Computer programmer 18251

Technology, Computer

Computer programmers held about 568, 000 jobs in 1996. Programmers are employed in almost every industry but the largest amount is in the computer and data processing industry that includes companies that write and sell software. Allot of programmers can also be found working for companies that provide engineering and management services, manufacturers of computer and office equipment, financial institutions, insurance carriers, educational institutions, and government agencies.

A growing number of computer programmers are employed on a temporary, a contract basis, or work as independent workers because allot of companies demand expertise with newer programming languages or more specialized areas of application. Rather than hiring programmers as permanent employees and then laying them off after a job is completed, employers can contract with temporary help agencies, consulting firms, or directly with programmers themselves. A marketing company may only need the services of several programmers to write and debug the software necessary to get a new database management system running. This practice also enables companies to bring in people with a specific set of skills. Bringing in an independent contractor with a certain level of experience in a new or advanced programming language enables an establishment to complete a particular job without having to retrain their workers. Such jobs may last anywhere from several weeks to a year or longer. There were 20, 000 self-employed computer programmers in 1996 and this number is expected to increase.

Programmers usually work in offices. Although they usually work about 40 hours a week, programmers may work longer hours or weekends in order to

meet deadlines or fix critical problems that occur during off hours. Programmers can access a system directly, but from remote locations, to make corrections or fix problems. Like other workers that spend a long time in front of a computer terminal typing at a keyboard, they are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome or cumulative trauma disorder.

Computer programs tell the computer what to do such as which information to identify and access, how to process it, and what equipment to use. Programs vary widely depending on the type of information to be accessed. Although simple programs can be written in a few hours, programs that use complex mathematical formulas or that draw data from many existing systems, require more than a year of work. Allot of programmers work together as a team under a senior programmer's supervision.

Programmers write specific programs by breaking down each step into a logical series of instructions the computer can follow. They then code these instructions in a conventional programming language, such as C and FORTRAN. An artificial intelligence language, such as LISP or Prolog; or one of the more advanced function-oriented or object-oriented languages, such as UML, Java, C++, Visual Basic, or Ada. Programmers usually know more than one programming language and since many languages are alike, they can often learn new languages relatively easily. In practice, the language they know or the type of environment they generally work in such as mainframe programmer, object-oriented programmer, or Internet or World Wide Web programmer often refers to programmers. In many large

organizations, programmers follow descriptions that have been prepared by software engineers or systems analysts. These descriptions list the input required the steps the computer must follow to process data, and the desired arrangement of the output.

Many programmers are involved in updating, repairing, modifying and expanding existing programs. When making changes to a section of code programmers need to make other users aware of the task the routine is to perform. They do this by using comments in the coded instructions so others can understand the program. Innovations such as Computer-Aided Software Engineering (CASE) tools enable a programmer to concentrate on writing the unique parts of the program because the tools automate various pieces of the program being built. CASE tools generate whole sections of code automatically, rather than line by line. This also stops more reliable and consistent programs and increases programmers' productivity by eliminating some of the routine steps.

Programmers often are grouped into two types: Applications programmers and systems programmers. Applications programmers usually are oriented toward business, engineering, or science. They write software to handle specific jobs within an organization, such as a program used in an inventory control system. They may also work alone to revise existing packaged software. Systems programmers maintain and control the use of computer systems software. These workers make changes in the sets of instructions that determine how the network, workstations, and central processing unit of the system handles the various jobs they have been given and how they

communicate with peripheral equipment, such as terminals, printers, and disk drives. Because of their knowledge of the entire computer system, systems programmers often help applications programmers determine the source of problems that may occur with their programs.

Programmers in software development companies may work directly with experts from various fields to create software, either programs designed for specific clients or packaged software for general use, ranging from games and educational software to programs for desktop publishing, financial planning, and spreadsheets. Much of this type of programming is in the preparation of packaged software, which comprises one of the most rapidly growing segments of the computer services industry.

The average earnings of programmers who worked full time in 1996 were about $40, 100 a year. The middle 50 percent earned between about $30, 700 and $52, 000 a year. The lowest 10 percent earned less than $22, 700; the highest 10 percent earned more than $65, 200. Starting salary offers for graduates with a bachelor's degree in the area of computer programming averaged about $35, 167 a year in private industry in 1997, according to the National Association of Colleges and Employers. Programmers working in the West and Northeast earned somewhat more than those working in the South and Midwest. On average, systems programmers earn more than applications programmers.

A survey of workplaces in 160 metropolitan areas reported that beginning programmers had average annual earnings of about $27, 000 in 1995. Experienced mid-level programmers with some supervisory responsibilities

had average annual earnings of about $40, 000. Median annual earnings for programmers at the supervisory or team leader level were about $55, 000.

According to Robert Half International Inc. starting salaries ranged from $32, 500 to $39, 000 for programmers and $47, 500 to $60, 000 for systems programmers in large establishments in 1997. Starting salaries for programmers in small establishments ranged from $28, 000 to $37, 000.

In the Federal Government, the entrance salary for programmers with a college degree or qualifying experience was about $19, 520 a year in early 1997; for those with a superior academic record, $24, 180.

The majority of computer programmers, almost 60 percent, had a bachelor's degree or higher in 1996. Of these, some hold a BA or BS in computer science, mathematics, or information systems while others have taken special courses in computer programming to supplement their study in fields such as accounting, inventory control, or other business areas. As the level of education and training required by employers continue to rise, this percentage should increase in the future.

Skills needed vary from job to job and the demand for various skills is generally driven by changes in technology. Employers using computers for scientific or engineering applications generally prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences. Graduate degrees in related fields may be required for some jobs. Employers who use computers for business applications prefer to hire people who have had college courses in management information

systems (MIS) and business, and who possess strong programming skills. Although knowledge of traditional languages such as FORTRAN, COBOL, or C is still important, increasing emphasis is placed on more advanced object-oriented languages and tools such as CASE tools, C++, Visual C++, Ada, Smalltalk, Visual Basic, PowerBuilder, and Java as well as 4th and 5th generation languages, graphic user interface (GUI) and systems programming. Employers prefer general business skills and experience related to the operations of the firm as well.

Most systems programmers hold a 4-year degree in computer science. Extensive knowledge of a variety of operating systems is essential. This includes being able to configure the operating system to work with different types of hardware, and adapting the operating system to best meet the needs of the particular organization. They must also be able to work with database systems such as DB2, Oracle, or Sybase.

When hiring programmers, employers look for people with the necessary programming skills who can think logically and pay close attention to detail. The job calls for patience, persistence, and the ability to work on exacting analytical work, especially under pressure. Ingenuity and imagination are also particularly important when programmers design solutions and test their work for potential failures. The ability to work with abstract concepts and do technical analysis is especially important for systems programmers because they work with the software that controls the computer's operation. Since programmers are expected to work in teams and interact directly with users,

employers want programmers who are able to communicate with non-technical personnel.

Beginning programmers may work alone on simple assignments after some initial instruction, or on a team with more experienced programmers. Either way, beginning programmers generally must work under close supervision. Because technology changes so rapidly, programmers must continuously update their training by taking courses sponsored by their employer or software vendors.

For skilled workers who keep up to date with the latest technology, the prospects for advancement are good. In large organizations, they may be promoted to lead programmer and be given supervisory responsibilities. Some applications programmers may move into systems programming after they gain experience and take courses in systems software. With general business experience, programmers may become programmer-analysts or systems analysts, or be promoted to a managerial position. Other programmers, with specialized knowledge and experience with a language or operating system, may work in research and development areas such as multimedia or Internet technology. As employers increasingly contract out programming jobs, more opportunities should arise for experienced programmers with expertise in a specific area to work as consultants.

Technical or professional certification is becoming more common as a way for employers to ensure a level of competency or quality in all areas. Many product vendors offer certification or may even require certification of technicians and professionals who work with their products. The number of

voluntary certificate or certification programs is also growing and this type of certification is available through organizations such as the Institute for Certification of Computing Professionals (ICCP). ICCP confers the designation Certified Computing Professional (CCP) to those who have at least 4 years of experience or 2 years of experience and a college degree. To qualify, individuals must pass a core examination plus exams in two specialty areas, or an exam in one specialty area and two computing languages. Those with little or no experience may be tested for certification as an Associate Computer Professional (ACP). Certification is not mandatory, buy it may give a job seeker a competitive advantage.

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