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—Programming

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programmer - analysts are responsible for both systems analysis and programming.

Programs vary with the type of problem to be solved. For example, the mathematical calculations involved in payroll accounting procedures are different from those required to determine the flight path of a space probe.

A business applications programmer developing instructions for billing customers would first take the company records the computer would need and they specify a solution by showing the steps the computer must follow to obtain old balances, add new charges, calculate finance charges, and deduct payments before determining a customer's bill.

The programmer then codes the actual instructions the computer will follow in a high - level programming language, such as COBOL.

Next, the programmer tests the operation of the program to be sure the instructions are correct and will produce the desired information.

The programmer tries a sample of the data with the program and reviews the results to see if any errors were made. If errors did occur, the program must be changed and rechecked until it produces the correct results. This is called "debugging" the program.

Finally, an instruction sheet is prepared for the computer operator who will run the program.

Although simple programs can be written in a few hours, programs that use complex mathematical formulas or many data files may require more than a year of work. In some cases, several programmers may work together in teams under a senior programmer's supervision.

Applications programmers are usually business - oriented, engineering - oriented, or science - oriented.

A different type of specialist, the **systems programmer**, maintains the general instructions (called software) that control the operation of the entire computer system.

These workers make changes in the sets of instructions that determine the allocation of the computer's resources among the various jobs it has been given.

Because of their knowledge of operating systems, systems programmers often help applications programmers determine the source of problems that may occur with their programs.

Working Conditions

Programmers work about 40 hours a week, but their hours are not always from 9 to 5. Once or twice a week a programmer may report early or work late to use the computer when it is available; occasionally, they work on weekends.

When a new program is being tested, programmers may get calls from computer operators asking for advice at all hours of the day or night.

Places of Employment

In 1978, about 247,000 persons worked as computer programmers. Most were employed by manufacturing firms, banks and insurance companies, data processing service organizations, and government agencies.

Many programmers work in large firms that need and can afford expensive computer systems. Small firms, which generally require computers only for payroll or billing purposes, often pay data processing service organizations to do this work.

Small firms may maintain their own low - cost, small business computers. Systems programmers usually work in research organizations, computer manufacturing firms, and large computer centers.

There are no universal training requirements for programmers because employers' needs vary.

—Choosing careers

(Continued from Page 1)

Other occupations, such as secretaries, are found in almost every industry.

"A few occupations are concentrated in certain parts of the country. Actors and actresses, for example, usually work in California or New York. For most occupations, however, employment is widely scattered and generally follows the same pattern as the distribution of the population.

One more factor you must consider is that all States have certification or licensing requirements for some occupations.

Physicians and nurses, elementary and secondary school teachers, barbers and cosmetologists, and electricians and plumbers are examples of workers who must be licensed.

If you are considering an occupation that is licensed, be sure to check the requirements in the State in which you plan to work because a license from one State may not be valid in another.

Common requirements for a license include completion of a State - approved training or educational program and a passing grade on a written test.

A very important item to consider when making a career choice is the extent to which a particular job matches your personality. Although it often is difficult for people to access themselves, your counselor undoubtedly is familiar with tests that can help you learn about yourself.

A particular job could require a person who is able to do one or more of the following:

—make responsible decisions.

—motivate others.

—direct and supervise others.

—work in a highly competitive atmosphere.

—enjoy working with ideas and solving problems.

—enjoy working with people.

—enjoy working with tools or machinery — good coordination and manual dexterity are necessary.

—work independently — initiative and self - discipline are necessary.

—work as part of a team.

—enjoy working with detail, either numbers or technical written material.

—enjoy helping people.

—use creative talents and ideas and enjoy having an opportunity for self - expression.

—derive satisfaction from seeing the physical results of your work.

—work in a confined area.

—perform repetitious work.

—enjoy working outside, regardless of the weather.

Most jobs require some combination of these characteristics.

Remember, even occupations that are small or overcrowded provide some jobs. So do occupations in which employment is growing very slowly or even declining, for there is a need to replace workers who leave the occupation.

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Architects earn over $25,000 a year

Attractive buildings and their surroundings enhance a community's appearance. But buildings must be safe as well as attractive and suit the needs of the people who use them. Architects take all these things into consideration and design buildings that are esthetically appealing, safe, and functional.

Architects provide a wide variety of professional services to individuals, organizations, corporations, or government agencies planning a building project. Architects are involved in all phases of development of a building or project, from the initial discussion of general ideas through construction. Their duties require a variety of skills — design, engineering, managerial, and supervisory.

Most architects spend a great deal of their time at the drawing board in well-equipped offices. It is at the drawing board that architects do most of their more creative and imaginative work so much of the time can be very satisfying and rewarding. This work often is varied by interviewing clients and contractors and discussing the design, construction procedures, or building materials of a project with other architects, landscape architects, or engineers. Contract administrators frequently work outdoors during inspections at construction sites.

About 54,000 architects were employed in 1978. This included architecture school graduates who have not become registered (licensed), although they work in the field. They must work under the supervision of licensed architects.

Most architects work for architectural firms or for builders, real estate firms, or other businesses that have large construction programs. Some work for government agencies responsible for housing, planning, or community development. About 1,600 architects work for the federal government, mainly for the Departments of Defense, Interior, Housing and Urban Development, and the General Services Administration.

Although found in many areas, a large proportion of architects are employed in seven cities: Boston, Chicago, Los Angeles, New York, Philadelphia, San Francisco, and Washington.

All states and the District of Columbia require individuals to be licensed before they may call themselves architects or contract for providing architectural services. To qualify for the licensing exam, a person must have either a Bachelor of Architecture degree followed by 3 years of acceptable practical experience in an architect's office or a Master of Architecture degree followed by 2 years of experience. As a substitute for formal training, most states accept additional experience (usually 12 years) and successful completion of a qualifying test for admission to the licensing examintion. Many architecture school graduates work in the field even though they are not licensed. However, a registered architect is required to take legal responsibility for all work.

Architects spend many hours at the drawing board.

Architects are expected to face competition for jobs through the 1980's. Although employment of architects is expected to rise faster than the average for all workers during this period, the number of degrees granted in architecture is expected to continue growing as well. If so, supply in this small field could exceed the number of job openings arising from employment growth, deaths, and retirements.

Demand for architects is highly dependent upon the level of new construction, and the anticipated rapid growth of nonresidential construction is expected to be a major determinant of job opportunities through the 1980's. Any significant upswing or downturn in building could temporarily alter demand, however. Indeed, the cyclical nature of construction activity leads some architects to move in and out of the field from time to time. Their design skills and familiarity with building materials and techniques enable them to move into related areas such as graphic design, advertising, visual arts, product design, construction contracting and supervision, and real estate.

The average salary for architects in 1978 was well over $25,000, according to the limited information available. Architects with well-established private practices generally earn much more than even highly paid salaried employees of architectural firms. Although the range in their incomes is very wide, some architects with many years of experience and good reputations earn well over $40,000 a year. Architects starting their own practices may go through a period when their expenses are greater than their income. Annual income may fluctuate due to changing business conditions.

In 1979, the average salary for architects working in the Federal Government was about $25,000.

General information about careers in architecture, including a catalog of publications, can be obtained from:

The American Institute of Architects, 1735 New York Ave. NW., Washington, DC 20006

Information about careers and schools in architecture is available from:

The Association of Collegiate Schools of Architecture, Inc. 1735 New York Ave. NW., Washington, DC 20006

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