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.

7-8: Samples and Populations

Unit Goals, Focus Questions, and Mathematical Reflections

Unit Goals

The Process of Statistical Investigation Deepen the understanding of the process of statistical investigation and apply this understanding to samples

- Pose questions, collect data, analyze data, and interpret data to answer questions

Analysis of Samples Understand that data values in a sample vary and that summary statistics of samples, even same-sized samples, taken from the same population also vary

- Choose appropriate measures of center (mean, median, or mode) and spread (range, IQR, or MAD) to summarize a sample
- Choose appropriate representations to display distributions of samples
- Compare summary statistics of multiple samples drawn from either the same population or from two different populations and explain how the samples vary

Design and Use of Simulations Understand that simulations can model real-world situations

- Design a model that relies on probability concepts to obtain a desired result
- Use the randomly generated frequencies for events to draw conclusions

Predictions and Conclusions About Populations Understand that summary statistics of a representative sample can be used to gain information about a population

- Describe the benefits and drawbacks to various sampling plans
- Use random-sampling techniques to select representative samples
- Apply concepts from probability to select random samples from populations
- Explain how sample size influences the reliability of sample statistics and resulting conclusions and predictions
- Explain how different sampling plans influence the reliability of sample statistics and resulting conclusions and predictions
- Use statistics from representative samples to draw conclusions about populations
- Use measures of center, measures of spread, and data displays from more than one random sample to compare and draw conclusions about more than one population

Use mean and MAD, or median and IQR, from random samples to assess whether the differences in the samples are due to natural variability or due to meaningful differences in the underlying populations

Focus Questions and Mathematical Reflections

Investigation 1 **Making Sense of Samples**	**Investigation 2** **Choosing a Sample From a Population**	**Investigation 3** **Using Samples to Draw Conclusions**
Problem 1.1 Comparing Performances: Using Center and Spread **Focus Question** Given a set of results, how might you use measures of center and variability (spread) to judge overall performance?	**Problem 2.1 Asking About Honesty: Using a Sample to Draw Conclusions** **Focus Question** What is a population? What is a sample? What is a sampling plan?	**Problem 3.1 Solving an Archeological Mystery: Comparing Samples Using Box Plots** **Focus Question** How might you analyze samples from known and unknown populations to determine whether the unknown population has one or more attributes in common with the known population?
Problem 1.2 Which Team Is Most Successful? Using the MAD to Compare Samples **Focus Question** What strategies might you use to evaluate numerical outcomes and judge success?	**Problem 2.2 Selecting a Sample: Different Kinds of Samples** **Focus Question** How could you select a sample of your school population to survey?	**Problem 3.2 Comparing Heights of Basketball Players: Using Means and MADs** **Focus Question** How can you determine whether differences in sample data are large enough to be meaningful, or just due to naturally occurring variability from one sample to another?
Problem 1.3 Pick Your Preference: Distinguishing Categorical Data From Numerical Data **Focus Question** How might you compare	**Problem 2.3 Choosing Random Samples: Comparing Samples Using Center and Spread** **Focus Question** How could you use	**Problem 3.3 Five Chocolate Chips in Every Cookie: Using Sampling in a Simulation** **Focus Question** How can you simulate a

results to see if each sample responded to a survey in a similar way? How can using percentages help you make comparisons?	statistics of a random sample of data to make predictions about an entire population?	real-world problem? How can you analyze the data that you collect from that simulation to draw conclusions?
Problem 1.4 Are Steel-Frame Coasters Faster Than Wood-Frame Coasters? Using the IQR to Compare Samples **Focus Question** How might you decide whether steel-frame coasters or wood-frame coasters are faster?	**Problem 2.4 Growing Samples: What Size Sample to Use?** **Focus Question** Can you make good statistical estimates with less work by selecting smaller samples? How does sample size relate to the accuracy of statistical estimates?	**Problem 3.4 Estimating a Deer Population: Using Samples to Estimate the Size of a Population** **Focus Question** How can you estimate the size of a large population?
Mathematical Reflection 1. a. A new term is used in this Investigation: sample. What do you think sample means? b. Suppose you have data from a 7th-grade class. The data are answers to the questions: • What is your favorite movie? • How many movies do you watch per week? i. Which statistic can you use to summarize the results of the data? ii. How could you use the data to predict the number of students in the entire 7th grade who would say they watch two movies per week? 2. a. How do graphs of distributions help	**Mathematical Reflection** 1. Why are data often collected from a sample rather than from an entire population? 2. Describe four plans for selecting a sample from a population. Discuss the advantages and disadvantages of each plan. 3. a. How are random samples different from convenience, voluntary-response, and systematic samples? b. Why is random sampling preferable to the other sampling plans? c. Describing three plans for selecting a random sample from a given population. What are the advantages and disadvantages of each plan? 4. Suppose you select several random samples of size 30 from the same	**Mathematical Reflection** 1. a. How can you use statistics to compare samples? How can you use samples to draw conclusions about the populations from which they are selected? b. In what ways might a data distribution for a sample be similar to or different from the data distribution for the entire population? 2. a. How can you use box plots, medians, and IQRs to compare samples? Give an example. b. How can you use means and MADs to compare samples? Give an example. c. How can you use statistics to decide whether differences between samples are expected due to natural variability or reflect measureable

you compare data sets? b. How do measures of center help you compare data sets? c. How do measures of spread help you compare data sets? 3. When does it make sense to compare groups using counts, or frequencies? When does it make sense to compare groups using percents, or relative frequencies? Explain.	population. a. When you compare the samples to each other, what similarities and differences would you expect to find among the measures of center and spread? b. When you compare the samples to the larger population, what similarities and differences would you expect to find among the measures of center and spread? 5. How has your idea of the term sample changed from what you wrote in Mathematical Reflections, Investigation 1?	differences in underlying populations? 3. a. How can you use simulations to generate samples? b. How can you use data from a capture-tag-recapture simulation to estimate the actual size of a population? 4. The process of statistical investigation involves posing questions, collecting and analyzing data, and making interpretations to answer the original questions. Choose a Problem from this Investigation. Explain how you used the process of statistical investigation to solve the Problem.