Circular Motion Quiz

Svadrut Kukunooru

September 23, 2020

10. Miranda has a mass of 67.6 kg and now flies her plane in a vertical loop of similar radius as before: 597.1 m. If her uniform speed is no 109.6 $m \cdot s^{-1}$, what is the normal force acting on her at the top of her path? I am assuming your answer is in N.

$$F_n = F_g - F_c.$$

$$F_n = mg - \frac{mv^2}{r}.$$

$$F_n = (67.6 \times 9.8) - \frac{67.6 \times 109.6^2}{597.1}.$$

$$F_n = \boxed{697.6 \text{ N in the other direction.}}$$

11. Miranda flies her plane in a vertical loop of radius 600.4 m such that at the top of the loop she just experiences "apparent weightlessness". What is the uniform speed, in $m \cdot s^{-1}$, of the plane that will result in this experience?

$$g = \frac{v^2}{r}.$$

$$9.8 = \frac{v^2}{600.4}.$$

$$v = \boxed{76.71 \ \frac{m}{s}.}$$

12. Miranda's twin sister, MElinda, is also a stunt pilot. Melinda has a mass of 65.57 kg. When she flies herp lane in a vertical loop such that the bottom has a radius of curvature of 618.9 m at 107.3 $m \cdot s^{-1}$, what is the normal force she will feel when she is at the bottom of her loop? I will assume your answer is in N (newtons).

$$F_n = F_c - F_g.$$

$$F_c = \frac{mv^2}{r} - mg.$$

$$F_c = \frac{65.57 \times 107.3^2}{618.9} - (65.57 \times 9.8).$$

$$F_c = \boxed{577.2 \text{ N}}.$$

13. A toy train of mass 280 g is travelling on a circular track of radius 45.5 cm at a speed of 29.1 $cm \cdot s^{-1}$. What is the magnitude of the net force, in N, allowing it to remain in its circular path? $F_n = \frac{mv^2}{r}$.

$$F_n = \frac{0.280 \times 0.291^2}{0.455}.$$

$$F_n = \boxed{0.052 \text{ N}}.$$

A race car with a mass of 1575 kg goes around a flat circular track of radius 230.1 m at a constant speed of 268.7 km h. What is the car's centripetal accleration?

$$F_c = \frac{v^2}{r}.$$

$$F_c = \frac{74.6^2}{230.1}.$$

$$F_c = \boxed{24.1}.$$