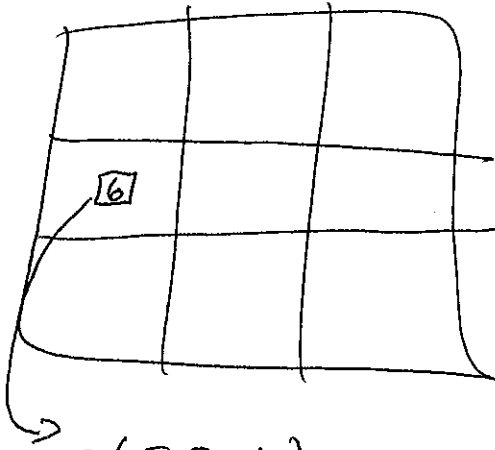
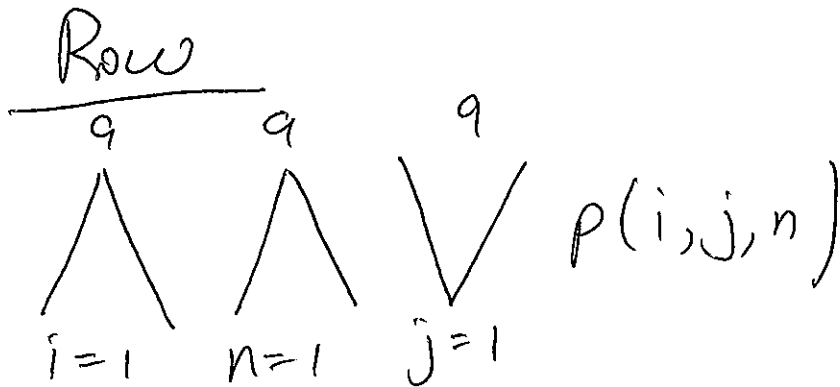


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(2)

Sudoku


 $p(5,2,6)$
 $\neg p(5,2,1)$
 $\neg p(5,2,2)$
 $\vdots$

 $p(2,1,7) \vee p(2,2,7) \vee p(2,3,7) \vee \dots \vee p(2,9,7)$

```

for (i=1; i <= 9; i++) {
    for (n=1; n <= 9; n++) {
        boolean ans = false;
        for (j=1; j <= 9; j++) {
            ans = ans || p[i][j][n];
        }
        if (!ans) return false;
    }
}
return true;

```

$$\bigwedge_{j=1}^9 \bigwedge_{n=1}^9 \bigvee_{i=1}^9 p(i, j, n) \quad \text{COLS}$$

$$\bigwedge_{r=0}^2 \bigwedge_{s=0}^2 \bigwedge_{n=1}^9 \bigvee_{i=1}^3 \bigvee_{j=1}^3 p(3r+i, 3s+j, n) \quad \text{BOXES}$$

$$p(i, j, n) \rightarrow \neg p(i, j, k) \text{ for all } k \neq n.$$

$$\text{Given } p(1, 1, 1) \wedge p(4, 2, 3) \wedge \dots$$

$$Q(x, y): y = x^2 - 4x + 3$$

$$Q(2, -1) \text{ is true.}$$

$$Q(3, 7) \text{ is false because } 3^2 - 4(3) + 3 = 0, \text{ not } 7.$$

$$\bigwedge_x P(x): \text{For all mammals, } \ast, \text{ they have hair, warm-blooded.}$$

↓
for all x.

$$\exists x P(x): \text{There exists a person with } \$1,000,000,000.$$

↓
there exist an x

$$Q(x): x^2 - 4x + 3 > 0$$

$$\forall x > 3 \quad Q(x).$$