

## **Mathematics X - programme subject in programmes for Specialization in General Studies**

Dette er en oversettelse av den fastsatte læreplanteksten. Læreplanen er fastsatt på Bokmål

Laid down as a regulation by the Norwegian Directorate for Education and Training on 22 May 2006 as delegated in a letter of 26 September 2005 from the Ministry of Education and Research pursuant to the Act of 17 July 1998 no. 61 relating to primary and secondary education (Education Act) Section 3-4 first paragraph.

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## **Purpose**

Mathematics is a subject that plays a key role in our modern civilization, as a tool to understand and function in society and as bearer of a tradition with roots in many of the world's ancient cultures. Mathematics is used to investigate the universe, systematize experiences and describe and understand natural and social relations. The pleasure obtained from working with the subject has in itself been a source of inspiration for mankind's development of mathematics.

The programme subject shall give an introduction to numbers theory, complex numbers, and probability and statistics. It shall demonstrate how the interaction between mathematical subjects and applied problems is mutually beneficial. In addition, the programme subject shall link the historical development of the respective mathematical subjects to different cultures.

One of the main purposes of the programme subject is to explore classic maths subjects and their application. Teaching in the programme subject shall be organized so as to develop the pupils' abilities in creative thinking, systematic experimentation, logical reasoning, critical evaluation and discussion.

## **Structure**

Mathematics X builds on mathematics 1T and is organized especially for Vg2 pupils who opt for mathematics R1.

The subject is structured into main subject areas, for which competence aims have been formulated. The main subject areas complement each other, and should be viewed in relation to one another.

### **Overview of the main subject areas:**

<b>Programme subject</b>	<b>Main subject areas</b>		
Mathematics X	Numbers theory	Complex numbers	Probability and statistics

## **Main subject areas**

### **Numbers theory**

The main subject area deals with prime numbers, divisibility and congruence. It involves analysis of the basic characteristics of whole numbers, with particular emphasis on modern applications in encryption and error recovery codes.

## Complex numbers

The main subject area deals with complex numbers, which extends the numerical concept from real numbers. This extension simplifies a number of calculations and is used in geometry and in the modelling of variations. Different representations of complex numbers, arithmetical operations, trigonometrical formulae and complex numbers as solutions to equations are central topics in the main subject area.

## Probability and statistics

The main subject area deals with the use of probability theory to describe and analyze random variations and systematic trends in a number of practical situations. Fundamental concepts in this main subject area are stochastic variables, expectation, variance and standard deviation, normal distribution and the central limit theorem.

## Teaching hours

Teaching hours are given in 60-minute units.

Mathematics X: 84 teaching hours per year

## Basic skills

Basic skills are integrated into the competence aims for this course in areas where they contribute to the development of and are part of the subject competence. In the Mathematics X programme subject, basic skills are understood as follows:

*Being able to express oneself orally and in writing* in Mathematics X involves the ability to formulate logical arguments, explain a mode of thought and articulate findings, concepts and hypotheses. It means posing questions, participating in talks and discussions of mathematical situations and problems, and presenting a reasoned argument for one's own proposed solution. It also means being able to formulate a mathematical proof in longhand with correct mathematical notation and logically valid conclusions, as well as writing mathematical symbols and expressions and setting up or drawing tables, diagrams, graphs and geometrical figures.

*Being able to read* in Mathematics X sciences involves the ability to extract relevant mathematical information out of written text. It means understanding mathematical symbols and logical reasoning. It also means being able to understand and interpret organized visual information such as tables, diagrams, graphs and geometric figures.

*Numeracy* is the most basic skill in mathematics. In Mathematics X this involves having confidence in applying various arithmetical operations without the use of digital tools. It also means making appropriate estimates and assessing the likelihood of a solution.

*Being able to use digital tools* in Mathematics X involves using digital tools for comprehensive computations and visualization. This means obtaining, processing and presenting mathematical information in electronic form. It also means evaluating the suitability, potential and limitations of the digital tool.

## Competence aims

### Mathematics X

#### Numbers theory

*The aims of the studies are to enable pupils to*

- reproduce Euclid's proof that there are infinitely many primes, use the Sieve of Eratosthenes to find prime numbers, and give an account of Fermat numbers and Mersenne numbers in the historical search for primes
- apply congruence arithmetic to analyze divisibility, solve linear congruence equations and determine whether simple diophantic equations have solutions
- give an account of practical applications of congruence arithmetic in encryption and error-correcting codes
- plan, execute and present an independent piece of research into a subject linked to the main subject area

#### Complex numbers

*The aims of the studies are to enable pupils to*

- use the four basic arithmetical operations, extraction of roots, absolute values and the conjugation rules for complex numbers, with and without digital tools
- use geometric representation of complex numbers, calculate with complex numbers in trigonometrical and apply de Moivre's formula
- find complex  $n$ th roots and solve linear and quadratic equations with complex coefficients
- give an account of and present the main elements in the history of complex numbers from the Renaissance to Caspar Wessel
- give an account of and present a self-selected subject linked to the application of complex number theory

## Probability and statistics

*The aims of the studies are to enable pupils to*

- give an account of the concepts of distribution and stochastic variables for finite probabilities, and find expectation, variance and standard deviation for a stochastic variable
- give an account of the significance of the normal distributions and calculate the probabilities linked to them
- apply the central limit theorem to work out probabilities for sums of independent stochastic variables and binomial distributions
- plan, execute and present an assignment linked to statistical applications of probability calculations in hypothesis testing and sample surveys

## Assessment

### Mathematics X for the natural sciences

Provisions for final assessment:

#### *Overall achievement grades*

Programme subject	Provision
Mathematics X	The pupils shall have an overall achievement mark.

#### *Examination for pupils*

Programme subject	Provision
Mathematics X	The pupils may be selected for an oral exam. The oral exam is prepared and marked locally.

#### *Examination for external candidates*

Programme subject	Provision
Mathematics X	The external candidates shall sit for an oral exam. The oral exam is prepared and marked locally.

The provisions for assessment are stipulated in the regulations of the Norwegian Education Act.