

# What is Computer Science and What do People Do Once They Know It?

## What Is Computer Science?

Computer science develops students' computational and critical thinking skills and shows them how to create, not simply use, new technologies. This fundamental knowledge is needed to prepare students for the 21st century, regardless of their ultimate field of study or occupation.

Additional Background: Computer science education encompasses “the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society.” A few of the topics and activities that might be included in a computer science course include:

- Algorithmic problem-solving
- Computing and data analysis (managing, processing, visualizing and interpreting data)
- Human-computer interaction
- Modeling and simulating real-world problems
- Creating and manipulating graphics
- Programming (including game design)
- Security (including cryptography)
- Web design (illustrating principles of programming, human-computer interaction and abstraction)
- Robotics (designing and programming)
- Ethical and social issues in computing

*Foundational computer science courses in K-12 teach the fundamental concepts of computing, much like a physics course teaches fundamental concepts around the laws of motion and energy. The new AP computer science course under development focuses around seven big ideas at the core of computer science—creativity, abstraction, data, algorithms, programming, Internet and impact—that are fundamental to computer science, but applicable to analysis in many disciplines.*

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## How is Computer Science Used in Various Careers?

Computer science develops students' computational and critical thinking skills and shows them how to create, not simply use, new technologies. This fundamental knowledge is needed to prepare students for the 21st century, regardless of their ultimate field of study or occupation.

*Additional Background:* In the 21st century, information technology is permeating many aspects of daily life and big data, software, and the Internet are being integrated into businesses and products throughout society. The knowledge and skills learned from studying computer science prepare students for careers in a variety of sectors. Examples include:

- In information technology—designing security software and hardware systems or developing mobile communication devices, networks and applications.
- In manufacturing—designing and using simulations to improve products. What is Computer Science and What do People Do Once They Know It?
- In healthcare—exploring the vast quantities of data produced by new DNA sequencing techniques, developing new remote monitoring systems for patients, or designing security and privacy for medical records.
- In retail—analyzing data to predict trends and improve inventory management.
- In weather forecasting—developing and interpreting models that predict the behavior of hurricanes.
- In the arts—designing new special effects for movies or composing digital music.
- In financial services—designing and overseeing automated trading services.

The breadth of ways in which computing knowledge prepares people for multiple careers is borne out by looking at the people working in computing occupations by sector. *In fact, over 70 percent of computing occupations are outside of the information technology industry:* 9 percent are in information services, 12 percent are in financial services, 36 percent are in professional and business services, 7 percent are in government and public education services, and 12 percent are in manufacturing. The College Board states studying AP Computer Science can open the pathway to 130 career areas and 48 college majors.

Conversely, even those whose majors were not in computing often move later into occupations focused in these areas; of the 2.2 million workers in computer and math occupations in 2009, 35 percent had computing or math-related degrees, 27 percent had degrees in other STEM fields, and 39 percent had non-STEM degrees.

Finally, an understanding of the core principles of computer science is key even for jobs not directly focused on computing skills--a June 2011 McKinsey Global Institute report predicts a shortfall of 1.5 million “data-savvy” manager and analysts by 2018.

For more information on computing careers see: <http://computingcareers.acm.org>