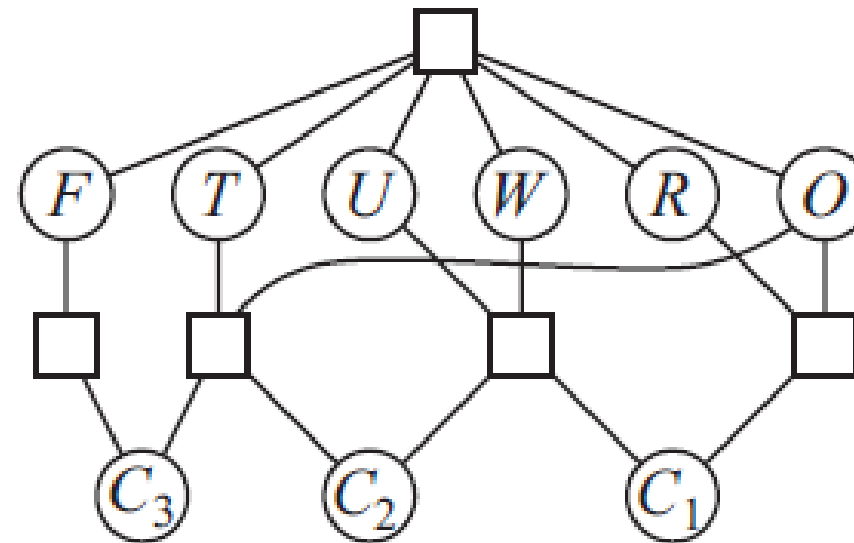


# Cryptarithmic Problems

$$\begin{array}{r}
 T \ W \ O \\
 + \ T \ W \ O \\
 \hline
 F \ O \ U \ R
 \end{array}$$

(a)



(b)

**Figure 6.2** (a) A cryptarithmic problem. Each letter stands for a distinct digit; the aim is to find a substitution of digits for letters such that the resulting sum is arithmetically correct, with the added restriction that no leading zeroes are allowed. (b) The constraint hypergraph for the cryptarithmic problem, showing the *Alldiff* constraint (square box at the top) as well as the column addition constraints (four square boxes in the middle). The variables  $C_1$ ,  $C_2$ , and  $C_3$  represent the carry digits for the three columns.

# Cryptarithmic Problem

$$\begin{array}{r} \phantom{00} \phantom{00} \\ + \phantom{00} \phantom{00} \\ \hline \phantom{00} \phantom{00} \phantom{00} \end{array}$$

$$\begin{array}{r} \phantom{00} \text{T} \text{O} \\ + \phantom{00} \text{G} \text{O} \\ \hline \text{O} \text{U} \text{T} \end{array}$$

| Character | Code |
|-----------|------|
| T         |      |
| O         |      |
| G         |      |
| U         |      |

|       |   |   |   |   |
|-------|---|---|---|---|
|       | S | E | N | D |
| +     | M | O | R | E |
| <hr/> |   |   |   |   |
| M     | O | N | E | Y |

|                      |                      |                      |                      |                      |
|----------------------|----------------------|----------------------|----------------------|----------------------|
|                      | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| +                    | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| <hr/>                |                      |                      |                      |                      |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| Character | Code |
|-----------|------|
| S         |      |
| E         |      |
| N         |      |
| D         |      |
| M         |      |
| O         |      |
| R         |      |
| Y         |      |

**B A S E**  
**+ B A L L**  

---

**G A M E S**  

---



|          |          |
|----------|----------|
| <b>B</b> | <b>7</b> |
| <b>A</b> | <b>4</b> |
| <b>S</b> | <b>8</b> |
| <b>E</b> | <b>3</b> |
| <b>L</b> | <b>5</b> |
| <b>G</b> | <b>1</b> |
| <b>M</b> | <b>9</b> |