**S12**

**Confidence Intervals**

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| --- | --- |
| Confidence Level | z-Score |
| 90% | **1.645** |
| 95% | **1.960** |
| 99% | **2.576** |

**The confidence interval**

is the range of possible values of the measured statistics.

**Confidence Level =** probability that the particular statistics (piece of data) is with the range indicated by the margin of error.

* Commonly used confidence levels are 90%, 95% and 99%. These are related to the z-scores of the distribution.

**Margin of Error =** is the range of values that a particular statistics (piece of data) is said to be within. For statistics with probability p, the margin of error is calculated by:

Where z is the z-score,

$$E=z\sqrt{\frac{p(1-p)}{n}}$$

p is the probability,

n is the sample size

and E is the margin of error.

* The greater the sample size, the smaller the margin of error. She smaller the margin of error, the greater the accuracy of the measurement.
* For repeated samples of the same size taken from the same population with a normal distribution, the standard deviation of the sample means is given by:

$$σ\_{\overbar{x}}=\frac{σ}{\sqrt{n}}$$

$$E=z\frac{σ}{\sqrt{n}}$$

and the margin of error is given by:

Example 1:

An opinion poll surveyed 100 households who were watching television at a particular time. Of these, 75% were watching *Hockey Night in Canada.*

1. Determine the margin of error at a 99% confidence level.
2. Determine the confidence interval for this situation.
3. Using a sentence, describe the combined results from a) and b)

Example 2:

A pharmaceutical manufacturer makes more than 500 000 pills of a certain drug each day. The company randomly samples 400 pills daily to check the they meet the proper weight (=mass) and the size standards. On a given day, 52 pills were found to be substandard.

1. What is the margin of error for this sample at a confidence level of 90%?
2. If the company would like to cut the margin of error in half, how would the sample size have to change?

Example 3:

A consumer’s group tested batches of light bulbs to see how long they lasted. The results, in hours, from one batch were 998, 1234, 1523, 1760, 937, 1193, 996, 1002, 986, 1285, 1163, and 1716. The manufacturer claims that the life of the light bulbs is normally distributed with a mean of 1200 hours and a standard deviation of 420 hours.

1. Calculate the mean of the sample and the standard deviation for the sample means.
2. Determine the 99% confidence interval for the sample mean.