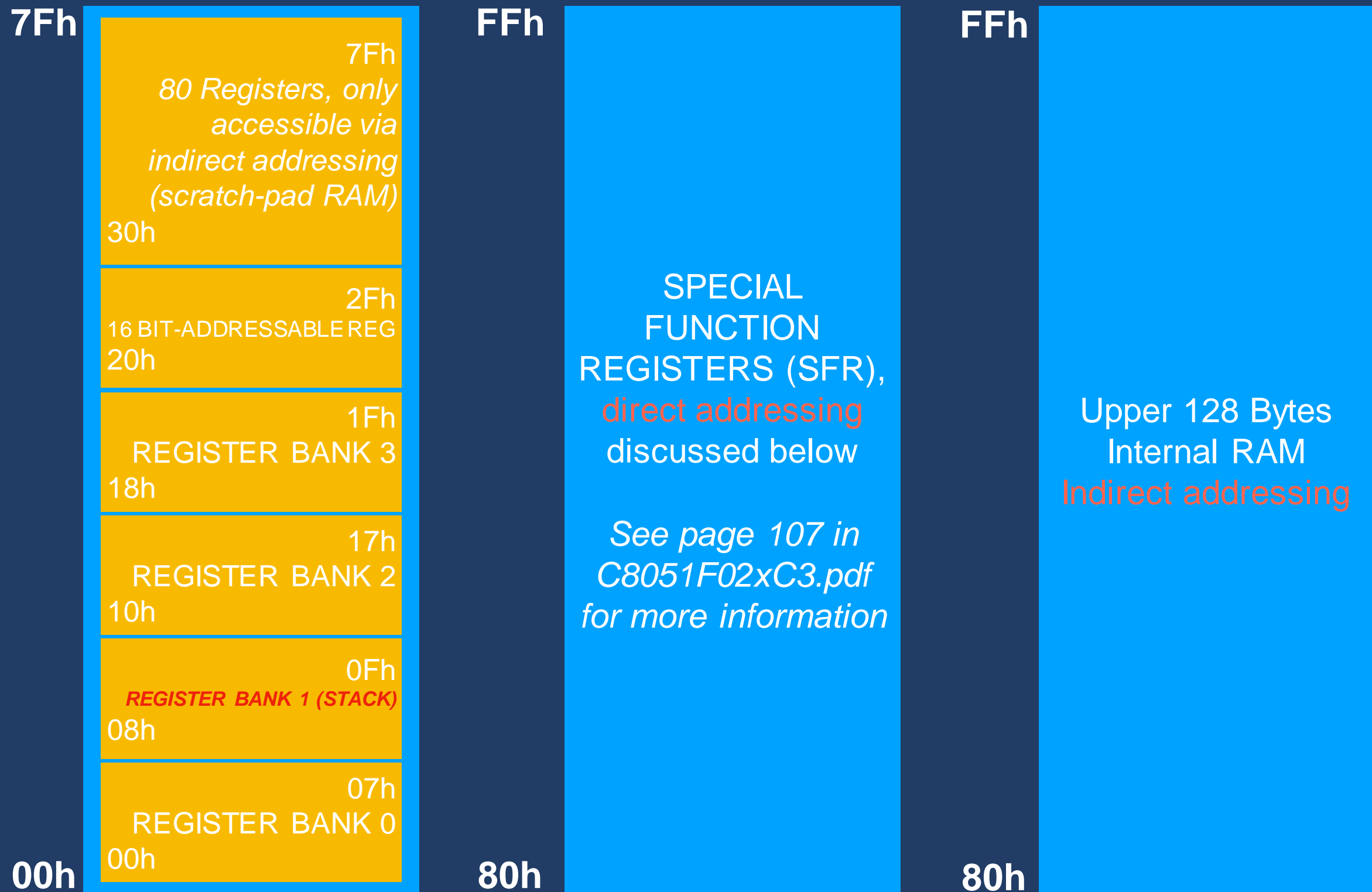
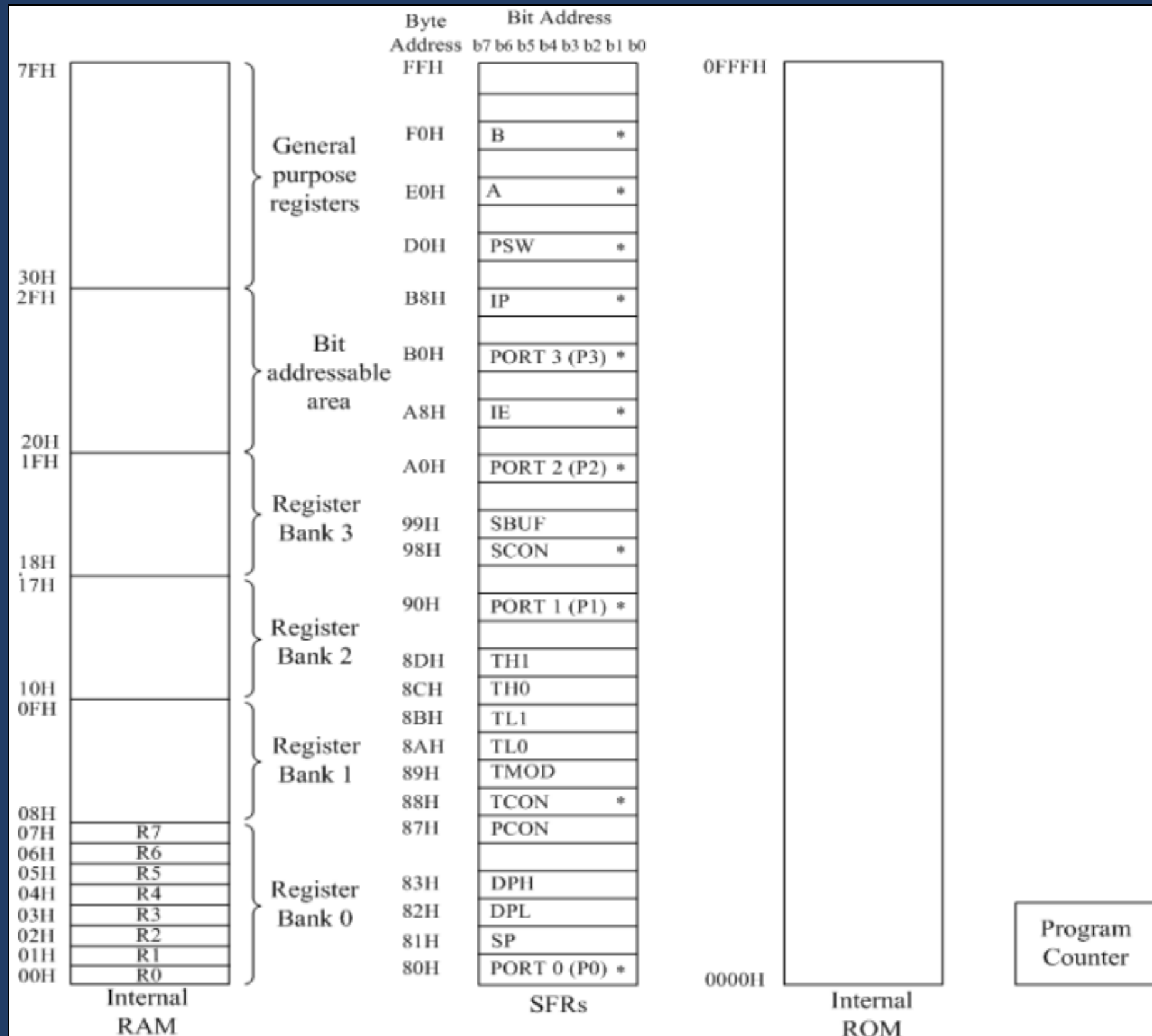


8051 DATA MEMORY MAP



**LOWER 128 BYTES,
NOT TO SCALE**

8051 DATA MEMORY MAP



* Indicates the SFRs which are also bit addressable

8051 ADDRESSING MODES

- A key part of computer operation involves the accessing of memory; this may be done on the 8051 using five main approaches.

• IMMEDIATE ADDRESSING MODE

- The data is included in the 8051 instruction.
- MOV A,#48H
- The # shows that the data is 'immediate'
- In a sense, this data is hard-coded into the instruction. Fast but less flexible.

• REGISTER ADDRESSING MODE

- The data operand is in a specified register.
- Only some registers may be used: R0 through R7 of each of the 8051's banks.
- MOV A,R7
 - Contents of R7 are copied to ACC.

• DIRECT ADDRESSING MODE

- The address of a location in RAM is specified, and its contents are operated upon. Only works with internal RAM & SFR's
- MOV A,10H
 - Contents of address are copied to ACC.

• INDIRECT ADDRESSING MODE

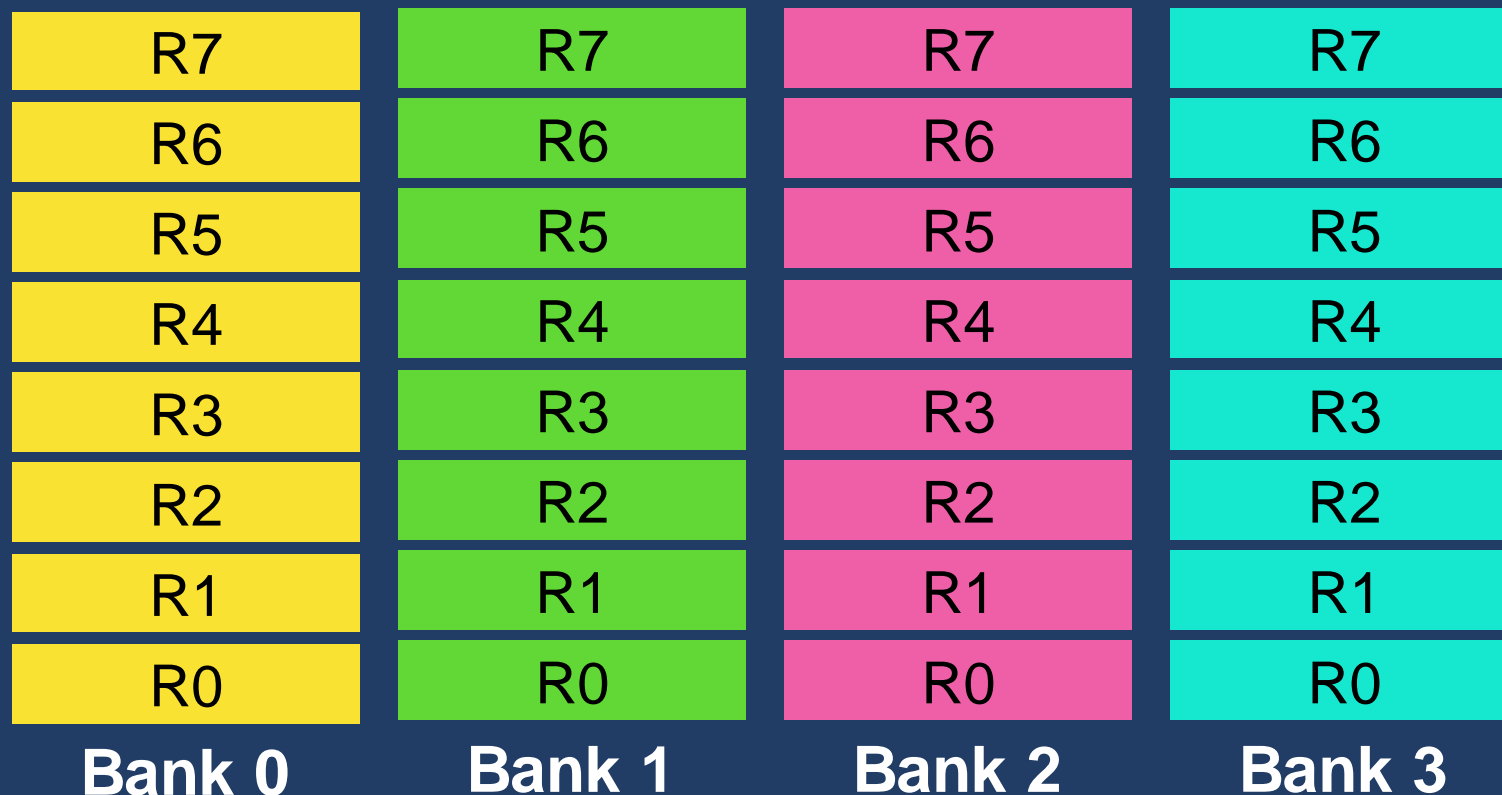
- Slower: the contents of a location of the address stored in a register are fetched.
- MOV A,@R7
 - The @ indicates an address
- Upper 128 bytes of RAM are accessible this way.

• INDEXED ADDRESSING MODE

- Used to step through data (as in lookup tables).
- We won't be exploring this in depth (and you won't be tested on it!), but see details about the MOVC instruction in C8051F02xC3.pdf

8051 GENERAL PURPOSE REGISTERS

- The lowest addresses of the 8051's internal RAM are a number of General Purpose Registers.
 - There are four banks of these registers, with each bank having 8 registers (R0 through R7).
 - 32 Bytes total.
 - By default, Bank 0 is enabled.
 - As default, MOV A,R7 will move Bank 0's contents to accumulator.
 - We can switch register banks using bits 3 and 4 of the PSW flag register.



	RS1	RS0
BANK 0	0	0
BANK 1	0	1
BANK 2	1	0
BANK 3	1	1

8051 FLAGS

PSW.7
CY
(Carry flag,
raised
when the
processor
needs to
carry in
addition)

PSW.6
AC
(Aux.
carry,
used
during
BCD
math)

PSW.5
F0
(User-
assignable flag)

PSW.4
RS1
(Register
bank
selector,
don't
worry
about for
now)

PSW.3
RS2
(Register
bank
selector,
don't
worry
about for
now)

PSW.2
OV
(Overflow,
raised when a
signed number
overflows into
the sign bit)

PSW.1
-
(User
assignable)

PSW.0
P
(Parity: 0
if acc.
holds
even
number
of 1's)

GENERAL PURPOSE REGISTER EXAMPLE CODE

```
MOV R0,#FFH      ;Load R0 with 0xFF (immediate addressing)
MOV R1,R0        ;Copy R0 contents to R1 (register addressing)
MOV P0,R1        ;2 cycles! Direct move from R1 to P0
MOV 00,#FFH      ;Address 00 is R0 (direct addressing)

;;Now, we'll switch reg. banks to bank 3 (PSW.4 HI, PSW.3 HI).

SETB PSW.4       ;Sets the register bank select bit RS1 high
SETB PSW.3       ;Sets the register bank select bit RS2 high

;;R0-R7 now refer to bank 3 rather than bank 0 (default)
MOV R0,#FFH      ;Same operation as top of code, different bank
MOV 00,#FFH      ;However, this still refers to 'bank 0, R0'
```