Write a program fragment to find the minimum value in

\[ q(x) = x^2 + bx + c \]

on the interval \([L, R]\), given \(b, c, L, R\).

Algorithm

- If \(x_c \in [L, R]\)
  - Calculate \(q(x_c) = -\frac{b^2}{4} + c\)
- Otherwise
  - Min value is minimum between \(q(L), q(R)\)

Another if statement!

Detailed Algorithm

Calculate \(x_c\)

\[
\text{if } L \leq x_c \leq R \quad \text{outer if statement}
\text{calculate } q_{\text{Min}}
\]

Otherwise

Calculate \(q_L, q_R\)

\[
\text{if } q_L \leq q_R \quad \text{inner if statement}
q_{\text{Min}} = q_L
\text{otherwise }
q_{\text{Min}} = q_R
\]

end
Logical operators

& & logical and
|| logical or
~ logical not

Note: MATLAB evaluates & & before ||

“false” is 0, “true” is non-zero

| X | Y | X & & Y | X || Y | ~X |
|---|---|---------|-------|----|
| 1 | 1 |     1   |   1   |  1 |
| 1 | 0 |     0   |   1   |  0 |
| 0 | 1 |     0   |   1   |  1 |
| 0 | 0 |     0   |   0   |  1 |

Top-Down Design

- State problem
- Define inputs & outputs
- Design algorithm
- Convert algorithm to program

How do we find the minimum value of a general function $f(x)$ within some specified domain?

Within the domain, repeatedly choose $x$ value and evaluate $f(x)$. 