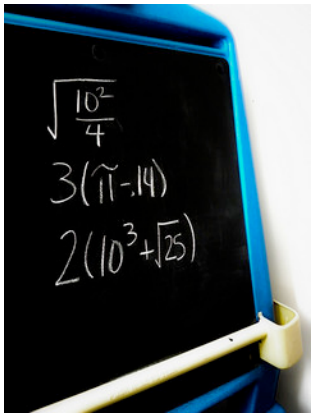
# 2.11 More Things Taken Out of Context

*A Practice Understanding Task*






Solve the following systems of inequalities:

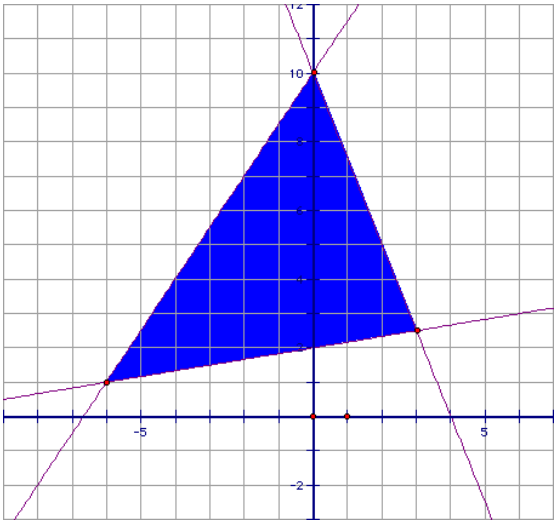
1. $\begin{cases} -5x + 3y \le 45 \\ 2x + 3y > 24 \end{cases}$

2. $\begin{cases} -10x + 6y \le 90 \\ 6x + 9y > 36 \end{cases}$

3. Is the point (-3, 10) a solution to the system in problem #1? Why or why not?

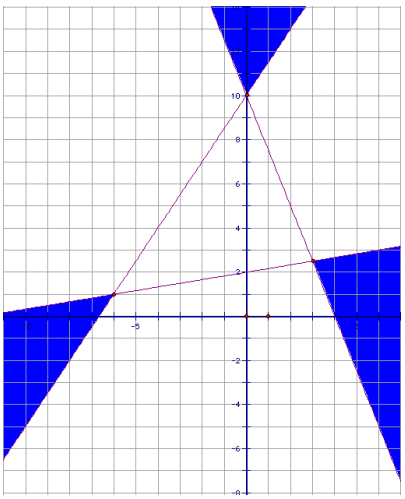
4. How are the inequalities representing the boundaries of the solution sets in problems #1 and #2 similar to each other? What accounts for these similarities?

5. Write the system of inequalities whose solution set is shown below:




6. Amanda is examining Frank's work on #5, when she exclaims, "You have written all of your inequalities backwards. The solution set to your system would look like this."

What do you think about Amanda's statement?



# 2.11 More Things Taken Out of Context — Teacher Notes

*A Practice Understanding Task*

**Purpose**: The purpose of this task is to practice solving systems of linear inequalities by identifying the overlapping (or intersecting) region of the half-planes that form the solution sets of each of the two-variable inequalities in the system. Students practice this in problems 1 and 2 by finding the overlapping region and in 3 by creating a system of inequalities whose solution is given as a shaded region in the coordinate plane. Students also must recognize the difference between a strict inequality and one that includes the points on the boundary line as part of the solution set. That is, in problem 4, they must distinguish the difference between $<$ and $\leq$, and between $>$ and $\geq$ as relationships. Students also get additional practice in recognizing parallel or equivalent lines for linear equations written in standard form.

**Core Standards Focus**:

**A.REI.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

**Related Standards:**

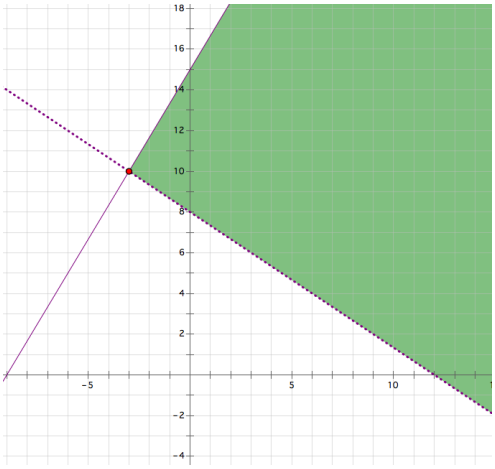
**Launch (Whole Class):**

Students should need very little introduction to this task. Point out the questions 1, 2 and 5 are practice problems, and that questions 3, 4 and 6 will extend their thinking.

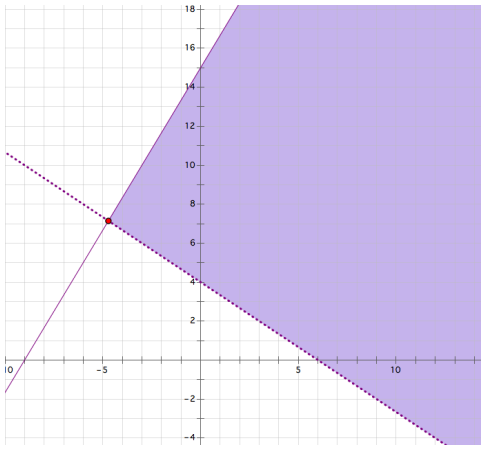
**Explore (Small Group):**

The main issue to watch for is whether students can find and shade the correct regions in the coordinate plane for 1 and 2, and if they can write a system of three linear inequalities in two variables for 5 so that the overlapping region of the three half-planes is the triangle given. This will require students to also be able to write the equations of the boundary lines shown. Watch for how students do this: using the slope and y-intercept of each line to write the equation in slope-intercept form, or using the two points of intersection that lie on each line. Also note if students are willing to leave their equations in slope-intercept form when they write their system of inequalities (which is fine) or if they feel compelled to transform their equations into standard form (which is not necessary, but may feel more "correct" to students since this is the form in which most systems have appeared throughout the module).

Solution set for problem 1:



Solution set for problem 2:



System for problem 5:

$$\begin{cases} y \le \frac{3}{2}x + 10 \\ y \le -\frac{5}{2}x + 10 \\ y \ge \frac{1}{6}x + 2 \end{cases} \quad \text{or} \quad \begin{cases} -3x + 2y \le 20 \\ 5x + 2y \le 20 \\ -x + 6y \ge 12 \end{cases}$$

**Discuss (Whole Class):**

If there are no issues with shading the appropriate solution set for questions 1 and 2, begin the discussion with question 5. Have a student who wrote the equations in slope-intercept form present their system of inequalities, followed by a student who wrote the equations in standard form. If both methods are not present in your class, bring up the question of which is "correct". It is important for students to recognize that the form in which we write the equation of the boundary line is not important.

Turn the discussion to the ideas represented in questions 3, 4 and 6.

For question 3, students should be able to conclude that the point (-3, 10) is not a solution to the system since it doesn't satisfy the second (strict) inequality in the system in #1.

For question 4, students should recognize the first inequalities in each system contain the same boundary line since one inequality is just a constant multiple of the other. The other boundary lines in the two systems are parallel to each other since the coefficients of the *x*-terms and the *y*-terms are proportional, but the constant terms are not.

For question 6, students should recognize that if Frank did indeed turn all of his inequality statements around (we assume Amanda means he switched around his "greater than" and "less than" signs), the solution to Frank's system would be an empty set rather than the solution proposed by Amanda, since all three half-planes would not share any points in common.

**Aligned Ready, Set, Go: Systems 2.11**