Counting Kernels
(Mean, Median, Mode and Range)

Middle School

Introduction

Everywhere we look we see numbers: speed limit signs, gas prices, temperature for the day, and the population of a city. A set of numbers or numbers comparing more than one thing can take on a different meaning. For example, the average salary of the players on a sports team or the average class score on a math test can have various meanings. Many career fields use mean, median, mode and range to find important information that helps with understanding data and trends. Farming is one career field that uses information to help and predict corn yields in a field. Why do you think it is important for farmers to predict harvest yields?

Background Information

Most of the corn we grow in the U.S. is dent corn (also called field corn). While a small portion of dent corn is used for corn cereal, corn starch, corn oil and corn syrup, dent corn is a grain used mostly for livestock feed and ethanol production. You could cook and eat both sweet corn and dent corn as corn on the cob, but the dent corn won't be as sweet and juicy.

Activity

This activity is designed to reinforce the concept of how to calculate mean, median, mode and range on an ear of field corn. If you have access to multiple ears, you may use them, but for this activity we will provide the data from three ears of corn.

The number of kernels on an ear of corn varies depending on many factors during the growth process. Water, sunlight, soil nutrients, temperature, humidity and other factors are all important as corn is developing. Before beginning the activity have students answer the questions in the Prior to Beginning the Activity section on the worksheet.

Math Review

Mean

Is the average of a data set. You add up all the numbers and divide by the number in the data set. Ex:(3, 5, 2, 7) ...3+5+2+7 = 17....17 divided by 4, Answer is 4.25

Median

Is the middle number in the data set. The numbers have to be listed from least to greatest. The middle number is the median.

- Even example - 2, 3, 5, 7.... Since we have an even number in the data set, take the middle number 3 and 5 add them then divided by 2....3+5 = 8.....8 divided by 2, Answer is 4.
- Odd example - 2, 3, 5, 6, 9 .... Since we have an odd number in the data, take the middle number. The median is then the middle number, Answer is 5.

Mode

The mode is the number that appears the most. In the above examples the mode is 0. In the following data set 2, 4, 4, 5, 9, Answer is 4

Range

The range is the difference (subtraction) between the largest and smallest number. In the data set 2, 4, 4, 5, 9 .... the range is 9-2 = 7, Answer is 7

Materials

- corn data sheet
- pencil
- calculator
- corn worksheet
- Counting Kernals PowerPoint
- Counting Kernels for Calculating Corn Yields Worksheet

Corn Data Sheet					
Corn Cob #1		**Corn Cob #2**		**Corn Cob #3**	
Row Number#	# of Kernels	Row Number#	# of Kernels	Row Number#	# of Kernels
1	29	1	23	1	23
2	28	2	25	2	23
3	30	3	23	3	24
4	29	4	24	4	25
5	28	5	22	5	22
6	29	6	26	6	23
7	31	7	27	7	23
8	35	8	25	8	26
9	30	9	23	9	26
10	31	10	25	10	25
11	30	11	27	11	24
12	31	12	25	12	26
13	30	13	23	13	26
14	28	14	25	14	23
15	29	15	26	15	24
16	29	16	27	16	23
		17	25	17	22
		18	22		

Directions

Use the Corn Worksheet to complete the following. The PowerPoint presentation will assist with this activity.

1. **Mean or Average:** Add up the number of kernels for corn cob #1, then take the total number of kernels in cob #1 and divide by the number of rows. Next, round to the nearest hundredth. Record your answer. Do this for corn cob #2 and corn cob #3 and record your answers.
2. **Median:** List all the numbers in corn cob #1 in order from least to greatest. Find the middle number in the list. If the cob has an even number of rows take the two middle numbers add them together and divide by 2. Do this same for corn cob #2 and corn cob #3.
3. **Mode:** Look at the numbers you listed for the median and find the number that appears the most that is the mode.
4. **Range:** Take the smallest number in corn cob #1 and subtract it from the largest this will get you the range. Do the same for corn cob #2 and corn cob #3.

Supplemental Worksheet

Watch the Counting Kernels video by Bill Johnston and complete the Counting Kernels for Calculating Corn Yields worksheet.

Corn Worksheet

Corn Cob #1		Corn Cob #2		Corn Cob #3	
Total #		Total #		Total #	
Mean		Mean		Mean	
Median		Median		Median	
Mode		Mode		Mode	
Range		Range		Range	

Prior to beginning activity questions:

1. Before you begin this activity, make a prediction regarding how many kernels you think each corn cob has?

2. How could you determine the number of kernels on an ear of corn?

3. How could you calculate the number of kernels in an acre? What would you need to know?

Questions

4. How close was your prediction? Was your number higher or lower?

5. Why is it important for farmers to know how to calculate mean, median, mode and range?

Corn Worksheet

ANSWER KEY

Corn Cob #1		Corn Cob #2		Corn Cob #3	
Total #	477	Total #	443	Total #	408
Mean	29.81	Mean	24.61	Mean	24
Median	29.5	Median	25	Median	24
Mode	29	Mode	25	Mode	23
Range	7	Range	5	Range	4

Prior to beginning activity questions:

1. Before you begin this activity, make a prediction regarding how many kernels you think each corn cob has?
   Varies

2. How could you determine the number of kernels on an ear of corn?
   Count them

3. How could you calculate the number of kernels in an acre? What would you need to know?
   If you knew how many corn plants were in an acre and how many cobs are on each plant, then multiple an average of kernels on each plant by how many in an acre.

Questions

4. How close was your prediction? Was your number higher or lower?
   Varies

5. Why is it important for farmers to know how to calculate mean, median, mode and range?
   They could then predict how many bushels of corn they will have at harvest.

Counting Kernels for Calculating Corn Yields

Points to remember:

- Number of rows and number of kernels are actually counted.
- Number of ears are based on the farmer's setting of the planter and the estimated germination.
- Number of kernels/bushel are based on the farmer's estimate of seed size.
  - The bigger the seed the fewer/bushel

Number of rows*	Number of kernels	Number of ears/acre (in thousands)	Number of kernels/bushel (in thousands)	Answer in bpa
16	43	24	85	
18	35	27	95	
16	32	22	100	
16	41	30	77	

*number of rows are almost always even numbers

Other interesting facts:

- Kansas normally ranks from 5th to 7th among the states in total corn produced.
- Kansas averaged 129 bushels per acre (bpa) in 2018.
- Kansas harvested 645 million total bushels in 2018.
- A bushel of corn weighs 56 pounds.
- A bushel of corn can produce:
  - 2.8 gallons of ethanol
  - Sweeten 400 cans of soda
  - 6 pounds of beef
  - 13 pounds of pork
  - 20 pounds of chicken
  - 28 pounds of catfish

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Number of rows*	Number of kernels	Number of ears/acre (in thousands)	Number of kernels/bushel (in thousands)	Answer in bpa
16	43	24	85	194.3
18	35	27	95	179.1
16	32	22	100	112.6
16	41	30	77	255.6

*number of rows are almost always even numbers

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