



A communication satellite has a period, $T_c = 1$ day. The orbital radius $r_c = 6.6 R$, with R , the earth's radius. A new satellite has its orbital radius $r_{new} = \frac{r_c}{4}$.

Determine its period T_{new} , in terms of T_c . (Sketch is not drawn to scale)

- A) $T_{new} = \frac{r_{new}}{r_c} T_c.$
- B) $T_{new} = \left(\frac{r_{new}}{r_c}\right)^{\frac{3}{2}} T_c.$
- C) $T_{new} = \frac{r_c}{r_{new}} T_c.$
- D) $T_{new} = \left(\frac{r_c}{r_{new}}\right)^{\frac{3}{2}} T_c.$

$$g = G \frac{M}{r^2}$$

$$\frac{g_1}{g_2} = \frac{r_2^2}{r_1^2}$$

$$\frac{T_2}{T_1} = \frac{\omega_1}{\omega_2} = \sqrt{\frac{g_1 r_2}{g_2 r_1}} = \left(\frac{r_2}{r_1}\right)^{\frac{3}{2}} .$$

$$T_{new} = \left(\frac{r_{new}}{r_c}\right)^{\frac{3}{2}} T_c .$$

Answer **B**

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