99. With $v_0 = 30$ m/s and $R = 20$ m, Eq. 4-26 gives

$$\sin 2\theta_0 = \frac{gR}{v_0^2} = 0.218 \ .$$

Because $\sin(\phi) = \sin(180° - \phi)$, there are two roots of the above equation:

$$2\theta_0 = \sin^{-1}(0.218) = 12.6° \quad \text{and} \quad 167.4° \ .$$

Therefore, the two possible launch angles that will hit the target (in the absence of air friction and related effects) are $\theta_0 = 6.3°$ and $\theta_0 = 83.7°$. An alternative approach to this problem in terms of Eq. 4-25 (with $y = 0$ and $1/\cos^2 = 1 + \tan^2$) is possible – and leads to a quadratic equation for $\tan\theta_0$ with the roots providing these two possible θ_0 values.