Focus Questions

Background

The student book is organized around three to five investigations, each of which contain three to five problems and a Mathematical Reflection that students explore during class.

In the Teacher Guide the Goals for each unit include two to four big concepts with an elaboration of the essential understandings for each.

In the Teacher Guide, a Focus Question is provided for each problem in an investigation. The Focus Question collapses the mathematical understandings and strategies embedded in the problem into one overarching question. The teacher can use the Focus Question to guide his/her instructional decisions throughout his/her planning, teaching, and reflections on student understanding.

Description

The Goals of the unit describe the mathematics content developed in the unit. The Focus Questions provide a story line for the mathematical development of an investigation. The set of Mathematical Reflections in the student book provide a story line for the mathematical development of the unit. The following contain all of the Goals, Focus Questions and Mathematical Reflections for each unit in CMP3.

Purpose

These stories can serve as an overview of the unit and as a guide for planning, teaching and assessing.

The Goals, Mathematical Reflections, and Focus Questions can be laminated and used a bookmark for the Teacher.

8-7: It's In The System

Unit Goals, Focus Questions, and Mathematical Reflections

Unit Goals

Linear Equations Develop understanding of linear equations and systems of linear equations

Recognize linear equations in two variables in standard form $Ax+By=C$

Recognize that a linear equation in the form $Ax+By=C$ has infinitely many solutions (x,y) and the graph of those solutions is always a straight line

Recognize that the form $Ax+By=C$ of linear equations is equivalent to the form $y=mx+b$ for linear equations

Continue to develop skills in solving a linear equation in two variables by graphing and with algebraic methods

Recognize that solving a system of linear equations is equivalent to finding values of the variables that will simultaneously satisfy all equations in the system

Develop skills in solving systems of linear equations by graphing solutions of separate equations; writing the system of equations in equivalent $y=mx+b$form; or using combinations of the system to eliminate one variable

Recognize that systems of linear equations in the form $\begin{cases} Ax + By = C \\ Dx + Ey = F \end{cases}$ may have exactly one solution, which is the intersection point of the lines represented by the equations; infinitely many solutions, which is represented by a single line for both equations; or no solution, which is represented by two parallel lines

Choose between graphing and symbolic methods to efficiently find the solution to a particular system of linear equations

Gain fluency with symbol manipulation in solving systems of linear equations

Solve problems that involve systems of linear equations

Linear Inequalities Develop understanding of graphing and symbolic methods for solving linear inequalities with one and two variables

Recognize differences between strict and inclusive inequalities

Continue to develop skill in solving a linear inequality in two variables by graphing and symbolic methods

Develop skill in solving systems of linear inequalities by graphing solutions of each inequality and finding the region of feasible points that satisfy both inequalities; and solving inequalities to find pairs of numbers that satisfy both inequalities

Choose between graphing and symbolic methods to efficiently find the region of feasible points to a particular system of linear inequalities

Solve a simple system consisting of a linear equation and a quadratic equation in two variables symbolically and graphically

Solve problems that involve linear inequalities or systems of linear inequalities

Focus Questions and Mathematical Reflections

Investigation 1 **Linear Equations With Two Variables**	**Investigation 2** **Solving Linear Systems Symbolically**	**Investigation 3** **Systems of Functions and Inequalities**	**Investigation 4** **Systems of Linear Inequalities**
Problem 1.1 Shirts and Caps: Solving Equations With Two Variables **Focus Question** What kind of solution will be found for an equation like 3x + 5y = 13 with two variables? What will the graphs of those two solutions look like?	**Problem 2.1 Shirts and Caps Again: Solving Systems With y = mx +b** **Focus Question** How can you solve a system of two linear equations with two variables by writing each equation in equivalent y = mx + b form? What are the solution possibilities for such systems and how are they shown by graphs of the solutions?	**Problem 3.1 Comparing Security Services: Linear Inequalities** **Focus Question** How can you use function graphs to find the solutions of an inequality like ax + b < cx + d? How can the solutions be represented on a number line graph?	**Problem 4.1 Limited Driving Miles: Inequalities With Two Variables** **Focus Question** If a problem involves solving an inequality like ax + by ≤ c, how many solutions would you expect to find and what would a coordinate graph of those solutions look like?
Problem 1.2 Connecting Ax + By = C and y = mx + b **Focus Question** How can one change an equation from Ax + By = C form to an equivalent y = mx + b form and vice versa?	**Problem 2.2 Taco Truck Lunch: Solving System by Combining Equations I** **Focus Question** How can you solve a system of linear equations by combining the two equations into one simpler equation by addition or subtraction?	**Problem 3.2 Solving Linear Inequalities Symbolically** **Focus Question** How does applying the same operation to both sides of an inequality change the relationship of the two quantities being compared (or not)? How can linear inequalities be solved by	**Problem 4.2 What Makes a Car Green: Solving Inequalities by Graphing I** **Focus Question** What graph of solutions (in the first quadrant) would you expect for an inequality with the general form ax + by ≤ c?

		strategies that are very similar to strategies for solving linear equations?	
Problem 1.3 Booster Club Members: Intersecting Lines **Focus Question** What happens when you search for common solutions to two linear equations with two variables?	**Problem 2.3Solving Systems by Combining Equations II** **Focus Question** How can equations in a system be transformed to equivalent forms that make it easier to solve by combination to eliminate variables?	**Problem 3.3 Operating at a Profit: Systems of Lines and Curves** **Focus Question** What are the possible solutions for a system that includes one linear and one quadratic function and how can you find these solutions?	**Problem 4.3 Feasible Points: Solving Inequalities by Graphing II** **Focus Question** What graph of solutions would you expect for an inequality with the general form $ax + by \leq c$?
			Problem 4.4 Miles of Emissions: Systems of Linear Inequalities **Focus Question** What do you look for to solve a system of linear inequalities and what will the graph of a solution look like?
Mathematical Reflection 1. What pattern will result from plotting all points (x,y) that satisfy an equation in the form $Ax + By = C$? 2. How can you change linear equations in the form $Ax + By = C$ to $y = mx + b$ form and vice versa? Explain when one form might be more useful than the other.	**Mathematical Reflection** 1. What is the goal in solving a system of linear equations? 2. What strategies can you use to solve a system of linear equations? 3. How can you check a possible solution of a system of linear equations?	**Mathematical Reflection** 1. How can you use coordinate graphs to solve linear equations such as $ax + b = cx + d$ and linear inequalities such as $ax + b < cx + d$? 2. How can you use symbolic reasoning to solve inequalities such as $ax + b < cx + d$?	**Mathematical Reflection** 1. Suppose you are given one linear inequality with two variables. How could you use a graph to find solutions of the inequality? 2. Suppose you were given a system of two linear inequalities. How could you use a graph to find solutions of the system?

3. How can you use a graph to find values of x and y that satisfy systems of two linear equations in the form Ax + By = C?		3. What strategies can you use to solve systems of equations and inequalities that involve linear and quadratic functions or lines and circles?	