(1) What does “MBR” stand for? What does MBR contain?

- “MBR” stands for “Master Boot Record”
- MBR consists of two components of “the bootstrap loader” and “the partition table”

(2) Why are “boot sector viruses” fatal to systems?

Boot sector viruses are fatal, because of the following reason:

- Since boot sector viruses infect the MBR sector (i.e., the bootstrap loader), such a virus will be active before an operating system starts.

- If a virus becomes active before an operating system, such a virus can modify the operating system (or even the device driver for the hard drive). For example, virtually all operating systems use their system calls to access hard drives. A boot sector virus can modify the system call in such a way that, when the system call reads disk sectors, the system call automatically filter out the virus codes so that operating systems will never be able to see the (boot sector) viruses.

- As the result, once a virus successfully infects the MBR (i.e., the bootstrap loader), operating systems will never be able to see them (even if they are there), making removals of such viruses is impossible.

Note: most of the boot-sector viruses do not disable the partition table.
(3) If your PC is stuck when you see the following screen, where did the problem happen (select one from the following options)?

When your PC is using:

(a) BIOS ROM
(b) The boot-strap loader in MBR
(c) The partition table in MBR
(d) IPL (the OS loader)
(e) Somewhere not in the above

Solution: (d) (IPL)

The problem must have happened while a processor is executing the IPL (of “Windows” in this particular case). It can not be any of (a), (b), (c), or (e).

- If (a), your hard drive will not be detected. Therefore, there is no way for us to see anything for “Windows”, since “Windows” should be loaded from a hard drive (or any bootable devices, such as USB drives, which should be first detected by the BIOS program).

- If (b), your processor will not be able to find any OS (since your processor should fail to recognize any existing partitions, where an OS should be stored).

- By the same reason for (b), it can not be (c).

- It can not be (e). If there is no problem in the IPL, we should have seen the “(Windows) desktop” (since the IPL is the last step before we (human users) will see “(Windows) desktop”.)
(4) If your PC is stuck when you see the following screen, where did the problem happen (select one from the following options)?

When your PC is using:

(a) BIOS ROM
(b) The boot-strap loader in MBR
(c) The partition table in MBR
(d) IPL (the OS loader)
(e) The target OS
(f) Somewhere not in the above

Solution: (d) (the IPL)

Since the error message says, “Windows Boot Manager”, it must be from “Windows”. Therefore, the problem can not be caused at anytime before IPL. Just like explained for question (3) above, if there is no problem in the IPL, we should have seen the “(Windows) desktop” (since the IPL is the last step before we (human users) will see “(Windows) desktop”. Since we do not see “the flying Windows”, the problem must have happened at the early stage in the ILP.
The following is a snapshot of “multi-boot” disk utility tool. Where should “multi-boot tool” be installed?

(a) BIOS ROM
(b) The boot-strap loader in MBR
(c) The partition table in MBR
(d) IPL (the OS loader)
(e) The target OS
(f) Somewhere not in the above

Solution: (b)

It must be installed in the boot-strap loader because of the following reasons:

(a) We can not install anything to “BIOS ROM” (without a special hardware tool, called “(BIOS) ROM writer”, which uses the ultra-violet light to delete the contents in ROM and special hardware circuits to “burn” a program to ROM.

(b) It is the right place.

(c) Since the partition table must be just data (in a table format), we can not “install” programs to the partition table.

(d) It’s too late (an operating system should already start loading).