2.1

1. Calls made by ls

without options:
close
read
open
execve
access
brk
ioctl
munmap
uname
mprotect
rt_sigaction
rt_sigprocmask
ugetrlimit
mmap2
fstat64
getdents64
set_thread_area
set_tid_address
statfs64
set_robust_list

Calls made with ls -l
open
mmap2
close
read
mprotect
munmap
connect
fstat64
statfs64
getdents64
write
socket
access
lgetxattr
stat64
lstat64
_llseek
getxattr
ioctl
brk
rt_sigaction
uname
ugetrlimit
futex
set_thread_area
set_tid_address
set_robust_list
rt_sigprocmask
execve

For large directories, the command was tried on /usr/include/linux

There are two primary differences:

1. ls -l calls lstat64 on ***each of the children*** of the parent dir if they exist.
   Reason: ls -l displays information on children too.
2. ls -l calls to lgetxattr,

Reason: We need extended security attributes too like system.posix_acl_access etc. if they exist.

2. **Calls by ltrace**

ltrace -o ltrace.out ls
Since, we are not allowed to use -S option, we get only the following.
grep -in .*open.* ltrace.out
75:opendir("." <unfinished ...>
77:<... opendir resumed>)

This is because ls calls wrappers to the system calls. For eg. opendir gets called which internally calls fstat64. Similarly, readdir64 gets called which calls getdents64 internally.

3. strace to count the number of files ,

We count the number of ***calls made to open.***

strace -cf -e trace=open <program>

firefox = 2958
ls – 9
nano – 59
soffice -writer= 2040

We can also check ***all*** sys calls like access, mmap etc. Essentially, any syscall that takes a filename as an argument. For those cases:
strace -cf -e trace=file <program>

firefox - 10024
ls – 19
nano - 125
soffice -writer= 12340

4.Bonus question:

strace -f -e trace=open ls 2> file;
grep '^open("' file | grep "\.so" | wc -l

firefox - 183
ls – 6
nano - 5
soffice -writer= 53