16. The acceleration is constant so that use of Table 2-1 (for both the x and y motions) is permitted. Where units are not shown, SI units are to be understood. Collision between particles A and B requires two things. First, the y motion of B must satisfy (using Eq. 2-15 and noting that θ is measured from the y axis)

$$y = \frac{1}{2} a_y t^2 \implies 30 = \frac{1}{2} (0.40 \cos\theta)\, t^2 \ .$$

Second, the x motions of A and B must coincide:

$$vt = \frac{1}{2} a_x t^2 \implies 3.0t = \frac{1}{2} (0.40 \sin\theta)\, t^2 \ .$$

We eliminate a factor of t in the last relationship and formally solve for time:

$$t = \frac{3}{0.2 \sin\theta} \ .$$

This is then plugged into the previous equation to produce

$$30 = \frac{1}{2} (0.40 \cos\theta) \left(\frac{3}{0.2 \sin\theta} \right)^2$$

which, with the use of $\sin^2\theta = 1 - \cos^2\theta$, simplifies to

$$30 = \frac{9}{0.2} \frac{\cos\theta}{1 - \cos^2\theta} \implies 1 - \cos^2\theta = \frac{9}{(0.2)(30)} \cos\theta \ .$$

We use the quadratic formula (choosing the positive root) to solve for $\cos\theta$:

$$\cos\theta = \frac{-1.5 + \sqrt{1.5^2 - 4(1)(-1)}}{2} = \frac{1}{2}$$

which yields

$$\theta = \cos^{-1}\left(\frac{1}{2}\right) = 60^\circ \ .$$