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**1. What is a processor register?**

A processor register is a quickly accessible location available to a computer's central processing unit. Registers usually consist of a small amount of fast storage, although some registers have specific hardware functions, and may be read-only or write-only. In computer architecture, registers are typically addressed by mechanisms other than main memory, but may in some cases be assigned a memory address.

**2. How are processor registers used by computers?**

Computers load data from a larger memory into registers where it is used for arithmetic operations and is manipulated or tested by machine instructions. Manipulated data is then often stored back to main memory, either by the same instruction or by a subsequent one. Modern processors use either static or dynamic RAM as main memory, with the latter usually accessed via one or more cache levels.

**3. Where are processors located, in terms of the memory hierarchy?**

Processor registers are normally at the top of the memory hierarchy, and provide the fastest way to access data. The term normally refers only to the group of registers that are directly encoded as part of an instruction, as defined by the instruction set. However, modern high-performance CPUs often have duplicates of these "architectural registers" in order to improve performance via register renaming, allowing parallel and speculative execution.

**4. How many "core" registers does the ARM Cortex-M4 architecture have?**

13 general-purpose registers, R0-R12.
Stack Pointer (SP), R13 alias of banked registers, SP_process and SP_main.
Link Register (LR), R14.
Program Counter (PC), R15.
Special-purpose Program Status Registers, (xPSR).

**5. How many "general purpose" registers does the ARM Cortex-M4 have? List them.**

The general-purpose registers R0-R12 have no special architecturally-defined uses. Most instructions that can specify a general-purpose register can specify R0-R12.

The low registers R0-R7 are accessible by all instructions that specify a general-purpose register.
The high registers R8-R12 are accessible by all 32-bit instructions that specify a general-purpose register.

Registers R8-R12 are not accessible by most 16-bit instructions.

**6. What are general purpose registers used for?**

General purpose registers can store both data and addresses, they are combined data/address registers. In some architectures, the register file is unified so that the GPRs can store floating-point numbers as well. In the Cortex M4 general purpose registers have no special architecturally-defined uses. Most instructions can specify one of the r0-r12 general purpose registers.

**7. What is the function of the SP (stack pointer) register?**

A stack register is a computer central processor register whose purpose is to keep track of a call stack. On an accumulator-based architecture machine, this may be a dedicated register such as SP on an Intel x86 machine. On a general register machine, it may be a register which is reserved by convention, such as on the PDP-11 or RISC machines, or it could be a reserved hardware memory address for this function.

**8. What is the function of the LR (link register)?**

A link register is a special-purpose register which holds the address to return to when a function call completes. This is more efficient than the more traditional scheme of storing return addressed on a call stack, sometimes called a machine stack. The link register does not require the writes and reads of the memory containing the stack which can save a considerable percentage of execution time with repeated calls of small subroutines.

**9. What is the function of the PC (program counter) register?**

The program counter is a processor register that indicates where a computer is in its program sequence. The PC is typically incremented after fetching an instruction, and holds the memory address of ("points to") the next instruction that would be executed.

**10. What is the function of the Program Status Register?**

A status register is a collection of status flag bits, such as information about the state of the processor. Individual bits are implicitly or explicitly read and/or written by the machine code instructions executing on the processor. The status register lets an instruction take action contingent on the outcome of a previous instruction. For example, a Z bit may be set if the result of the operation is zero and cleared if it is nonzero. Other classes of instructions may also modify the flags to indicate status. A string instruction