6 (a) Define Simple Harmonic Motion.

The distance, x, of a particle from a fixed point, o, is given by
$x = 7\sin\omega t + 24\cos\omega t$, ω being a constant.

(i) Show that the particle is describing simple harmonic motion about o.

(ii) Calculate the amplitude of the motion.

The motion of a particle is simple harmonic motion if its acceleration towards a particular point is proportional to its displacement from that point.

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(i) $x = 7\sin\omega t + 24\cos\omega t$

$\dfrac{dx}{dt} = 7\omega\cos\omega t - 24\omega\sin\omega t$

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$\dfrac{d^2x}{dt^2} = -7\omega^2\sin\omega t - 24\omega^2\cos\omega t$

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$= -\omega^2 x$

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$\therefore$ S.H.M. about $x = 0$

(ii) amplitude $= \sqrt{7^2 + 24^2}$

$= 25$

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