

CS 103000

Prof. Madeline Blount

Week 2:

VARIABLES + BINARY

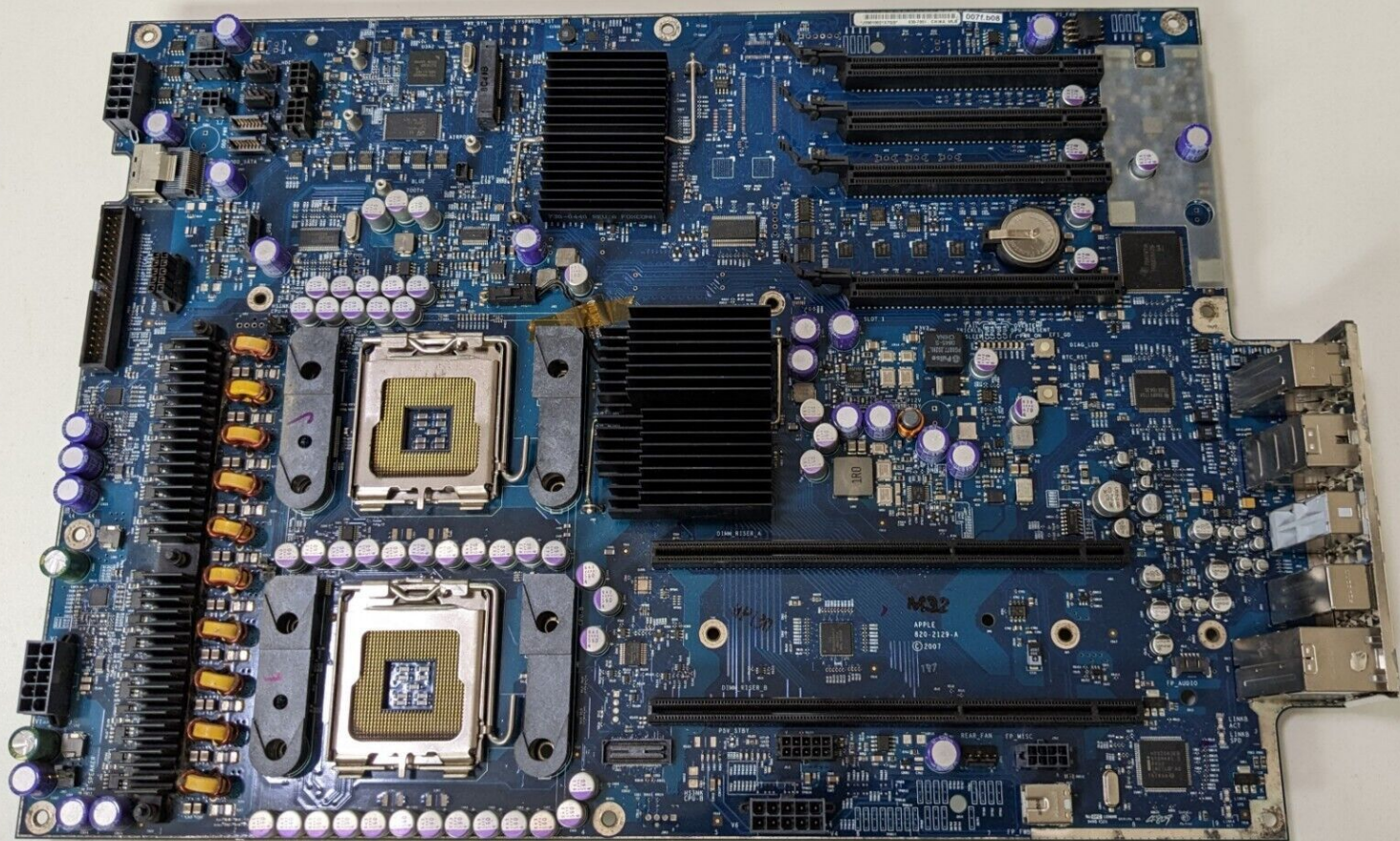


*Dall-E 2: cats learning C++ in the forest on '90's technology*

```
int score = 0;
```

declaration

initialization



| Data Type   | Memory Size |
|-------------|-------------|
| bool        | 1 byte      |
| char        | 1 byte      |
| int         | 4 bytes     |
| float       | 4 bytes     |
| double      | 8 bytes     |
| std::string | 24 bytes    |



## INTEGER OVERFLOW: weirdness, limitations



we don't have infinite memory!

int = 32 bits (4 bytes)

000000000000000000000000000000000000

111111111111111111111111111111111111

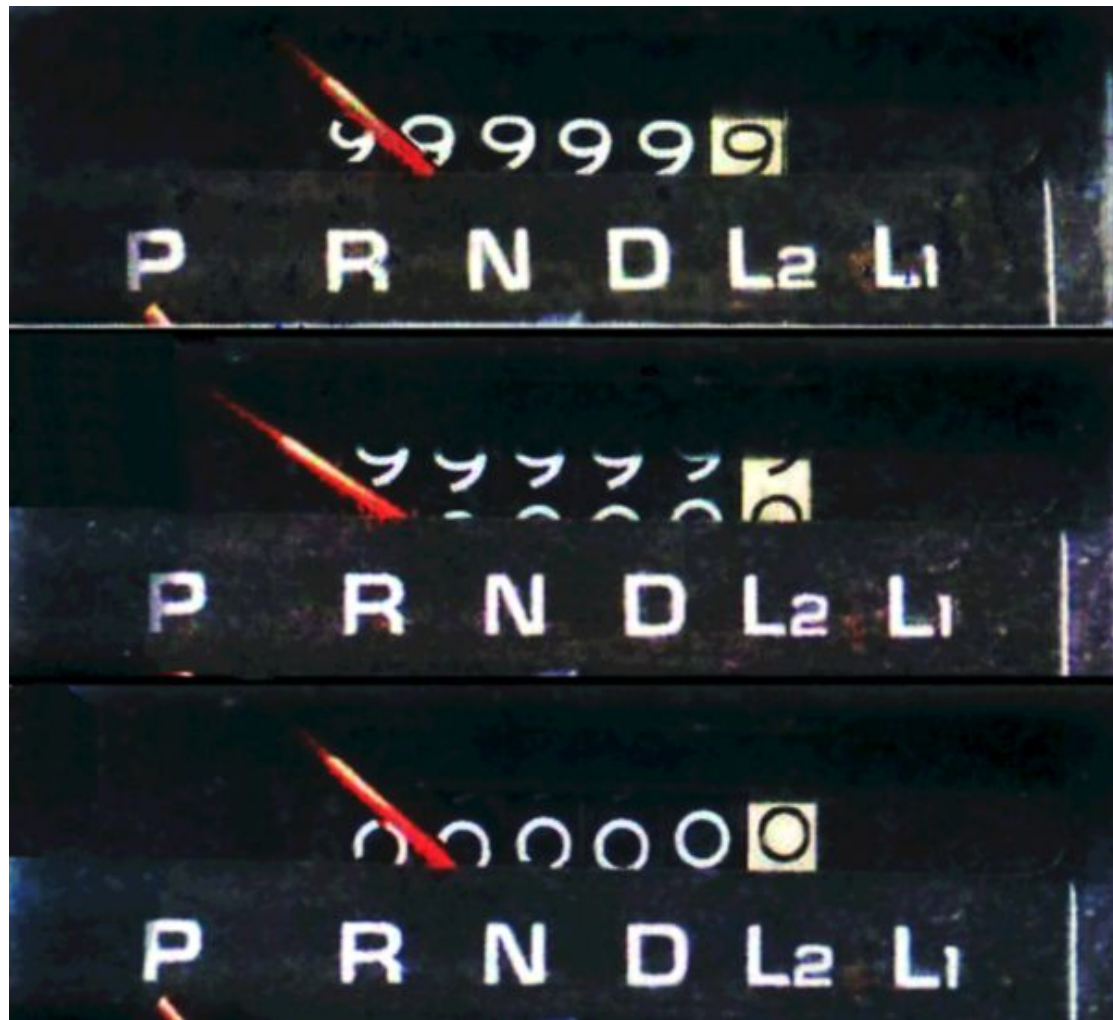
4,294,967,295

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+/- 2,147,483,647



## INTEGER OVERFLOW



| Data Type   | Memory Size |
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ASCII =  
**A**merican  
**S**tandard  
**C**ode for  
**I**nformation  
**I**nterchange  
(1963)

1000011    1100001    1110100    0100001

|    |    |     |    |
|----|----|-----|----|
| 67 | 97 | 116 | 33 |
| C  | a  | t   | !  |

| Binary   | Dec | Char  | Binary   | Dec | Char | Binary   | Dec | Char |
|----------|-----|-------|----------|-----|------|----------|-----|------|
| 010 0000 | 32  | space | 100 0000 | 64  | @    | 110 0000 | 96  | `    |
| 010 0001 | 33  | !     | 100 0001 | 65  | A    | 110 0001 | 97  | a    |
| 010 0010 | 34  | "     | 100 0010 | 66  | B    | 110 0010 | 98  | b    |
| 010 0011 | 35  | #     | 100 0011 | 67  | C    | 110 0011 | 99  | c    |
| 010 0100 | 36  | \$    | 100 0100 | 68  | D    | 110 0100 | 100 | d    |
| 010 0101 | 37  | %     | 100 0101 | 69  | E    | 110 0101 | 101 | e    |
| 010 0110 | 38  | &     | 100 0110 | 70  | F    | 110 0110 | 102 | f    |
| 010 0111 | 39  | '     | 100 0111 | 71  | G    | 110 0111 | 103 | g    |
| 010 1000 | 40  | (     | 100 1000 | 72  | H    | 110 1000 | 104 | h    |
| 010 1001 | 41  | )     | 100 1001 | 73  | I    | 110 1001 | 105 | i    |
| 010 1010 | 42  | *     | 100 1010 | 74  | J    | 110 1010 | 106 | j    |
| 010 1011 | 43  | +     | 100 1011 | 75  | K    | 110 1011 | 107 | k    |
| 010 1100 | 44  | ,     | 100 1100 | 76  | L    | 110 1100 | 108 | l    |
| 010 1101 | 45  | -     | 100 1101 | 77  | M    | 110 1101 | 109 | m    |
| 010 1110 | 46  | .     | 100 1110 | 78  | N    | 110 1110 | 110 | n    |
| 010 1111 | 47  | /     | 100 1111 | 79  | O    | 110 1111 | 111 | o    |
| 011 0000 | 48  | 0     | 101 0000 | 80  | P    | 111 0000 | 112 | p    |
| 011 0001 | 49  | 1     | 101 0001 | 81  | Q    | 111 0001 | 113 | q    |
| 011 0010 | 50  | 2     | 101 0010 | 82  | R    | 111 0010 | 114 | r    |
| 011 0011 | 51  | 3     | 101 0011 | 83  | S    | 111 0011 | 115 | s    |
| 011 0100 | 52  | 4     | 101 0100 | 84  | T    | 111 0100 | 116 | t    |
| 011 0101 | 53  | 5     | 101 0101 | 85  | U    | 111 0101 | 117 | u    |

# Unicode Consortium

(more bits, up to 32 -  
many more characters)



jellyfish

Unicode: U+1FABC,  
"\U0001FABC"

UTF-8: F0 9F AA BC



0 0 0 1 0 1 1 1

1 0 0 1 0 0 0 1

15

81