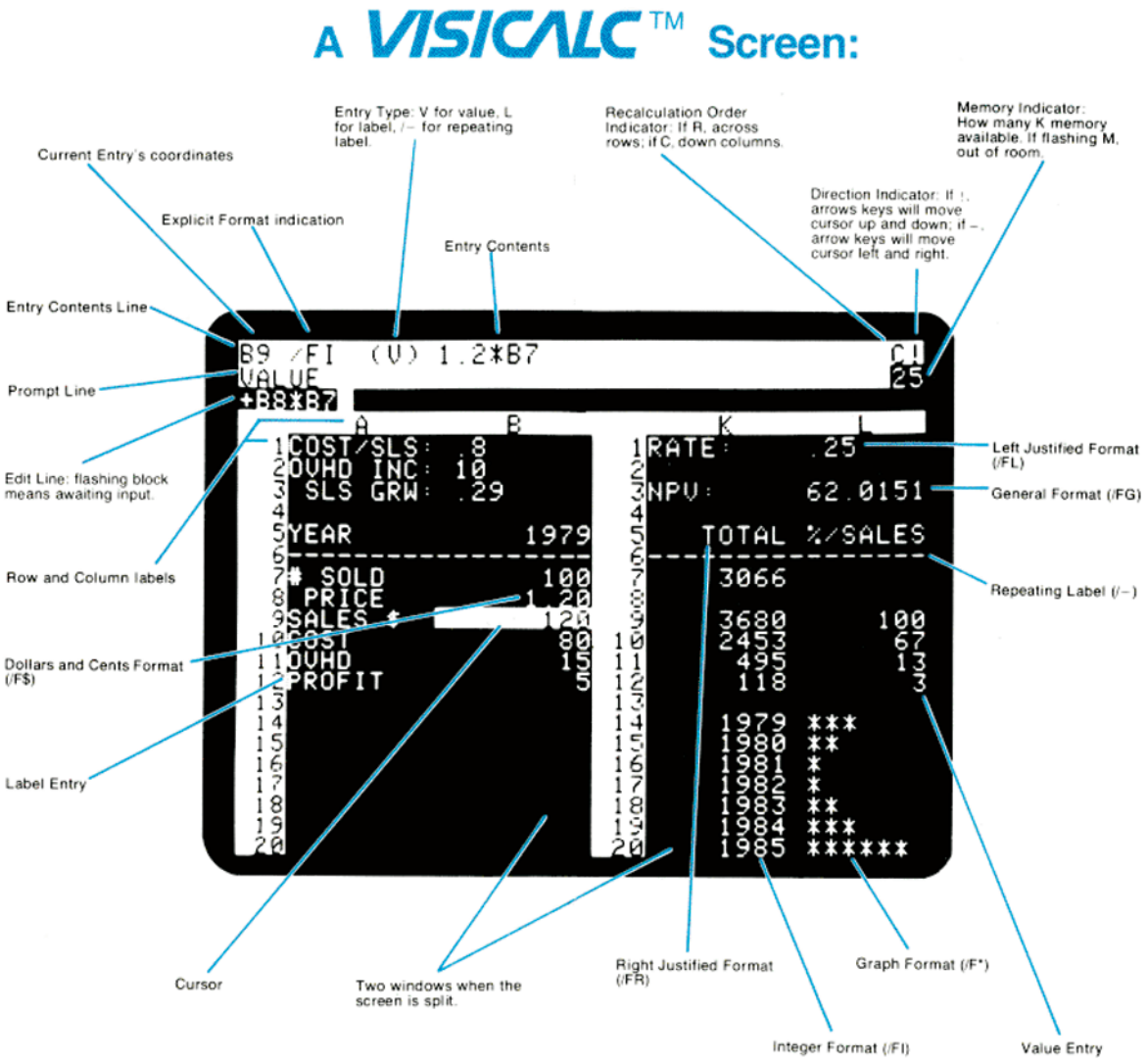
Random Fact 8.1

The Explosive Growth of Personal Computers

In 1971, Marcian E. "Ted" Hoff, an engineer at Intel Corporation, was working on a chip for a manufacturer of electronic calculators. He realized that it would be a better idea to develop a *general-purpose* chip that could be *programmed* to interface with the keys and display of a calculator, rather than to do yet another custom design. Thus, the *microprocessor* was born. At the time, its primary application was as a controller for calculators, washing machines, and the like. It took years for the computer industry to notice that a genuine central processing unit was now available as a single chip.

Hobbyists were the first to catch on. In 1974 the first computer *kit,* the Altair 8800, was available from MITS Electronics for about $350. The kit consisted of the microprocessor, a circuit board, a very small amount of memory, toggle switches, and a row of display lights. Purchasers had to solder and assemble it, then program it in machine language through the toggle switches. It was not a big hit.

The first big hit was the Apple II. It was a real computer with a keyboard, a monitor, and a floppy disk drive. When it was first released, users had a $3000 machine that could play Space Invaders, run a primitive bookkeeping program, or let users program it in BASIC. The original Apple II did not even support lowercase letters, making it worthless for word processing. The breakthrough came in 1979 with a new spreadsheet program, VisiCalc. In a spreadsheet, you enter data and their relationships into a grid of rows and columns (see the figure). Then you modify some of the data and watch in real time how the others change. For example, you can see how changing the mix of widgets in a manufacturing plant might affect estimated costs and profits. Middle managers in companies, who understood computers and were fed up with having to wait for hours or days to get their data runs back from the computing center, snapped up VisiCalc and the computer that was needed to run it. For them, the computer was a spreadsheet machine.



The VisiCalc Spreadsheet Running on an Apple II

The next big hit was the IBM Personal Computer, ever after known as the PC. It was the first widely available personal computer that used Intel's 16-bit processor, the 8086, whose successors are still being used in personal computers today. The success of the PC was based not on any engineering breakthroughs but on the fact that it was easy to *clone*. IBM published specifications for plug-in cards, and it went one step further. It published the exact source code of the so-called BIOS (Basic Input/Output System), which controls the keyboard, monitor, ports, and disk drives and must be installed in ROM form in every PC. This allowed third-party vendors of plug-in cards to ensure that the BIOS code, and third-party extensions of it, interacted correctly with the equipment. Of course, the code itself was the property of IBM and could not be copied legally. Perhaps IBM did not foresee that functionally equivalent versions of the BIOS nevertheless could be recreated by others. Compaq, one of the first clone vendors, had fifteen engineers, who certified that they had never seen the original IBM code, write a new version that conformed precisely to the IBM

specifications. Other companies did the same, and soon a variety of vendors were selling computers that ran the same software as IBM's PC but distinguished themselves by a lower price, increased portability, or better performance. In time, IBM lost its dominant position in the PC market, and it sold its personal computer division to the Chinese manufacturer Lenovo in 2005.

IBM never produced an *operating system* for its PCs—that is, the software that organizes the interaction between the user and the computer, starts application programs, and manages disk storage and other resources. Instead, IBM offered customers the option of three separate operating systems for its original PC. Most customers couldn't care less about the operating system. They chose the system that was able to launch most of the few applications that existed at the time. It happened to be DOS (Disk Operating System) by Microsoft. Microsoft cheerfully licensed the same operating system to other hardware vendors and encouraged software companies to write DOS applications. A huge number of useful application programs for PC-compatible machines was the result.

PC applications were certainly useful, but they were not easy to learn. Every vendor developed a different *user interface:* the collection of keystrokes, menu options, and settings that a user needed to master to use a software package effectively. Data exchange between applications was difficult, because each program used a different data format. The Apple Macintosh changed all that in 1984. The designers of the Macintosh had the vision to supply an intuitive user interface with the computer and to force software developers to adhere to it. It took Microsoft and PC-compatible manufacturers years to catch up.

Today, most personal computers are used for accessing information from online sources, entertainment, word processing, and home finance (banking, budgeting, taxes). Some analysts predict that the personal computer will merge with the television set and cable network into an entertainment and information appliance.