Problem 11.19:

A photograph of a bullet shows a Mach angle of 28°. Determine the speed of the bullet for standard air.

**Given**: Photo of bullet moving through standard air shows Mach angle, \( \alpha := 28 \text{ deg} \)

**Find**: Speed of bullet

**Solution**:
Computing equations, \( \sin(\alpha) = \frac{1}{M} \) and \( C = \sqrt{kR \cdot T} \)

Assumptions: (1) air behaves as an ideal gas
(2) constant specific heats

\[
M = \frac{1}{\sin(\alpha)} \quad \text{and} \quad M = \frac{V}{C} \quad \text{Thus} \quad V = C \cdot M = \frac{C}{\sin(\alpha)}
\]

Since \( C = \sqrt{kR \cdot T} \) then

\[
V := \frac{1}{\sin(\alpha)} \sqrt{(kR \cdot T)}
\]

\[
V = 724.589 \frac{m}{s}
\]