Examples from Ch. 3

• A pigeon is flying at $\mathbf{v}_p = -\widehat{\mathbf{i}}(2\text{ m/s})$ as seen from the ground. Above the pigeon is a hawk with a velocity of $\mathbf{v}_h = -\widehat{\mathbf{j}}[5\text{ m/s}]$ as seen from the ground. What's the velocity of the hawk as seen by the pigeon? What angle does that velocity make with the vertical?

• A toy car is travelling in a circle of radius 100 m at a constant speed of 100 m/s. What is the acceleration of the toy car?

A Zero, the car has constant speed.

B 100 m/s^2 in magnitude, perpendicular to $\mathbf{v}$ in direction.

C None of the above.

• A little boy is playing with a cubical wooden crate with side length L. He lays his popgun horizontally on one side of the crate and fires across the open top of the crate. The pellet from the popgun hits at the point where the bottom of the crate joins the opposite side. Show that the initial horizontal speed of the pellet must have been $v_0 = \sqrt{(gL)/2}$.

A ball is thrown from $x = y = 0$ at velocity $\mathbf{v}_0$ and angle θ_0. What is the speed of the ball when it has come back down half the distance from its maximum height h? The answer should involve only v_0 and θ_0.

Answer: $v = v_0\sqrt{1 - (\sin^2\theta_0)/2}$.