(-\infty, 1)$.

✎ Pencil Problem #2 ✎

2a. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$x < 2 \text{ and } x \geq -1$$

2b. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$4x - 5 > 7 \text{ and } 5x - 2 < 3$$

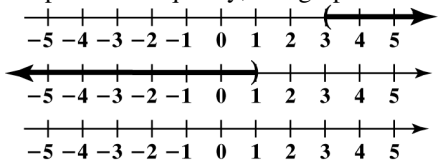
Solve each inequality.

$$4x - 5 > 7 \quad \text{and} \quad 5x - 2 < 3$$

$$4x > 12 \qquad 5x < 5$$

$$x > 3 \qquad x < 1$$

Graph each inequality, and graph the intersection.



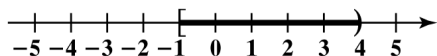
Since the two sets do not intersect, the solution set is \emptyset .

2b. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$x - 4 \leq 2 \text{ and } 3x + 1 > -8$$

2c. Solve and graph the solution set: $1 \leq 2x + 3 < 11$

$$\begin{aligned} 1 &\leq 2x + 3 < 11 \\ 1 - 3 &\leq 2x + 3 - 3 < 11 - 3 \\ -2 &\leq 2x < 8 \\ \frac{-2}{2} &\leq \frac{2x}{2} < \frac{8}{2} \\ -1 &\leq x < 4 \end{aligned}$$



The solution set is $[-1, 4)$.

2c. Solve and graph the solution set: $-11 < 2x - 1 \leq -5$

Objective #3: Find the union of two sets.

Solved Problem #3

3. Find the union: $\{3, 4, 5, 6, 7\} \cup \{3, 7, 8, 9\}$

The union is the set consisting of all the elements from each set.

$$\{3, 4, 5, 6, 7\} \cup \{3, 7, 8, 9\} = \{3, 4, 5, 6, 7, 8, 9\}$$

Pencil Problem #3

3. Find the union: $\{a, e, i, o, u\} \cup \emptyset$

Objective #4: Solve compound inequalities involving *or*.

Solved Problem #4

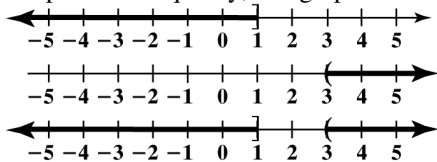
4a. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$3x - 5 \leq -2 \quad \text{or} \quad 10 - 2x < 4$$

Solve each inequality.

$$\begin{aligned} 3x - 5 &\leq -2 & \text{or} & & 10 - 2x &< 4 \\ 3x &\leq 3 & & & -2x &< -6 \\ x &\leq 1 & & & \frac{-2x}{-2} &> \frac{-6}{-2} \\ & & & & x &> 3 \end{aligned}$$

Graph each inequality, and graph the union.



The solution set is $(-\infty, 1] \cup (3, \infty)$.

Pencil Problem #4

4a. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$-2x + 5 > 7 \quad \text{or} \quad -3x + 10 > 2x$$

4b. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$2x+5 \geq 3 \text{ or } 2x+3 < 3$$

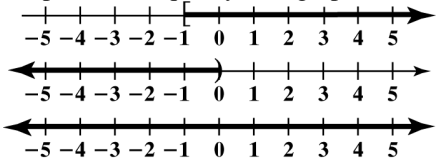
Solve each inequality.

$$2x+5 \geq 3 \quad \text{or} \quad 2x+3 < 3$$

$$2x \geq -2 \quad \quad \quad 2x < 0$$

$$x \geq -1 \quad \quad \quad x < 0$$

Graph each inequality, and graph the union.



The solution set is $(-\infty, \infty)$.

4b. Solve and graph the solution set. Use graphs to show the solution set to each of the two given inequalities, as well as a third graph that shows the solution set of the compound inequality.

$$4x+3 < -1 \text{ or } 2x-3 \geq -11$$

Answers for Pencil Problems (*Textbook Exercise references in parentheses*):

1. $\{2, 4\}$ (4.2 #1)		
2a. $[-1, 2)$ (4.2 #11)	2b. $(-3, 6]$ (4.2 #17)	2c. $(-5, -2]$ (4.2 #29)
3. $\{a, e, i, o, u\}$ (4.2 #37)	4a. $(-\infty, 2)$ (4.2 #53)	4b. $(-\infty, \infty)$ (4.2 #51)

Homework:

- Review the Section 4.2 summary** on page 306 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.