CS5541 - Computer Systems
Struct Alignment

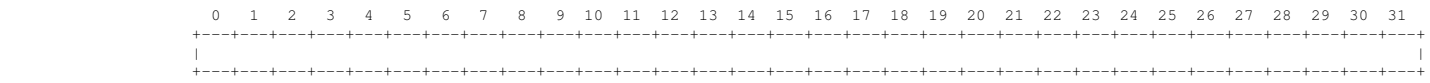
Problem 1:

Consider the following datatype definition on an IA32 (x86) machine.

```
typedef struct {
  char  c;
  double *p;
  int i;
  double d;
  short s;
} struct1;
```

A. Using the template below (allowing a maximum of 32 bytes), indicate the allocation of data for a structure of type `struct1`. Mark off and label the areas for each individual element (there are 5 of them). Use an "x" to indicate the parts that are allocated, but not used (to satisfy alignment).

Assume the alignment rules discussed in lecture: data types of size x must be aligned on x-byte boundaries. **Clearly indicate the right hand boundary of the data structure with a vertical line**.



B. How many bytes are allocated for an object of type `struct1`?

C. What alignment is required for an object of type `struct1`? (If an object must be aligned on an x-byte boundary, then your answer should be x.)

D. If we define the fields of `struct1` in a different order, we can reduce the number of bytes wasted by each variable of type `struct1`. What is the number of **unused, allocated** bytes in the best case?