In an historical movie, two knights on horseback start from rest 92.3 m apart and ride directly toward each other to do battle. Sir George's acceleration has a magnitude of 0.245 m/s2, while Sir Alfred's has a magnitude of 0.227 m/s2. Relative to Sir George's starting point, where do the knights collide?

Solution

a_G - Sir George's acceleration, a_A - Sir Alfred's acceleration, t – time before collision,

s – the distance between two knights, s_G – the distance where do the knights collide relative to Sir George's starting point.

The space between the knights diminishes at acceleration

$$a = a_G + a_A = 0.245\frac{\text{m}}{\text{s}^2} + 0.227\frac{\text{m}}{\text{s}^2} = 0.472\frac{m}{s^2}.$$

Collision occurs when $s = \frac{at^2}{2}$:

$$s = \left(\frac{1}{2}\right) * 0.472\frac{m}{s^2} * \ t^2 = 92.3\ \text{m} \ \rightarrow t^2 = 391.102 \rightarrow t \ = \ 19.8\, s.$$

George will have moved

$$s_G = \frac{a_G t^2}{2} = \left(\frac{1}{2}\right) * 0.245 * 19.8^2 = 48\ m$$ from his initial position at that time.

Answer: $47.908\ m$.