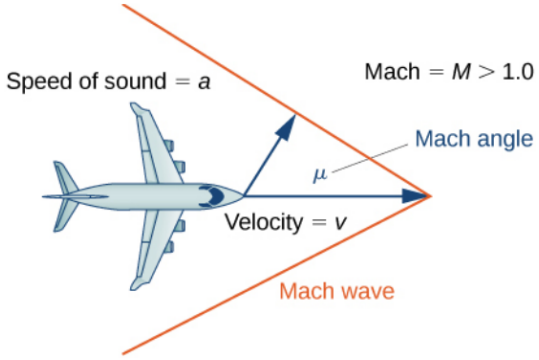
Exercise 221

An airplane's Mach number M is the ratio of its speed to the speed of sound. When a plane is flying at a constant altitude, then its Mach angle is given by $\mu = 2\sin^{-1}\left(\frac{1}{M}\right)$. Find the Mach angle (to the nearest degree) for the following Mach numbers.



a. $M = 1.4$

b. $M = 2.8$

c. $M = 4.3$

Solution

Plug the given numbers into the formula for μ. If $M = 1.4$, then

$$\mu = 2\sin^{-1}\left(\frac{1}{1.4}\right) \approx 91°.$$

If $M = 2.8$, then

$$\mu = 2\sin^{-1}\left(\frac{1}{2.8}\right) \approx 42°.$$

If $M = 4.3$, then

$$\mu = 2\sin^{-1}\left(\frac{1}{4.3}\right) \approx 27°.$$