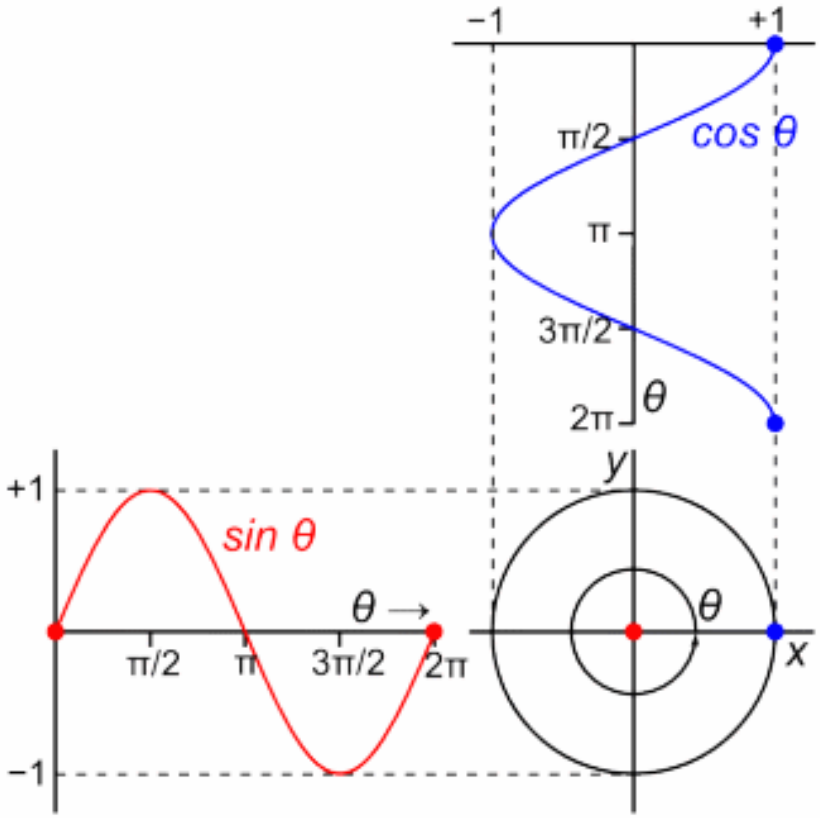
Physics Level 3 S.H.M.
Reference Circle
Structure

- Simple Harmonic Motion
  - Reference Circle
    - $d_y = A\sin(\omega t)$ - $d_x = A\cos(\omega t)$
    - $v_y = A\omega\cos(\omega t)$ - $v_x = -A\omega\sin(\omega t)$
    - $a_y = -A\omega^2\sin(\omega t)$ - $a_x = -A\omega^2\cos(\omega t)$
    - $F_y = -mA\omega^2\sin(\omega t)$ - $F_x = -mA\omega^2\cos(\omega t)$



- $\omega = a_c/\sqrt{A}$ - from centripetal acceleration
  $a_c = v^2/r$ and $v = r\omega$
- $T = 1/f$
- $\omega = 2\pi f$ & $\omega = 2\pi/T$ $\therefore T = 2\pi/\omega$

$a_c = v^2/r$
$\Rightarrow a_c = v^2/A$
$\Rightarrow a_c = (\omega A)^2/A$
$\Rightarrow a_c = \omega^2 A^2/A$
$\Rightarrow a_c = \omega^2 A$
$\Rightarrow a_c/A = \omega^2$
$\Rightarrow \sqrt{(a_c/A)} = \omega$
$\Rightarrow \omega = \sqrt{(a_c/A)}$