



set the vertex of parabola at $(0, 2h)$
 equation of parabola
 is $y = 2h - kx^2$

$$\begin{aligned} \text{when } y = h, \quad h &= 2h - kx^2 \\ kx^2 &= h \\ x^2 &= \frac{h}{k} \\ x &= \pm \sqrt{\frac{h}{k}} \end{aligned}$$

\therefore bird flies a total of $2\sqrt{\frac{h}{k}}$ metres at 10 m/s

$$\begin{aligned} \text{time} &= \frac{d}{s} \\ &= \frac{2\sqrt{\frac{h}{k}}}{10} \\ &= \frac{1}{5}\sqrt{\frac{h}{k}} \end{aligned}$$

$$\text{when } y = 0, \quad 0 = 2h - kx^2$$

$$\begin{aligned} kx^2 &= 2h \\ x^2 &= \frac{2h}{k} \\ x &= \pm \sqrt{\frac{2h}{k}} \end{aligned}$$

$$\begin{aligned} \therefore \text{rock travels } &\sqrt{\frac{2h}{k}} + \sqrt{\frac{h}{k}} \\ &= \sqrt{\frac{h}{k}}(\sqrt{2} + 1) \text{ metres horizontally} \end{aligned}$$

$$\begin{aligned} \text{velocity} &= \frac{d}{t} \\ &= \frac{\sqrt{\frac{h}{k}}(\sqrt{2} + 1)}{\frac{1}{5}\sqrt{\frac{h}{k}}} \\ &= \underline{5(\sqrt{2} + 1) \text{ m/s}} \\ &= 12.1 \text{ m/s (to 1 dp)} \end{aligned}$$