

- **80386**: introduced in 1985 also known as (80386DX)
 - With 32-bit internal and external data bus.
 - 32-bit address bus ($2^{32} = 4$ gigabyte-physical memory). With virtual memory 64 terabytes(2^{46}).
 - 80386SX was later introduced with the same internal structure with 16-bit external data bus and 24-bit address bus. 80386SX was much cheaper.
- All microprocessors discussed so far were general-purpose microprocessors and could not handle mathematical operations rapidly. For this reason, **8087**, **80287**, **80387** numeric data processing chips called **math co-processors** were used.
- **80486**: introduced in 1989 with 32-bit internal-external data bus and 32-bit address bus.
 - built in math co-processor in a single chip.
 - Introduction of **cache memory** (Static RAM with very fast access time)

Table 1: Evolution of Intel's Microprocessors

Product	8080	8085	8086	8088	80286	80386	80486
Year Introduced	1974	1976	1978	1979	1982	1985	1989
Clock rate (MHz)	2-3	3-8	5-10	5-8	6-16	16-33	25-50
No. transistors	4500	6500	29,000	29,000	130,000	275,000	1.2 million
Physical memory	64K	64K	1M	1M	16M	4G	4G
Internal data bus	8	8	16	16	16	32	32
External data bus	8	8	16	8	16	32	32
Address bus	16	16	20	20	24	32	32
Data type (bits)	8	8	8,16	8,16	8,16	8,16,32	8,16,32

THE 8086 INTERNAL ORGANIZATION, PIPELINING AND REGISTERS

