10 In this question, all distances are in metres and time, t, is in seconds.

A particle P is at a fixed point O at time $t = 0$.
The velocity, v, of P is given by $v = 3\sin 2t$ for $t \geqslant 0$.

(a) Find the exact value of t for which the velocity is zero for the first time after P leaves O. [2]

(b) Find an expression, in terms of t, for the displacement of P from O at time t. [4]

(c) Find the distance travelled by P for $0 \leqslant t \leqslant \pi$. [3]