The centripetal force F on mass m travelling in a circle with angular velocity ω (radians / s) is given by

$$F = mr\omega^2$$

The force necessary to produce an acceleration a in a mass m is given by

$$F = ma$$

Thus we can derive the centripetal acceleration

$$mr\omega^2 = ma$$

$$a = r\omega^2$$

Now we require that a=*g*, and to solve for ω; thus we have

$$\omega^2 = \frac{g}{r}$$

$$\omega = \sqrt{\frac{g}{r}}$$

An angular velocity of ω rad/s is equal to ω/2π revolutions / second or 60ω/2π rpm. This is 9.549 ω, expressed to 3dp. The angular velocity Ω rpm needed to produce an acceleration of *g*, is therefore given by

$$\Omega = 9.549\sqrt{\frac{g}{r}}$$

$$= 9.549\sqrt{g}\frac{1}{\sqrt{r}}$$

Taking *g*=9.807, we have $\sqrt{g} = 3.132$, and thus

$$\Omega = (9.549)(3.132)\frac{1}{\sqrt{r}}$$

$$= 29.907\frac{1}{\sqrt{r}}$$

$$\approx 30\frac{1}{\sqrt{r}}$$