



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

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

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

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

Answer **B**