# Princeton University
# COS 217: Introduction to Programming Systems
# A Post-Add Condition Code Setter Circuit

**Description**

Accept 32 "a" inputs, 32 "b" inputs, and 32 "sum" inputs. View each set of 32 inputs as a binary number. sum is the (previously computed) sum of a and b.

Produce four outputs:
Z: Set to 1 iff sum is zero.
N: Set to 1 iff sum is negative.
V: Set to 1 iff the signed computation "a + b = sum" generated an overflow.
C: Set to 1 iff the unsigned computation "a + b = sum" generated a carry.

**Truth Tables**

| sum31 | sum30 | ... | sum0 | Z |
|---|---|---|---|---|
| 0 | 0 | ... | 0 | 1 |
| 0 | 0 | ... | 0 | 0 |
| ... | ... | ... | ... | ... |
| 1 | 1 | ... | 1 | 0 |

| a31 | b31 | sum31 | N | V | C |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 |

**Boolean Expression**

```
Z = ~sum31 & ~sum30 & ... & ~sum0
N = sum31
V = (~a31 & ~b31 & sum31) | (a31 & b31 & ~sum31)
C = (~a31 & b31 & ~sum31) | (a31 & ~b31 & ~sum31)
    | (a31 & b31 & ~sum31) | (a31 & b31 & sum31)
```

**Circuit**

(See reverse)