# New Development of Statistical Education in the Secondary- Level Education in Japan

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## 1. Introduction

The Ministry of Education has decided to introduce a system of five working days a week in the elementary and middle schools in academic year 2002 and reduce the total number of school hours in each grade by 30 per cent. The Ministry accordingly revised the guidelines for courses of study that are applied to elementary, middle and high schools level education. The revised guidelines are to be implemented starting from academic year 2002.

The paper describes main features of the new guidelines with special reference to statistical education in the curriculum of mathematics in the secondary-level school education and discusses the problems.

## 2. Teaching of statistics in the curriculum of mathematics in the middle school

In the existing guideline of courses of study, statistical education in mathematics starts at Grade 2. Statistics-related subjects appear in “Handling of data” at Grade 2 and “Probability and sample surveys” at Grade 3.

However, in the new guideline, “Handling of data” and “Sample surveys” are removed and moved to the high school, and “Probability” is moved from Grade 3 to Grade 2. So the teaching of statistics closely related to our daily life will completely disappear in the curriculum of middle school mathematics.

## 3. Teaching of statistics in the curriculum of mathematics in the high school

In the current guideline, mathematics in the high school consists of six subjects: Math I, Math II, Math III, Math A, Math B and Math C each having three or four sections. Only Math I with 4 sections is compulsory, and other 5 subjects are optional. For each of Math A, B and C, students can choose 2 sections to learn out of 4 sections. Probability and statistics related subjects appear in Math I, B and C. Math I has a section on probability, Math B has a section on probability distribution, and Math C has a section on statistical processing, including normal distribution and statistical inference. That is, probability is a compulsory subject for all students, but other statistics related topics are optional.

According to the revised guideline, mathematics in the high school follows the similar scheme, but the addition of a new subject: Math Basic. Topics contained in Math I, Math II, Math III, Math A, Math B and Math C are rearranged and simplified. All students will have to take either or both of Math Basic and Math I. Other subjects are optional.

In the new guideline, Math I, II and III will be more calculus-oriented. Probability will be moved from Math I to Math A and a new section “Statistics and computers” will appear in Math B. Probability distribution and conditional probability currently in Math B will be moved to Math C, and statistical processing will continue to remain in Math C.

“Handling of data” and “Sample surveys” eliminated from middle school mathematics will be treated in a section on “Statistics in daily life” in Math Basic to be newly created.

The table below gives a comparison of topics covered in high school mathematics in current and revised guidelines.

*Table. A comparison of topics in high school mathematics in current and new guidelines*

| Existing guideline implemented in 1991 | New guideline to be implemented in 2002 |
|---|---|
| | Math Basic (2 units covering all 3 sections)<br>(1) Mathematics and human activities<br>(2) Mathematical thinking in daily life<br>(3) Statistics in daily life |
| Math I (4 units)<br>(1) Quadratic functions<br>(2) Geometric figures and measuring<br>(3) Handling the number of articles<br>(4) Probability | Math I (3 units)<br>(1) Equations and inequalities<br>(2) Quadratic functions<br>(3) Geometric figures and measuring |
| Math II (3 units)<br>(1) Various functions<br>(2) Geometric figures and functions<br>(3) Variations of values of functions | Math II (4 units)<br>(1) Formulae and proofs<br>(2) Geometric figures and functions<br>(3) Various functions<br>(4) Concepts of differentiation and integration |
| Math III (3 units)<br>(1) Functions and limits<br>(2) Differential calculus<br>(3) Integral calculus | Math III (3 units)<br>(1) Limits<br>(2) Differentiation<br>(3) Integration |
| Math A (2 units out of 4)<br>(1) Numbers and formulae<br>(2) Plane geometry<br>(3) Series<br>(4) Computing and computers | Math A (2 units covering all three sections)<br>(1) Plane figures<br>(2) Sets and logic<br>(3) Number of cases and probability |
| Math B (2 units out of 4)<br>(1) Vectors<br>(2) Complex number and complex plane<br>(3) Prob. distribution and conditional probability<br>(4) Algorithm and computer | Math B (2 units out of 4)<br>(1) Series<br>(2) Vectors<br>(3) Statistics and computers<br>(4) Numerical calculation and computers |
| Math C (2 units out of 4)<br>(1) Matrix and linear calculation<br>(2) Various curves<br>(3) Numerical calculation<br>(4) Statistical processing | Math C (2 units out of 4)<br>(1) Matrix and its applications<br>(2) Formulae and curves<br>(3) Probability distribution<br>(4) Statistical processing |

## 4. Problems

In the new curriculum of mathematics as a whole, both the coverage of topics and the number of hours will be reduced in the secondary-level education, and some topics will be moved from the middle school to the high school. Probability and statistics related subjects would inevitably be affected by the revision.

As far as probability and statistics related subjects are concerned, all topics currently included in the middle and high school mathematics will be included somewhere in the revised guideline in a rearranged manner. However, all of these will be treated as optional subjects. Therefore, whether the statistical education will become better or worse depends on how the new guideline would be implemented in practice.