Examples of Tasks from CCSS Edition Course 1, Unit 2

Getting Started

The tasks below are selected with the intent of presenting key ideas and skills. **Not every answer is complete**, so that teachers can still assign these questions and expect students to finish the tasks. If you are working with your student on homework, please use these solutions with the intention of increasing student understanding and independence. A list of questions to use as you work together, prepared in English and Spanish, is available. Encourage students to refer to their class notes and Math Toolkit entries for assistance. Comments in red type are not part of the solution.

As you read these selected homework tasks and solutions, you will notice that some very sophisticated communication skills are expected. Students develop these over time. This is the standard for which to strive. See Research on Communication.

The Statistics and Probability page might help you follow the conceptual development of the ideas you see in these examples.

Main Mathematical Goals for Unit 2

Upon completion of this unit, students should be able to:

- use various graphical displays of data to reveal important patterns in a data set and interpret those patterns in the context of the data.
- compute measures of center and variability for sets of data and interpret the meaning of those statistics.
- transform distributions by adding a constant or by multiplying by a positive constant and recognize how those transformations affect the shape, center, and spread of distributions.

What Solutions are Available?

Lesson 1: Investigation 1—Applications Task 1 (p. 90), Review Task 26 (p. 101), Review Task 30 (p. 102)
Investigation 2—Applications Task 5 (p. 92), Connections Task 10 (p. 94), Connections Task 11 (p. 94), Extensions Task 21 (p. 99)

Lesson 2: Investigation 2—Applications Task 3 (p. 130), Reflections Task 16 (p. 137), Review Task 32 (p. 143)
Investigation 3—Reflections Task 20 (p. 138), Extensions Task 25 (p. 140), Review Task 33 (p. 143)
Investigation 4—Applications Task 6 (p. 132), Connections Task 13 (p. 136), Review Task 35 (p. 143)
Investigation 5—Applications Task 10 (p. 134), Connections Task 11 (p. 135)

Technology

Many data sets used in this unit are available in *CPMP-Tools*. This public domain software can be downloaded from www.wmich.edu/cpmp/CPMP-Tools/ or on ConnectED. Alternatively, students can enter the data into a graphing calculator with statistics capabilities for analysis purposes.

Selected Homework Tasks and Expected Solutions

(These solutions are for tasks in the CCSS Edition book.
For homework tasks in books with earlier copyright dates, see Helping with Homework.)

Lesson 1, Investigation 1, Applications Task 1 (p. 90)

a. $94.74(24.3)(50) = $115,109.10

b. $9.04(37.8)(50) = $17,085.60

c. The histogram could be made by hand with a scale of $2.00 to $5.00 for the Hourly Compensation Costs, or the student could put the data in their calculator, or if they have *CPMP-Tools* on a computer, the data can be found under Statistics, Data Analysis, Unit 2 Patterns in Data>Hourly Compensation. The values on the dot plot in the student text have been rounded to the nearest dollar.

The hourly earnings distribution is skewed to the right. The center of the distribution in terms of the median is about $24 per hour. The mean would be larger due to the high values and is about $29 per hour. The spread is very large; the range is approximately $86 per hour.

d. There are 4 dots from $40 up to, but not including, $50. The relative frequency is $\frac{4}{70}$ or about 0.0571.

Lesson 1, Investigation 1, Review Task 26 (p. 101)

a. –23.1

b. 23.1

c–e. To be completed by the student.

Lesson 1, Investigation 1, Review Task 30 (p. 102)

a. Students might figure 20% of $108 to get $21.60, for a total of $129.60. Or they might figure (1.20)(108) = $129.60.

b–c. To be completed by the student.

Lesson 1, Investigation 2, Applications Task 5 (p. 92)

In these particular tasks, students need to recall what information is important when describing the shape of a distribution. The focus is on symmetry—skewed left, skewed right, or normal (mound-shaped)—and outliers. To estimate the median, students look to see where the middle of the data is located; the same amount of data on both sides. To estimate the mean, the student should look for the balance point of the histogram. See page 77 or students' Math Toolkits.

a. **i.** The shape is fairly symmetric, mound-shaped with irregular tails on both sides.

ii. The median is between 38 and 39 inches. About half of the players in this draft jumped higher than 38–39 inches, and about half jumped lower.

iii. The mean of about 38.2 is the balance point of the distribution. Mean is another word for the average jump by a player in the draft.

b. To be completed by the student.

Lesson 1, Investigation 2, Connections Task 10 (p. 94)

a, c–d. To be completed by the student.

b. The symbol Σ in mathematics means to sum all of the terms together. Since it asks to sum all x^2, students need to sum $(x_1)^2 + (x_2)^2 + (x_3)^2 + (x_4)^2$, which is equivalent to $2^2 + 10^2 + 5^2 + 6^2 = 165$.

Lesson 1, Investigation 2, Connections Task 11 (p. 94)

a. In order to get a mean of 80 for 3 scores, the sum of the three grades must be 80(3), or 240 points. So far, Matt has 81 + 83 = 164 points. He must get 240 – 164 = 76 on the next test.

b. The median is defined as the value in the middle of an ordered list of data. Since both his scores are above an 80, any score will keep his median score at 80 or above; in this case, above.

Lesson 1, Investigation 2, Extensions Task 21 (p. 99)

In the current lesson, students learned that if there is an outlier added to a set of data, it can radically change the mean, however, the median of the same data set is not affected much if at all. Therefore, in mathematics, we say that the median is resistant to outliers. So if the mean is higher than the median, that would suggest that the data might be skewed to the right, and if the mean is less than the median, then the data might be skewed to the left.

a. The fact that the mean is larger than the median suggests that the distribution is skewed to the right (towards the larger numbers).

b. *Hint:* You know the mean enrollment size of the public high schools and the number of public high schools there are. How can you use both of them to find the number of students?

c. **i–ii.** To be completed by the student.

iii. *Hint:* To find the actual percentage of students that are minority, you cannot count each school equally since they have different enrollments. How many students in all the schools are minorities, and how many students are there total? Find the answer to those questions and you will be able to get the actual percentage.

d. No. Note that in Part c, the answer to part ii is different from that in part iii. This question asks for the equivalent of part iii, but you do not have the enrollment numbers and percent minority for each high school building in the United States.

Lesson 2, Investigation 2, Applications Task 3 (p. 130)

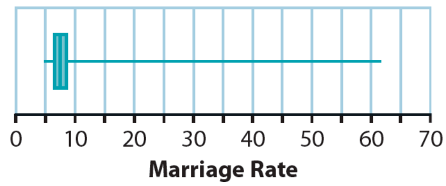
These data are located in *CPMP-Tools* under Statistics, Data Analysis, Data>Unit 2 Patterns in Data> Number of Marriages.

a. Hawaii's marriage rate per 1,000 people is about 22.8. This state is the only one in the bar from 22 up to 23.

b. To be completed by the students.

c. This rate would be much too high (almost one marriage per resident every 13 or so years). There are a lot of people who get married in Nevada, especially in Las Vegas, who are not residents of Nevada.

d. From the histogram, the lower quartile is between 6 and 7; the median is between 7 and 8, and the upper quartile is between 8 and 9. Students' box plots will vary slightly depending on their choice of values in the intervals and whether they show the known outliers.



e. **i.** All but 3 of the 50 states (6%) have a marriage rate less than or equal to 11.4, so Tennessee is in about the 94th percentile.

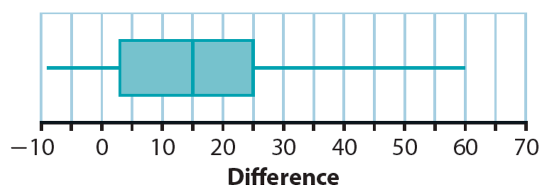
ii. To be completed by the student.

Lesson 2, Investigation 2, Reflections Task 16 (p. 137)

These data are located in *CPMP-Tools* under Statistics, Data Analysis, Unit 2 Patterns in Data> Blood Lead Levels.

a. The differences and box plot appear below.

Differences: –3, –3, 1, –9, 0, 7, –6, 4, 2, 1, 13, 5, 6, 14, 14, 15, 16, 9, 23, 16, 25, 18, 22, 25, 17, 23, 32, 25, 36, 30, 42, 47, 60



b. If the exposure made no difference, the box plot would be centered at 0.

c. Almost all of the values are positive, meaning that a child who had a parent exposed to lead at work tended to have a higher lead level in his or her blood than did a child matched by age and neighborhood.

d–e. To be completed by the student.

Lesson 2, Investigation 2, Review Task 32 (p. 143)

a. 20

b. –10

c. 4

d–f. To be completed by the student.

Lesson 2, Investigation 3, Reflections Task 20 (p. 138)

No. A maximum that is not an outlier would occur in a data set where all values, or the top 25% of the values, are clustered closely together. For example, a maximum that is not an outlier occurs in the box plot of fitness test scores in Reflections Task 17.

Hint: Look at the box plot in Task 19 on page 138 when answering the second question of this task.

Lesson 2, Investigation 3, Extensions Task 25 (p. 140)

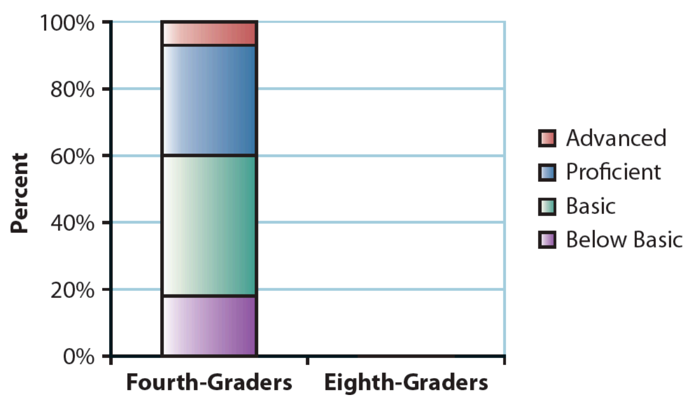
CCSS MATHEMATICAL PRACTICE Extensions Task 25 continues the introduction to categorical data begun in Connections Task 9 of Lesson 1. Students will learn to represent and interpret data on a single count variable. For example, in Part a, the number of 23-year-old males and females who fall into each category was counted. These counts then were changed to percentages. The percentages were represented on a bar graph. Because all possible categories were included and every 23-year-old male or female falls into just one of them, the total of the percentages is 100%.

a. Things generally look worse for 23-year-old men than for women. A slightly larger percentage of men than women are high school dropouts, about 12% compared to just under 10%. At the other extreme, about 23% of women already have a bachelor's degree or more while the percentage for men is only about 14%. About the same percentage of men and women currently are enrolled in college.

Here are the data for Part a, in case your students would like to see the exact percentages.

	High School Dropout	General Educational Development (GED) Recipient, Not Enrolled in College	High School Graduate, Not Enrolled in College	Enrolled in College	Bachelor's Degree or More
Men	11.8	9.3	48.7	15.8	14.3
Women	9.5	6.6	44.1	16.2	23.4

b. The bar for fourth-graders is shown below. Students should create the bar for eighth-graders and write a summary comparing the achievement of the two groups.



Lesson 2, Investigation 3, Review Task 33 (p. 143)

a. A 1% increase would be $\frac{1}{7}$ of 21 customers, or 3 customers.

b–d. To be completed by the student.

Lesson 2, Investigation 4, Applications Task 6 (p. 132)

a. To be completed by the student.

b. The standard deviation or the interquartile range could be used to measure consistency. Which one to select depends on how you want to handle Jordan's outlier in 1986. The interquartile range will be resistant to this outlier. Jordan has a standard deviation of 829 points per year, and Abdul-Jabbar has a standard deviation of 271. Jordan was much less consistent using this measure. And this is not entirely because of his atypical performance in 1986. His interquartile range of 452 is quite a bit larger than Abdul-Jabbar's of 307.

Students learned how to calculate the standard deviation by hand during this unit (see page 120). They found it for small data sets. For a data set this large, students could put the data into lists on their calculator or put it into a spreadsheet on *CPMP-Tools*. Either way, they can find the standard deviation. They can also find the interquartile range on their calculator.

c. To be completed by the student.

Students learned that an outlier can be determined by taking the value and adding 1.5 times the IQR or taking the value and subtracting 1.5 times the IQR. If the value is larger or smaller than the results, it is considered an outlier.

d. To be completed by the student.

Lesson 2, Investigation 4, Connections Task 13 (p. 136)

a. To be completed by the student.

b. The mean is sensitive to the skew and to the outliers and so is larger than at least 30 of the 43 platforms. Thus, it is not a very useful measure of center. Similarly, the standard deviation is sensitive to the skew and the outliers and also is quite large. This shows why the mean and standard deviation are considered appropriate as summary statistics only for approximately normal distributions.

Lesson 2, Investigation 4, Review Task 35 (p. 143)

a. $\frac{2}{5}$

b. $-\frac{5}{3}$

c. $-\frac{3}{4}$

d–f. To be completed by the student.

Lesson 2, Investigation 5, Applications Task 10 (p. 134)

These data are located in *CPMP-Tools* under Statistics, Data Analysis, Unit 2 Patterns in Data>Study Time.

a–c. To be completed by the student.

d. You could multiply each of the hours worked by 20 to get the number of hours each student works per semester and then compute the mean and standard deviation of the semester hours. Alternatively, you could simply multiply the mean and the standard deviation from Part b by 20. The mean is 344 hours per semester, with a standard deviation of about 142 or 143 hours.

e. The mean will increase by 10 hours, to 27.2 hours per week, and the standard deviation will remain unchanged at about 7.1 hours.

Lesson 2, Investigation 5, Connections Task 11 (p. 135)

One standard deviation above *and* one below the mean will capture about $\frac{2}{3}$ of the data when the distribution is approximately normal. Thus, twice the standard deviation will usually be larger than the IQR. The standard deviation in Problem 6 is 11.29, and the IQR is 16. Twice the standard deviation, or about 22.6 in this case, is in fact greater than the IQR of 16.