# CS 537: Intro to Operating Systems (Summer 2017)
## Worksheet 17 - Crash Consistency
### DUE: Aug 9th 2017 (Wednesday)

The INITIAL STATE, or state(i), of a very simple file system is shown:

```
Inode Bitmap : 10000000
Inode Table : [size=1,ptr=0,type=d] [] [] [] [] [] [] []
Data Bitmap : 10000000
Data : [("." 0), (".." 0)] [] [] [] [] [] [] []
```

There are only eight inodes and eight data blocks; each of these is managed by a corresponding bitmap. The inode table shows the contents of each of eight inodes, with an individual inode enclosed between square brackets; in the initial state above, only inode 0 is in use. When an inode is used, its size (i.e., number of blocks) and pointer field are updated accordingly (in this question, files can only be one block in size; hence a single inode pointer); when an inode is free, it is marked with a pair of empty brackets like these " []". Note there are only two file types: directories (type=d) and regular files (type=r). Data blocks are either "in use" and filled with something, or "free" and marked accordingly with " []". Directory contents are shown in data blocks as comma-separated lists of tuples like: ("name", inode number). The root inode number is zero.

File systems crash. One sad outcome of a crash is that the file system is left in an inconsistent state. In this question, you'll be given the final output (on-disk state) of a file system, and try to determine if an inconsistency has arisen. If one has, write "inconsistent" and suggest a fix! Otherwise, write down that the file system is "consistent".

a. FILE SYSTEM STATE: Consistent or inconsistent? If inconsistent, how to fix?

```
Inode Bitmap : 11111111
Inode Table : [size=1,ptr=0,type=d] [] [] [] [] [] [] []
Data Bitmap : 10000000
Data : [("." 0),(".." 0)] [] [] [] [] [] [] []
```

b. FILE SYSTEM STATE: Consistent or inconsistent? If inconsistent, how to fix?

```
Inode Bitmap : 11100000
Inode Table : [size=1,ptr=0,type=d] [size=1,ptr=1,type=r] [size=1,ptr
    =2,type=r] [] [] [] [] []
Data Bitmap : 10000000
Data : [("." 0),(".." 0),("b" 1),("c" 2)] [DATA] [DATA] [] [] [] [] []
```

c. FILE SYSTEM STATE: Consistent or inconsistent? If inconsistent, how to fix?

```
Inode Bitmap : 10000000
Inode Table : [size=1,ptr=0,type=d] [] [] [] [] [] [] []
Data Bitmap : 11110000
Data : [("." 0),(".." 0)] [] [] [] [] [] [] []
```

d. FILE SYSTEM STATE: Consistent or inconsistent? If inconsistent, how to fix?

```
Inode Bitmap : 11000000
Inode Table : [size=1,ptr=0,type=d] [size=1,ptr=1,type=d] [] [] [] []
    [] []
Data Bitmap : 11000000
Data : [("." 0),(".." 0),("a" 1)] [("." 1),(".." 1)] [] [] [] [] [] []
```

e. FILE SYSTEM STATE: Consistent or inconsistent? If inconsistent, how to fix?

```
Inode Bitmap : 11000000
Inode Table : [size=1,ptr=0,type=d] [size=1,ptr=1,type=r] [] [] [] []
    [] []
Data Bitmap : 11000000
Data : [("." 0),(".." 0),("a" 1)] [("." 1),(".." 1)] [] [] [] [] [] []
```

f. FILE SYSTEM STATE: Consistent or inconsistent? If inconsistent, how to fix?

```
Inode Bitmap : 11100000
Inode Table : [size=1,ptr=0,type=d] [size=1,ptr=1,type=r] [size=1,ptr
    =2,type=r] [] [] [] [] []
Data Bitmap : 11100000
Data : [("." 0),(".." 0)] [DATA] [DATA] [] [] [] [] []
```