15. Since the x and y components of the acceleration are constants, then we can use Table 2-1 for the motion along both axes. This can be handled individually (for Δx and Δy) or together with the unit-vector notation (for Δr). Where units are not shown, SI units are to be understood.

   (a) Since $\vec{r}_0 = 0$, the position vector of the particle is (adapting Eq. 2-15)

$$\begin{aligned} \vec{r} &= \vec{v}_0 t + \frac{1}{2}\vec{a}t^2 \\ &= (8.0\,\hat{\jmath})t + \frac{1}{2}(4.0\,\hat{\imath} + 2.0\,\hat{\jmath})t^2 \\ &= (2.0t^2)\,\hat{\imath} + (8.0t + 1.0t^2)\,\hat{\jmath}\ . \end{aligned}$$

   Therefore, we find when $x = 29$ m, by solving $2.0t^2 = 29$, which leads to $t = 3.8$ s. The y coordinate at that time is $y = 8.0(3.8) + 1.0(3.8)^2 = 45$ m.

   (b) Adapting Eq. 2-11, the velocity of the particle is given by

$$\vec{v} = \vec{v}_0 + \vec{a}t\ .$$

   Thus, at $t = 3.8$ s, the velocity is

$$\vec{v} = 8.0\,\hat{\jmath} + (4.0\,\hat{\imath} + 2.0\,\hat{\jmath})(3.8) = 15.2\,\hat{\imath} + 15.6\,\hat{\jmath}$$

   which has a magnitude of

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{15.2^2 + 15.6^2} = 22 \text{ m/s}\ .$$