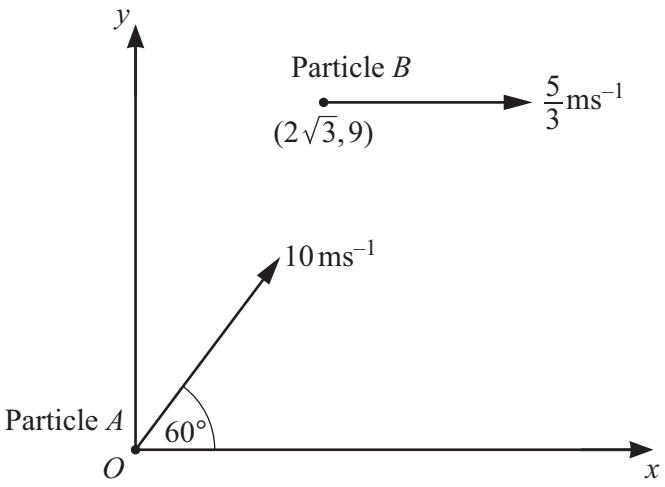
**11** In this question **i** is a unit vector in the positive $x$-direction and **j** is a unit vector in the positive $y$-direction. Time is in seconds and distances are in metres.

The diagram shows the initial positions and velocities of two particles, $A$ and $B$, that move in the $x$-$y$ plane.




Particle $A$ starts from the origin $O$ at time $t = 0$. It moves with constant speed $10\,\text{ms}^{-1}$ in the direction 60° above the $x$-axis.

**(a)** Find the exact values of the components of the velocity of particle $A$ in the $x$-direction and the $y$-direction. [2]

**(b)** Find, in terms of $t$, the position vector of particle $A$ at time $t$. [1]

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Particle $B$ starts from the point $(2\sqrt{3}, 9)$ at time $t = 0$. It moves with constant speed $\frac{5}{3}\text{ms}^{-1}$ parallel to the positive $x$-axis.

**(c)** Find, in terms of $t$, the position vector of particle $B$ at time $t$. [2]

**(d)** Hence show that the particles collide. [4]

**Question 12 is printed on the next page.**



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**12** A metal tank is in the shape of a cuboid with a square base of side $x$ m and an open top. The tank has a volume of $5\,m^3$. Given that $x$ can vary, and that the area of the metal used to make the tank is a minimum, find the dimensions of the tank. [6]

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