Check Point

A multiple choice test has 30 multiple choice questions. There are 4 choices per questions and only 1 correct answer. A student answers each question by randomly guessing. Construct the distribution for the number of correct answers

1. Is this a Binomial Distribution? Explain
2. What would the graph look like if we did the distribution for 100 questions instead?(Hint you do not need to recalculate your answer)
3. Propose a question that would create a uniform distribution.

Standard deviation and means

How many months old are you?

Write down the months old of your classmates in the chart below:

What is the Mode:

 Median:

Mean: is the average $\overbar{x}=\frac{\sum\_{}^{}x}{n}$

Standard deviation: is the extent to which the data are spread from the mean

 Formula for standard deviation of a population $σ=\sqrt{\frac{\sum\_{}^{}\left(x-\overbar{x}\right)^{2}}{n}}$

|  |  |  |  |
| --- | --- | --- | --- |
| Person | Months old | Deviation from the mean | Deviation squared |
| 1 |  |  |  |
| 2 |  |  | Mean:Standard deviation: |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |
| 11 |  |  |  |
| 12 |  |  |  |
| 13 |  |  |  |
| 14 |  |  |  |
| 15 |  |  |  |
| 16 |  |  |  |
| 17 |  |  |  |
| 18 |  |  |  |
| Total: |  |  |  |

What is the Population:

 Sample:

What if we were going to do this of the whole school?

 How do you think the mean would change?

 How would the standard deviation change?

Let’s try this:

How many children are in your family?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # children | Frequency | Deviation from mean | Deviation from mean squared | Deviation from mean squared x frequency |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| Total |  |  |  |  |

Mean:

Standard deviation:

If we considered this a sample from the entire population of Canada then we need to use a different standard deviation formula:

 Sample Standard Deviation: $s=\sqrt{\frac{\sum\_{}^{}\left(x-\overbar{x}\right)^{2}}{n-1}}$

 Why do you think it is n-1?

 Calculate the sample standard deviation:

NOTE: The actual average number of children per family in Canada is 1.1 children!

 Can you have 1.1 children?

Data can be:

 Discrete: this means that the data can only appear in a finite number of values (number of children)

 Continuous: this means that the Data can have an infinite number of values (i.e. age if I did not ask you to round the numbers)

How do you think the spread of the data will affect Standard deviation?

 The data below both have the same mean: 34

 Calculate the standard deviation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Value | Frequency | Deviation from mean | Deviation from mean squared | Deviation from mean squared x frequency |
| 24 | 1 |  |  |  |
| 26 | 2 |  |  |  |
| 28 | 3 |  |  |  |
| 30 | 4 |  |  |  |
| 32 | 7 |  |  |  |
| 34 | 8 |  |  |  |
| 36 | 5 |  |  |  |
| 38 | 4 |  |  |  |
| 40 | 2 |  |  |  |
| 42 | 2 |  |  |  |
| 44 | 2 |  |  |  |
| total |  |  |  |  |

Standard deviation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Value | Frequency | Deviation from mean | Deviation from mean squared | Deviation from mean squared x frequency |
| 28 | 2 |  |  |  |
| 30 | 4 |  |  |  |
| 32 | 9 |  |  |  |
| 34 | 12 |  |  |  |
| 36 | 7 |  |  |  |
| 38 | 4 |  |  |  |
| 40 | 2 |  |  |  |
| Total |  |  |  |  |

Standard deviation:

Now you can use your calculators to calculate the Standard deviation and mean:

1. Without any calculations, determine which set of data is likely to have the greatest standard deviation?

|  |  |
| --- | --- |
| Length | Frequency |
| 14 | 5 |
| 15 | 5 |
| 16 | 5 |
| 17 | 5 |
| 18 | 5 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Length | Frequency

|  |  |
| --- | --- |
| Length | Frequency |
| 14 | 1 |
| 15 | 3 |
| 16 | 18 |
| 17 | 3 |
| 18 | 0 |

 |
| 14 | 2 |
| 15 | 5 |
| 16 | 12 |
| 17 | 5 |
| 18 | 1 |

1. Calculate the mean and standard deviation for each set of data in question 1:
	1. Mean: Standard deviation:
	2. Mean: Standard deviation:
	3. Mean: Standard deviation:
2. Thirty-five randomly selected members of a high school basketball league were asked to make 10 free throws. The rate of success was recorded for each player. The standard deviation was calculated for the group. This process was repeated with 10 randomly selected people at a shopping mall. Which group do you expect would have the greater standard deviation?
3. A soft drink company uses automated devices to fill 355-ml cans of soda pop. The machine must be checked frequently to ensure each can contains 355 ml. In a 30 can sample these volumes, in ml, were found:

 353 351 357 358 352 356 354 352 353 351 353 355 351 353 353 350 356 358 358 354 356 355 355 352 357 354 356 352

a) Calculate the mean:

b) Calculate the sample standard deviation:

c) What problems could arise if the standard deviation got too high?

1. The life time of 30 batteries from each of 2 brands of batteries are given

Duracell

 7.2 6.8 4.6 4.5 6.1 6.3 5.4 4.8 6.8 5.9 4.7 4.0 5.2 8.0 6.2 7.4 4.9 5.6 9.2 3.2 3.0 4.2 5.8 6.5 5.7 4.9 6.0 4.5 5.6 5.0

Energizer

 5.3 6.2 4.9 5.8 5.5 4.6 5.9 3.2 6.5 5.9 4.9 6.4 5.7 5.3 4.8 5.6 6.7 5.5 4.8 5.9 4.8 5.6 6.1 7.4 5.7 6.7 5.8 5.2 5.5 5.8

a) Calculate the mean and standard deviation of each brands battery lifetime.

b) Which brand is better? explain