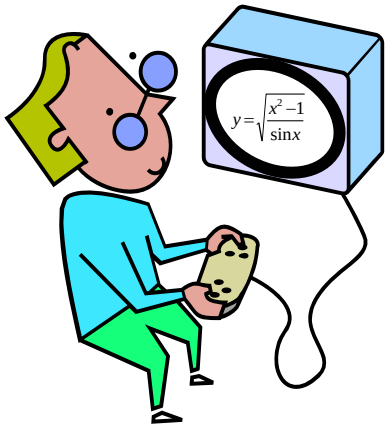
Math ≟ GAMES

Math lovers often say that solving a math problem is a lot like a game: you're faced with a challenge and you have to think up a strategy to deal with it . . . and it's as much fun looking for the answer as finding it!



Note: This activity uses a random sample of Canadian results from the 2006/2007 *Census at School* survey. The question on time use was not included in more recent questionnaires, so you cannot use your class data for this activity.

Are math lovers more likely to be fond of games?

To answer this question, we can analyze *Census at School* data pertaining to the time students spend playing video or computer games and board or card games. (See question #17 of the 2006/2007 Grade 9 to 12 questionnaire at www.censusatschool.ca under "Survey Questions")

We will compare the time spent during one week playing such games:

- by respondents who report that math is their favourite subject
- by those with another favourite subject

Using Canadian data from the 2006/2007 *Census at School* survey, draw up a large random sample of 200 students. Visit www.censusatschool.ca, click on Data and results and under "International results and random data selector", click on "random data selector". At the bottom of the next screen, click on "Choose data", select "Canada" and then "Phase Four Secondary (06/07)".

Then sort the dataset by age to select a sample of students of the same age.

Split the sample into two groups: students who declare that math is their favourite subject and students who prefer another subject. For each group:

- Begin by calculating the **mean time** spent playing games. (Include video or computer games **and** board or card games.)
- Then examine the distribution of time spent playing games by creating a **histogram**.
  - How do you decide on the size of the histogram's **classes or groups?**
  - What extra information about the **mean time** does the **histogram** provide?
- Determine the different **quartiles**.
- Calculate the **standard deviation** of time spent playing games.

What relationships can you establish:

- Between the **histogram** and the **quartiles**?
- Between the **histogram** and the **standard deviation**?

Do you observe a **significant** difference between the two groups? Can the differences between the groups (for mean time, quartiles, standard deviation and histogram) solely be attributed to **randomness?**

Does the difference appear to be greater for one of the two game categories (video and computer games or board and card games)?

Can you conclude that:

- Those who like math play games more often?
- Those who like math may be more likely to play games than those who don't?
- Playing games can lead to liking math?

Explain your reasoning for each of these hypotheses.

Definitions

Random sample: Probability (or random) sampling involves the selection of a sample from a population, based on the principle of randomization or chance. See also: http://www.statcan.ca/english/edu/power/ch13/probability/probability.htm

Mean time: Sum of all time values observed, divided by the number of observations.

Histogram: The histogram is used to summarize discrete or continuous data that are measured on an interval scale. A histogram divides the range of possible values in a data set into classes or groups. For each group, a rectangle is constructed with a base length equal to the range of values in that specific group, and a height proportional to the number of observations falling into that group. A histogram has an appearance similar to a vertical bar graph, but when the variables are continuous, there are no gaps between the bars. When the variables are discrete, however, gaps should be left between the bars. See also: http://www.statcan.ca/english/edu/power/ch9/histograms/histo.htm

Quartiles: The median divides the data into two equal sets.

- The lower quartile (given the notation Q_1) is the value of the middle of the first set, where 25% of the values are smaller than Q_1 and 75% are larger.
- The upper quartile (given the notation Q_3) is the value of the middle of the second set, where 75% of the values are smaller than Q_3 and 25% are larger..

The median (given the notation $Q_{2)}$ is the second quartile.
See also: http://www.statcan.ca/english/edu/power/ch12/range.htm

Standard deviation: The variance (symbolized by $\mathbf{S^2}$) and standard deviation (the square root of the variance, symbolized by **S**) are the most commonly used measures of spread. The variance for a discrete variable made up of **n** observations is defined as:

$$S^2 = \frac{\sum (x - \overline{x})^2}{n}$$

The standard deviation for a discrete variable made up of **n** observations is the positive square root of the variance and is defined as:

$$S = \sqrt{\frac{\sum (x - \overline{x})^2}{n}}$$

See also: http://www.statcan.ca/english/edu/power/ch12/variance.htm

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