TOPIC 12

LESSON 12.2a

Tiles, Gumballs, and Pumpkins

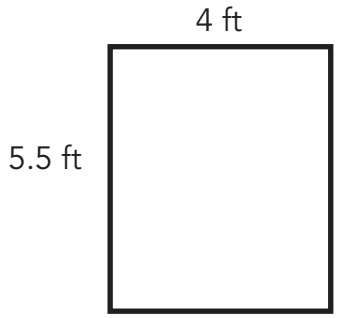
7.SP.1
7.SP.2

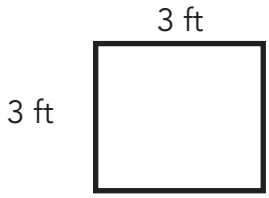
Objective

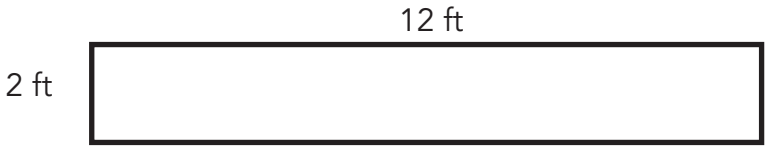
USing Ramdom Samples to Draw Inferences

Warm-Up

Mr. Mario has three bulletin boards in his classroom. What is the average amount of space per bulletin board?

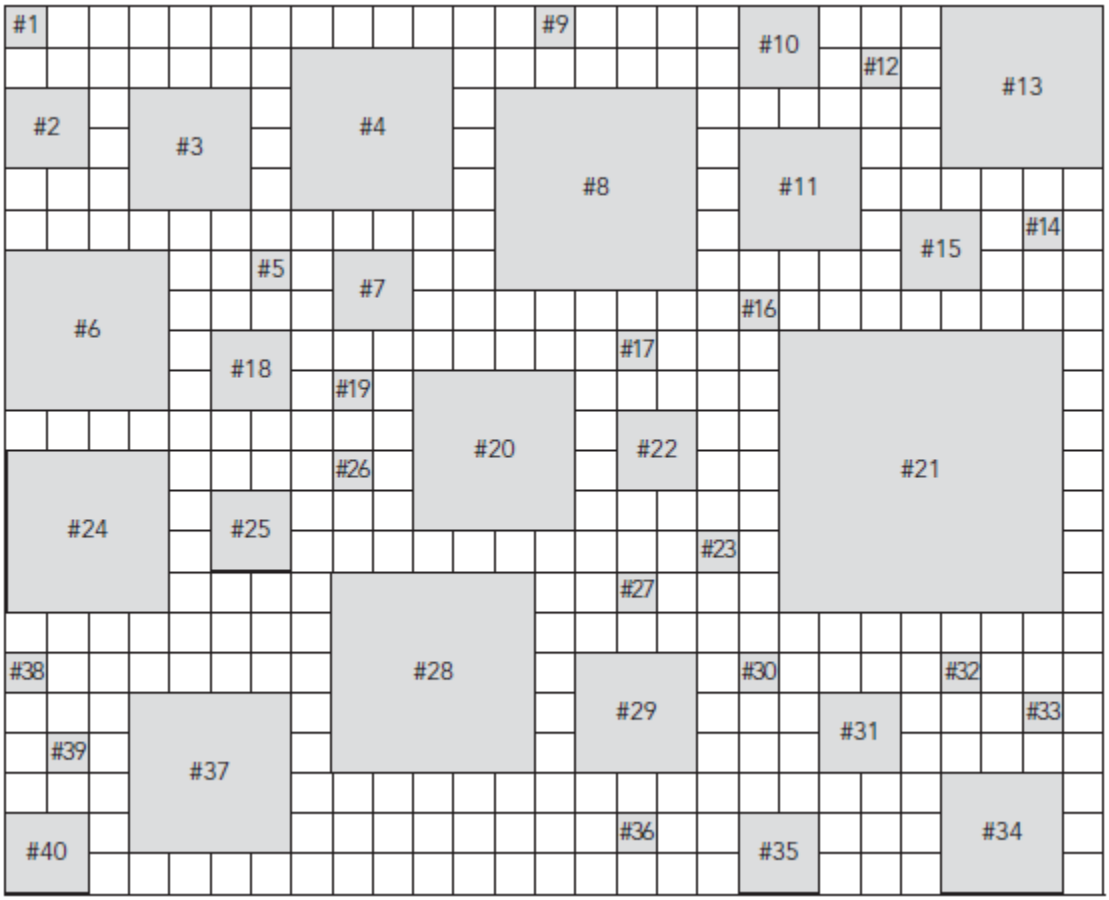






Selecting Squares

The Art Club created a design on the floor of the art room. Each of the 40 numbered squares on the floor will have colored tiles. The club needs to calculate how many colored tiles they must buy. Each small grid square represents a square that is one foot long and one foot wide.



The Art Club needs to complete the art room floor plan project by tomorrow! Because they are short of time, they decide they do not have enough time to measure all 40 squares.

1. Suggest a method for the Art Club to use to sample the 40 squares. What would they do once they collect their sample?

EXPLORE 1

Using Multiple Samples to Make Predictions

Samantha says, "Since we don't have a lot of time, why don't we just select 5 squares and calculate their total area? That should be good enough for us to estimate the total area of all the squares that will need colored tiles."

1. Do you think Samantha's idea could work to estimate the total area for all the squares that need colored tiles? Explain your reasoning.

2. What is the population for this problem?

WORKED EXAMPLE

As you learned, you can select a sample to estimate parameters of a population. In this problem situation, the Art Club is going to set up a ratio using the sample of squares they select to the total area of those sample squares.

They will use the ratio:

number of squares in the sample : total area of the sample squares.

Samantha decides to select the following squares: 1, 15, 21, 37, and 40.

Total area

#1: 1 × 1 = 1 square foot
#15: 2 × 2 = 4 square feet
#21: 7 × 7 = 49 square feet
#37: 4 × 4 = 16 square feet
#40: 2 × 2 = 4 square feet

Ratio

number of squares in the sample : total area of the sample squares

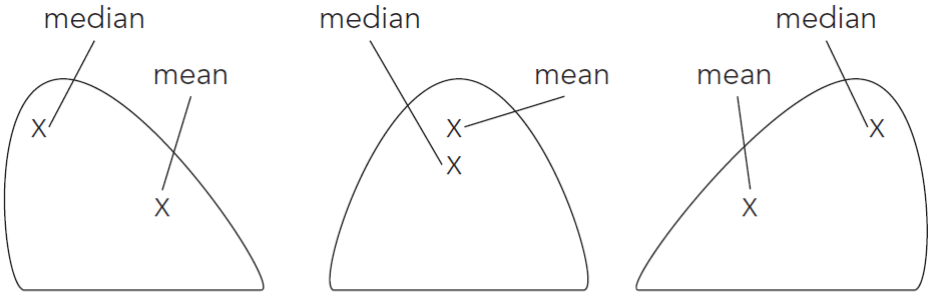
5 squares : 74 square feet

So, the total area of these 5 squares is 74 square feet.

3. Select 5 numbered squares that you think best represent the 40 squares that need colored tiles. Record the numbers of the squares you selected.

4. Calculate the total area of the 5 numbered squares you selected.

Now that you have collected your data, you need to analyze the data. Remember, there are three common distributions of data: skewed left, skewed right, and symmetric. The distribution of data can help you determine whether the mean or median is a better measure of center.
Examine the diagrams shown.



skewed right

The mean of a data set is greater than the median when the data are skewed to the right.

The median is the best measure of center because the median is not affected by very large data values.

symmetric

The mean and median are equal when the data are symmetric.

skewed left

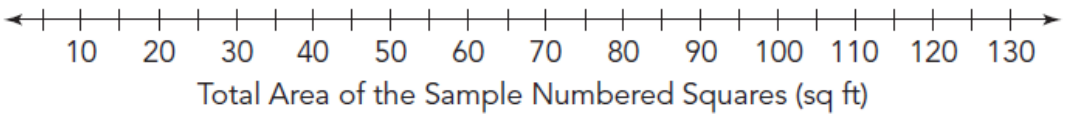
The mean of a data set is less than the median when the data are skewed to the left.

The median is the best measure of center because the median is not affected by very small data values.

The median is not affected by very large or very small data values, but the mean is affected by these large and small values.

5. Compare the total area of your sample to the total areas of your classmates' samples.

a. Record the total area you calculated for your sample on the dot plot shown. Then, record the total areas your classmates calculated on the same dot plot.



b. Describe the distribution of the dot plot.

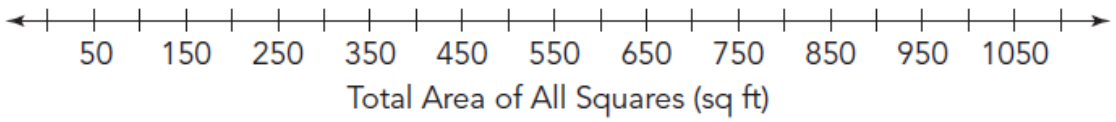
c. Estimate the total area for a sample of 5 squares using the data values in the dot plot.

You can set up a ratio of the sample of 5 squares to the total area of those 5 sample squares, as Samantha did, and then you can set up a proportion to estimate the total area of those 40 squares in the Art Club's floor plan design. In doing so, you are scaling up from your sample to the population of the squares.

6. Write a ratio of the number of squares in your sample to the total area of the squares.

7. Estimate the total area of all 40 squares on the fl oor plan using proportional reasoning.

8. Compare the estimated total area of the 40 squares on the floor plan with your classmates' estimated total areas.
a. Record the estimated total area of the 40 squares on the floor plan on the dot plot shown. Then, record your classmates' estimates of the total area of the 40 squares.



b. Describe the shape of the distribution. Compare with the distribution in Question 5.

c. Estimate the total area of the squares in the floor plan using data values in the dot plot.

EXPLORE 2

Using Random Samples to Make Predictions

Samples chosen by looking at the squares and trying to pick certain squares will probably contain many more of the larger squares in the floor plan. Most of the squares actually have small areas (17 of the 40 squares have an area of 1 square foot, and 10 of the 40 squares have an area of 4 square feet); therefore, you need to use another method to randomly choose squares.

1. How might you randomly choose 5 squares for your sample?

2. Soo Jin has a suggestion on how to randomly select the numbered squares. She says, "I can cut out the squares from the floor plan, and then I can put these squares in a bag. That will help me randomly select squares." Will Soo Jin's method result in a random sample? Explain your reasoning or suggest a way to modify her strategy.

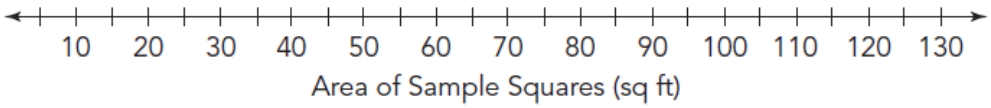
3. How can you use the random number table to choose 5 numbered squares for your sample?

4. Use a random number table to choose 5 numbered squares using two-digit numbers ranging between 01 and 40. Record the square numbers.

5. Calculate the total area of the 5 numbered squares you selected.

6. Compare the total area of your sample to the total areas your classmates calculated from their random samples.

a. Record the total areas your classmates calculated and the total area you calculated on the dot plot shown.

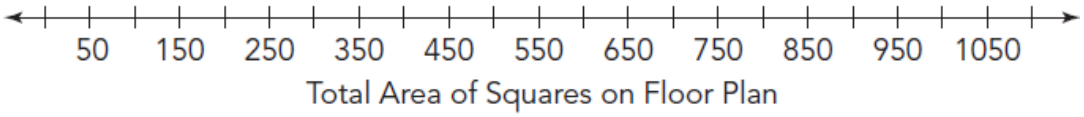


b. How do the values plotted on this dot plot compare to the values plotted in the previous activity? Compare the shapes and the centers of the data values for both dot plots.

7. Using proportional reasoning, estimate the total area of all 40 squares on the fl oor plan using the area you calculated from the random sample.

8. Compare your estimated total area from the random sample for all 40 squares with your classmates' total area estimates.

a. Record your estimated total area of the 40 squares on the dot plot shown. Then, record your classmates' estimates of the total area of the 40 squares on the dot plot.



b. Estimate the total area of the squares in the floor plan using data values in the dot plot.

c. How do the values plotted on this dot plot compare to the values plotted in Activity 2.1, Question 8? Compare the distributions and the centers of the data values for both dot plots.

9. The actual total area of the 40 numbered squares is 288 square feet.

a. Is 288 a parameter or a statistic? Explain your reasoning.

b. Locate 288 on each dot plot you created in the previous activity and this activity. What do you notice?

c. Calculate the percent error for the parameter and your statistics from this activity and the previous activity for the total sum of the areas of the squares.

d. Based on your percent error, which sample is more accurate? Is this what you expected? Explain your reasoning.

Name: _____ Date: _____ Class: _____

Homework HW

LESSON 12.2a

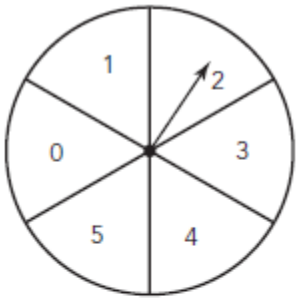
Tiles, Gumballs, and Pumpkins

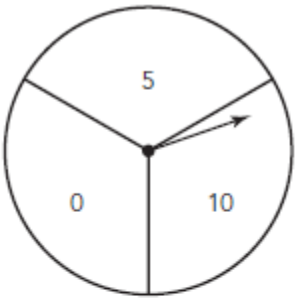
Objective USing Ramdom Samples to Draw Inferences

Review

1. Mike spins each spinner one time. He determines the product of the two numbers.

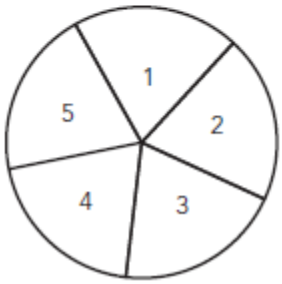
a. Create an array to illustrate the possible products.





b. What is the sample space?

c. Determine P(multiple of 10).



d. Determine P(0).

2. A game requires spinning a spinner numbered 1 through 5 and rolling a six-sided number cube.

a. Determine the possible outcomes for playing the game.

b. What is the probability of spinning an even number and rolling an even number?

c. What is the probability of spinning a 5 or rolling a 5?

3. Evaluate the expression $1.2(x + 0.9) - 10.8$ for each unknown.

a. $x = -5.5$ b. $x = 8.9$