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.

8-2 Looking for Pythagoras

Unit Goals, Focus Questions, and Mathematical Reflections

Unit Goals

Pythagorean Theorem Understand and apply the Pythagorean Theorem

- Develop strategies for finding the distance between two points on a coordinate grid
- Explain a proof of the Pythagorean Theorem
- Use the Pythagorean Theorem and its converse to solve a variety of problems.
- Use the Pythagorean Theorem to find the equation of a circle with its center located at the origin

Real Numbers Understand the set of real numbers consists of rational and irrational numbers

- Interpret square roots and cube roots of numbers by making use of their related geometric representations
- Relate the area of a square to the side length of the square
- Estimate the values of square roots
- Estimate the values of cube roots
- Relate the volume of a cube to the edge length of the cube
- Compare numbers that can be represented as fractions (rational numbers) to numbers that cannot be represented as fractions (irrational numbers) and recognize that the set of real numbers consists of rational and irrational numbers.
- Represent rational numbers as fractions and as terminating decimals or repeating decimals
- Recognize that irrational numbers cannot be represented as fractions and are nonterminating, nonrepeating decimals
- Recognize that the square root of a whole number that is not a square is irrational
- Locate irrational numbers on a number line
- Use and understand properties of rational and irrational numbers.

Focus Questions and Mathematical Reflections

Investigation 1 Coordinate Grids	Investigation 2 Squaring Off	Investigation 3 They Pythagorean Theorem	Investigation 4 Using the Pythagorean Theorem: Understanding Rational numbers	Investigation 5 Using the Pythagorean Theorem: Analyzing Triangles and Circles
Problem 1.1 Driving Around Euclid: Locating Points and Finding Distances **Focus Question** How do driving distance between two coordinates relate to each other?	**Problem 2.1** Looking for Squares **Focus Question** How many different square areas are possible to draw using the dot grid as vertices? Why are some square areas not possible?	**Problem 3.1** Discovering the Pythagorean Theorem **Focus Question** You know the sum of the two shortest side lengths of a triangle must be greater than the third side length. Is there a similar relationship among the squares on the sides of a triangle? Is the relationship the same for all triangles?	**Problem 4.1** Analyzing the Wheel of Theodorus: Square Roots on a Number Line **Focus Question** Dan you find distances that are exact square roots of all whole numbers? Can you order square roots on a number line?	**Problem 5.1** Stopping Sneaky Sally: Finding Side Lengths **Focus Question** How can you use the Pythagorean Theorem to find distances in a geometric shape?
Problem 1.2 Planning Parks: Shapes on a Coordinate Grid **Focus Question** How do the coordinates of endpoints of a segment help draw other lines, which re parallel or perpendicular to the segment?	**Problem 2.2** Square Roots **Focus Question** What does $\sqrt{x}$ mean? How does it relate to x?	**Problem 3.2** A Proof of the Pythagorean Theorem **Focus Question** How can you prove that the relationship observed in Problem 3.1 will work for all right traingles?	**Problem 4.2** Representing Fractions as Decimals **Focus Question** Why can you represent every fraction as a repeating or terminating decimal? How can you predict which representations will repeat and which will	**Problem 5.2** Analyzing Triangles **Focus Question** How do the lengths of the sides of a 30-60-90 triangle relate to each other?

			terminate?	
Problem 1.3 Finding Areas **Focus Question** How does knowing how to calculate areas of rectangles and triangles help n the calculation of irregular areas?	**Problem 2.3** Using Squares to Find Lengths **Focus Question** How can you find the distance between any two points on a grid?	**Problem 3.3** Finding Distances **Focus Question** How can you find the distance between any two points on a plane?	**Problem 4.3** Representing Decimals as Fractions **Focus Question** Can you represent every repeating or terminating decimal as a fraction?	**Problem 5.3** Analyzing Circles **Focus Question** What is the relationship between the coordinates of a point (x, y) on a circle with a center at the origin?
	Problem 2.4 Cube Roots **Focus Question** What does it mean to take the cube root of a number?	**Problem 3.4** Measuring the Egyptian Way: Lengths That Form a Right Triangle **Focus Question** If a triangle with side lengths a, b, and c satisfies the relationship $a^2 + b^2 = c^2$, is the triangle a right triangle?	**Problem 4.4** Getting Real: Irrational Numbers **Focus Question** Can you identify every number as either rational or irrational?	
Mathematical Reflections 1. In the city of Euclid, how does the driving distance form one place to another compare to the flying distance? 2. Suppose you know the coordinates of two landmarks in	**Mathematical Reflection** 1. Describe how you would find the length of a line segment connecting two dots on dot paper. Be sure to consider horizontal, vertical, and tilted segments. 2. a. Explain what it	**Mathematical Reflection** 1. Suppose you are given the lengths of two sides of a right triangle. Describe how you can find the length of the third side. 2. Suppose two points on a grid are not on	**Mathematical Reflection** 1. Give three examples of fractions with decimal representations that terminate. 2. Give three examples of fractions with decimal representations that	**Mathematical Reflection** 1. Give at least two examples of ways in which the Pythagorean Theorem can be useful. 2. Describe the special properties of a 30-60-90 triangle.

Euclid. How can you find the distance between the landmarks? 3. What are some strategies for finding areas of figures drawn on a grid?	means to find the square root of a number. b. Explain whether or not a number can have more than one square root. 3. a. Explain what it means to find the cube root of a number. b. Explain whether or not a number can have more than one cube root.	the same horizontal or vertical line. Describe how you can use the Pythagorean Theorem to find the distance between the points without measuring. 3. How can you determine whether a triangle is a right triangle if you know only the lengths of its sides?	repeat. 3. Give three examples of irrational numbers, including one irrational number greater than 5. 4. How can you determine whether you can write a given decimal as a fraction?	3. What information do you need to write the equation of a circle with the center at the origin?