Problem Sheet 6

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Problem 6.1

a) The new file system contains a 'lost+found' directory. This directory keeps unlinked files so they can later be recovered if needed. Files that appear here are typically files that are unlinked but still open in another program. Files may also end up in 'lost+found' due to filesystem corruption.

b) By default ext2 - 4 filesystems reserve 5% of the data blocks on the filesystem for the root user. The available blocks are all the free blocks minus the blocks reserved for root.

c) Nothing happens to the mounted filesystem. So long as the file system remains mounted, deleting `vhd.ext3` simply unlinks the filesystem but we still have access to it.

d) The number of free blocks remains the same, however the number of free inodes has reduced by one as there is another file whose metadata needs to be stored that has been created. This is because while the space for `big.data` is allocated, the blocks remain free until the file is filled with content.

e) The file 'big.data' cannot be removed. This is because the previous terminal command: '`sudo chattr +i big.data`' made the file immutable, which means that it cannot be deleted, links to it cannot be created and the file cannot be renamed.

f) After running `sudo chroot mnt /bin/sh` the root directory was changed from '`/`' to '`mnt`' in a new root environment. This is used when one wants to isolate the running of a program to a directory so it does not access the rest of the filesystem. Busybox needs to be statically linked so that it remains fully contained in the root environment. If it was dynamic, it may have dependecies outside the root environment and would be able to affect the rest of the filesystem.

g) In order to run comands like `vi`, the command `busybox` needs to precede it.
To run commands such as `top` you need to manually mount the `/proc` directory to the file system using

```
mount -r proc p /proc
```

This avoids copying the the `proc` folder into the filesystem.

h) After unmounting the file system, the number of free inodes has increased by one. This is because there is one less file whose metadata the system needs to keep track of. In addition, the number of available blocks has increased, meaning that space has been freed up which makes sense as the filesystem has been unmounted.