

Centripetally Directed Accelerations and Forces

Name: _____

- 1.1 To withstand "g-forces" of up to 10 g's, caused by suddenly pulling out of a steep dive, fighter jet pilots train on a "human centrifuge." 10 g's is an acceleration of 98 m/s^2 . If the length of the centrifuge arm is 12 m, at what speed is the rider moving when she experiences 10 g's?

Ans:

- 1.2 A particle rotates in a circle with centripetal acceleration $a_c = 8.0 \text{ m/s}^2$. What is a_c if (a) the radius is doubled without changing the particle's speed and (b) the speed is doubled without changing the circle's radius?

Ans:

Ans:

- 1.3 A peregrine falcon in a tight, circular turn can attain a centripetal acceleration 1.5 times the free-fall acceleration. If the falcon is flying at 20.0 m/s , what is the radius of the turn?

Ans:

- 2.1 A 200.0 g block on a 50.0 cm long string swings in a circle on a horizontal, frictionless table at 75.0 rpm . What is the speed of the block? What is the tension in the string?

Ans:

Ans:

- 2.2 A 1500.0 kg car drives around a flat 200.0 m diameter circular track at 25 m/s . What are the magnitude and direction of the net force on the car? What causes this force?

Ans:

Ans:

- 2.3 The passengers in a roller coaster feel 50.0% heavier than their true weight as the car goes through a dip with a 30.0m radius of curvature. What is the car's speed at the bottom of the dip?

Ans:

- 3.1 You hold a bucket in one hand. In the bucket is a 500g rock. You swing the bucket so the rock moves in a vertical circle of radius 1.1m. What is the minimum speed the rock must have at the top of the circle if it is to always stay in contact with the bottom of the bucket? (Start with a FBD and show all calculations.)

Ans:

- 3.2 Find the minimum speed for a roller coaster to just barely make it around the top of a loop-the-loop of radius 30.0m. (Start with a FBD and show all calculations.)

Ans:

- 3.3 If the coefficient of static friction between rubber tires and dry concrete is 0.95, determine the maximum speed a car can make a turn of radius 85.0 meters on horizontal concrete road without skidding. (Start with a FBD and show all calculations.)

Ans: