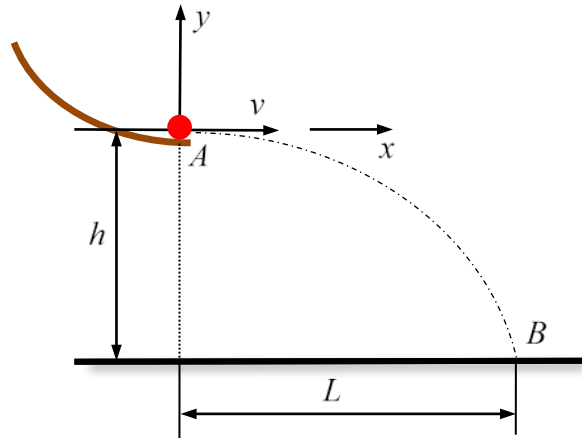1-7. A marble ball slides off the ramp with a horizontal velocity. If the velocity is normally distributed $v \sim N(2, 0.2^2)$ m/s, and the height of the ramp is $h = 2$ m from the ground, what is the probability that the range L where the marble hits the ground is smaller than 1.2 m?

$$(+\uparrow) \; y_B = y_A + (v_A)_y t + \frac{1}{2} a t^2$$

$$-h = 0 + 0 + \frac{1}{2}(-g)t^2$$

$$t = \sqrt{2h/g}$$

$$(+\rightarrow) \; x_B = x_A + (v_A)_x t$$

$$L = 0 + vt$$

$$L = v\sqrt{2h/g}$$

$$\mu_L = \mu_v \sqrt{2h/g} = 2\sqrt{2(2)/9.81} = 1.28 \text{ m}$$

$$\sigma_L = \sigma_v \sqrt{2h/g} = 0.2\sqrt{2(2)/9.81} = 0.13 \text{ m}$$

$$\Pr\{L < 1.2\} = \Phi\left(\frac{1.2 - \mu_L}{\sigma_L}\right) = \Phi\left(\frac{1.2 - 1.28}{0.13}\right) = 0.27$$