

## 1.10 Problem solving

Students  
Section 1.11 is a part of 1 assignment: CSC108 CH01 PA  
 This assignment's due date has passed. Activity will still be recorded, but will not count towards this assignment (unless the due date is changed). See this article for more info.

Includes: 0 PA  
Due 01/30/2025, 11:59 PM EST

## 1.11 Why programming

## Computing careers

While careers in law, medicine, and engineering have existed for hundreds of years, computers are relatively new so careers in computing are new too. Today, computing jobs are often ranked among the best jobs, in terms of opportunity, salary, work-life balance, job security, job satisfaction, work conditions, etc. Nearly all computing jobs require some training in programming; some jobs then focus on programming, while others instead focus on related aspects.

In a 2022 ranking (below), the top job is information security analyst (in the field of cybersecurity) and software developer is #5. Note: Rankings from different sources vary greatly; some have more engineers, human resources managers, data scientists, marketing, etc. Also, the specific ordering in a ranking is not usually substantial (like rank #2 vs. #5), and rankings change every year. However, note that most rankings consistently have several computing jobs in the top tier.

Table 1.11.1: Best jobs of 2022, per U.S. News and World Report.

The rankings are based on growth potential, work-life balance, and salary.

Ranking	Occupation	Description
1	Information Security Analyst	Carries out security measures to protect company networks.
2-4	Nurse Practitioner, Physician's Assistant, Medical and Health Services Manager	
5	Software Developer	Designs computer programs, combining creativity and technical know-how, often working in teams.
6	Data Scientist	
7-12	Financial Manager, Statistician, Lawyer, Speech-Language Pathologist, Physician, Registered Nurse	
13	IT Manager	Coordinate computer related activities for a company or organization.

Source: [U.S. News and World Report](#) (includes links to expanded descriptions), 2022.

Feedback?

PARTICIPATION ACTIVITY | 1.11.1: Computing jobs are often ranked among the best jobs.

- 1) What factor was used to rank the best jobs?
  - Salary
  - Job security
  - Multiple factors were considered
- 2) Software developers spend nearly all their time alone at a computer.
  - True
  - False
- 3) Interestingly, the above list is dominated by jobs in what two general areas?
  - Computing and healthcare
  - Computing and manufacturing

Feedback?

## Types of computing jobs

Table 1.11.2: Computing jobs.

A wide variety of computing jobs exist.

Occupation	Job Summary	Entry-level education	2021 median pay
Computer and Information Research Scientists	Computer and information research scientists invent and design new approaches to computing technology and find innovative uses for existing technology. They study and solve complex problems in computing for business, medicine, science, and other fields.	Master's degree	\$131,490
Computer Network Architects	Computer network architects design and build data communication networks, including local area networks (LANs), wide area networks (WANs), and intranets. These networks range from a small connection between two offices to a multinational series of globally distributed communications systems.	Bachelor's degree	\$120,520
Computer Programmers	Computer programmers write code to create software programs. They turn the program designs created by software developers and engineers into instructions that a computer can follow.	Bachelor's degree	\$93,000
Computer Support Specialists	Computer support specialists provide help and advice to people and organizations using computer software or equipment. Some, called computer network support specialists, support information technology (IT) employees within their organization. Others, called computer user support specialists, assist non-IT users who are having computer problems.	Varies: High-school degree and higher	\$57,910
Computer Systems Analysts	Computer systems analysts study an organization's current computer systems and procedures and design information systems solutions to help the organization operate more efficiently and effectively. They bring business and information technology (IT) together by understanding the needs and limitations of both.	Bachelor's degree	\$99,270
Database Administrators	Database administrators (DBAs) use specialized software to store and organize data, such as financial information and customer shipping records. They make sure that data are available to users and are secure from unauthorized access.	Bachelor's degree	\$101,000
Information Security Analysts	Information security analysts plan and carry out security measures to protect an organization's computer networks and systems. Their responsibilities are continually expanding as the number of cyberattacks increase.	Bachelor's degree	\$102,600
Network and Computer Systems Administrators	Computer networks are critical parts of almost every organization. Network and computer systems administrators are responsible for the day-to-day operation of these networks.	Bachelor's degree	\$80,600
Software Developers	Software developers are the creative minds behind computer programs. Some develop the applications that allow people to do specific tasks on a computer or other device. Others develop the underlying systems that run the devices or control networks.	Bachelor's degree	\$109,020
Web Developers	Web developers design and create websites. They are responsible for the look of the site. They are also responsible for the site's technical aspects, such as performance and capacity, which are measures of a website's speed and how much traffic the site can handle. They also may create content for the site.	Associate's degree	\$78,300

Source: [BLS.gov](#) (includes links to detailed descriptions and outlooks for each occupation).

Feedback?

PARTICIPATION ACTIVITY | 1.11.2: Computing jobs.

Refer to the above BLS table of computing jobs.

How to use this tool ▾

[Software developers](#) [Web developers](#) [Computer systems analysts](#) [Information security analysts](#)[Computer support specialists](#) [Computer programmers](#)

Likely requires both a strong knowledge of computer technology, and excellent interpersonal skills due to dealing with non-technical users.

Create, design, and program software.

Help write programs created by software developers.

Help organizations use computing technology to operate effectively. Requires strong combination of business and computing technology knowledge.

Focus on protecting an organization's computers and data. Increasingly important as "hackers" continue to steal huge amounts of data, as widely-publicized in recent years.

Build websites, which may involve the look/feel, the content, the performance of the site, and more.

Reset

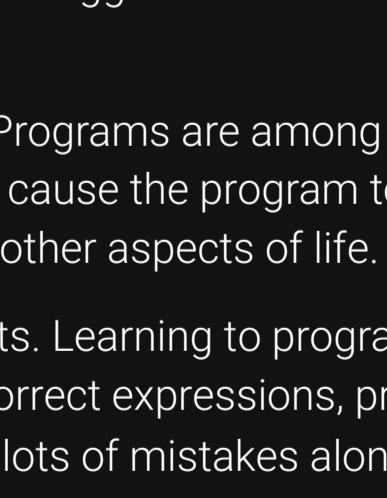
Feedback?

For many non-computing jobs (dentist, attorney, nurse, business, etc.), computer usage is high, and thus knowledge of computing technology can yield strong advantages even for people not in a computing career.

## Programming and non-computing jobs

Many people in non-computing jobs find that knowing some programming can benefit their careers. Some examples:

- Kelly majored in chemistry and now works as a scientist in a pharmaceutical company. Kelly helps analyze clinical trials. Her company uses commercial statistical software, but she found that writing small custom programs yielded even better analyses. Her co-workers now come to her for help. She is glad she took a required programming class in college, though at the time she wasn't as happy about it.
- Paul majored in civil engineering and now authors technical content for a large company. Paul noticed that several authoring tasks done in Google Docs by the in-house 25-person authoring team could be automated. Building on the programming he learned in a required college course, Paul spent several hours online learning about Google Docs' add-on programming, and wrote two small add-ons. His add-on programs have become part of the standard authoring process for the entire team, who frequently thank Paul for saving them time and relieving them of tedious tasks.
- Eva majored in business and got a job in sales operations of a Silicon Valley startup company. Building on the C++ programming he learned from a college course, he started tinkering with writing database query programs using "SQL", and discovered he had a knack for it. His job duties have expanded to include running database reports, and he has automated dozens of reports via programming, helping people throughout the company be more productive.
- Eva (pictured here) majored in environmental science. She voluntarily took a programming course in college believing the knowledge/skills could be important to her. She took a job at a startup company doing various marketing tasks. She began to manage the company's website, and realized that a few small programs could make the web pages dynamic and interactive. She wrote the code herself, which was reviewed and approved by the engineering team and became part of the company's live website. She plans on getting a graduate degree in environmental science and expects programming will be useful in her research.



PARTICIPATION ACTIVITY | 1.11.3: Programming in non-computing jobs.

Consider the examples above.

- 1) Kelly voluntarily took a programming course in college.

- True
- False

- 2) Ethan learned SQL programming in a college course and now applies SQL programming in his job.

- True
- False

- 3) Eva voluntarily took a programming class in college.

- True
- False

Feedback?

## Precision, logic, and computational thinking

Many people find that programming encourages precise, logical thought that can lead to better writing and speaking, clearer processes, and more. The thought processes needed to build correct, precise, logical programs is sometimes called **computational thinking** and has benefits beyond programming.

PARTICIPATION ACTIVITY | 1.11.4: Learning programming tends to aid in precise, logical thought aspects of computational thinking.

Start  2x speed

Travel policies for the conference

Workers will be painting offices on Monday. The painters will have ID tags. They are white and brown.

People within 50 miles must drive. People under 25 miles may take a taxi. People over 300 miles may fly.

Inform the contractors of special requests.

Programmers use variables each with one unique name

Painters will be painting offices on Monday. The painters will have ID tags. The ID tags are white and brown. Inform the painters of special requests.

Help organizations use computing technology to operate effectively. Requires strong combination of business and computing technology knowledge.

Focus on protecting an organization's computers and data. Increasingly important as "hackers" continue to steal huge amounts of data, as widely-publicized in recent years.

Build websites, which may involve the look/feel, the content, the performance of the site, and more.

Reset

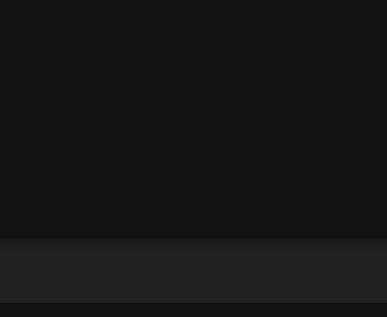
Feedback?

For many non-computing jobs (dentist, attorney, nurse, business, etc.), computer usage is high, and thus knowledge of computing technology can yield strong advantages even for people not in a computing career.

Programming and non-computing jobs

Many people in non-computing jobs find that knowing some programming can benefit their careers. Some examples:

- Kelly majored in chemistry and now works as a scientist in a pharmaceutical company. Kelly helps analyze clinical trials. Her company uses commercial statistical software, but she found that writing small custom programs yielded even better analyses. Her co-workers now come to her for help. She is glad she took a required programming class in college, though at the time she wasn't as happy about it.



- Paul majored in civil engineering and now authors technical content for a large company. Paul noticed that several authoring tasks done in Google Docs by the in-house 25-person authoring team could be automated. Building on the programming he learned in a required college course, Paul spent several hours online learning about Google Docs' add-on programming, and wrote two small add-ons. His add-on programs have become part of the standard authoring process for the entire team, who frequently thank Paul for saving them time and relieving them of tedious tasks.

- Eva (pictured here) majored in environmental science. She voluntarily took a programming course in college believing the knowledge/skills could be important to her. She took a job at a startup company doing various marketing tasks. She began to manage the company's website, and realized that a few small programs could make the web pages dynamic and interactive. She wrote the code herself, which was reviewed and approved by the engineering team and became part of the company's live website. She plans on getting a graduate degree in environmental science and expects programming will be useful in her research.

PARTICIPATION ACTIVITY | 1.11.3: Programming in non-computing jobs.

Consider the examples above.

- 1) Kelly voluntarily took a programming course in college.

- True
- False

- 2) Ethan learned SQL programming in a college course and now applies SQL programming in his job.

- True
- False

- 3) Eva voluntarily took a programming class in college.

- True
- False

Feedback?

For many non-computing jobs (dentist, attorney, nurse, business, etc.), computer usage is high, and thus knowledge of computing technology can yield strong advantages even for people not in a computing career.

Programming and non-computing jobs

Many people in non-computing jobs find that knowing some programming can benefit their careers. Some examples:

- Kelly majored in chemistry and now works as a scientist in a pharmaceutical company. Kelly helps analyze clinical trials. Her company uses commercial statistical software, but she found that writing small custom programs yielded even better analyses. Her co-workers now come to her for help. She is glad she took a required programming class in college, though at the time she wasn't as happy about it.



- Paul majored in civil engineering and now authors technical content for a large company. Paul noticed that several authoring tasks done in Google Docs by the in-house 25-person authoring team could be automated. Building on the programming he learned in a required college course, Paul spent several hours online learning about Google Docs' add-on programming, and wrote two small add-ons. His add-on programs have become part of the standard authoring process for the entire team, who frequently thank Paul for saving them time and relieving them of tedious tasks.

- Eva (pictured here) majored in environmental science. She voluntarily took a programming course in college believing the knowledge/skills could be important to her. She took a job at a startup company doing various marketing tasks. She began to manage the company's website, and realized that a few small programs could make the web pages dynamic and interactive. She wrote the code herself, which was reviewed and approved by the engineering team and became part of the company's live website. She plans on getting a graduate degree in environmental science and expects programming will be useful in her research.

PARTICIPATION ACTIVITY | 1.11.4: Learning programming tends to aid in precise, logical thought aspects of computational thinking.

Start  2x speed

Travel policies for the conference

Workers will be painting offices on Monday. The painters will have ID tags.

People within 50 miles must drive.

They are white and brown.

People under 25 miles may take a taxi.

Inform the contractors of special requests.

People over 300 miles may fly.

Programmers use variables each with one unique name

Painters will be painting offices on Monday. The painters will have ID tags. The ID tags are white and brown. Inform the painters of special requests.

If distance &lt; 25 miles

Options are drive or taxi

Else if distance &gt; 25 and &lt; 300 miles

Only option is drive

Else if distance &gt; 30