Computers are not illogical.

Database queries

Suppose your boss wants a list of all elderly male employees, who earn less than $60,000 per year.

query: Age > 50 AND Gender = 'M' AND AnnualWage < 60000

Suppose the university Registrar needs a list of all students from a La Crosse high school with GPA above 3.5.

query:

Suppose the government wishes to offer loans to freshmen with a family income less than $30,000 but have no scholarships.

query:
Cruise Control Software Requirements

Requirement 1

\[\text{car is started} \implies \text{IsOn is set to false}\]

Requirement 2

\[\text{OFF switch is pressed} \implies \text{IsOn is set to false}\]

Requirement 3

\[\text{ON switch is pressed} \implies (\text{IsOn is set to true AND IsSet is set to false})\]

Requirement 4

\[(\text{SET switch is pressed AND IsOn=true}) \implies \text{IsSet is set to true AND SpeedSetting is set to CarSpeed}\]

Requirement 5

\[(\text{IsOn=true AND IsSet=true AND CarSpeed<SpeedSetting}) \implies \text{throttle speed is increased}\]
Program to translate exam scores to letter grades

```java
beginWithFirstExam;
while (moreExamsRemain) do {
    getNextExamScore;
    if (examScore > 89) then
        recordScoreAs("A");
    if (79<examScore AND examScore<90) then
        recordScoreAs("B");
    if (69<examScore AND examScore<80) then
        recordScoreAs("C");
    if (59<examScore AND examScore<70) then
        recordScoreAs("D");
    if (examScore<60) then
        recordScoreAs("F");
}
```

Digital Circuits 101

It is typical to consider the following:

<table>
<thead>
<tr>
<th>Logic</th>
<th>Electrical</th>
<th>Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>gnd</td>
<td>0</td>
</tr>
<tr>
<td>true</td>
<td>V⁺</td>
<td>1</td>
</tr>
</tbody>
</table>
Equivalence Circuit  
\[(\text{NOT } A \text{ AND NOT } B) \text{ OR } (A \text{ AND } B)\]

3-bit Greater than \((A > B)\)  
(suppose \(A\)'s bits are \(A_{\text{left}} A_{\text{mid}} A_{\text{right}}\) and \(B\)'s bits are \(B_{\text{left}} B_{\text{mid}} B_{\text{right}}\))

\[ \begin{align*}
&\text{(A_{\text{left}} \text{ AND NOT B}_{\text{left}})} \\
&\text{OR (A_{\text{left}} = B_{\text{left}}) AND (A_{\text{mid}} \text{ AND NOT B}_{\text{mid}})} \\
&\text{OR (A_{\text{left}} = B_{\text{left}}) AND (A_{\text{mid}} = B_{\text{mid}}) AND (A_{\text{right}} \text{ AND NOT B}_{\text{right}})}
\end{align*}\]