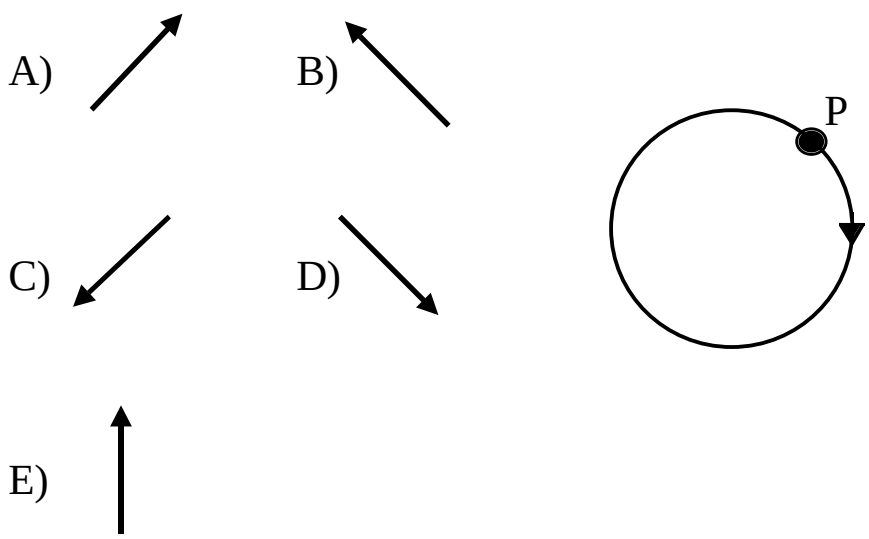
Chapter 5

A 1500 kg car travels at a constant speed of 22 m/s around a circular track which has a radius of 80 m.

Which statement is true concerning this car?

A) The velocity of the car is changing.
B) The car is characterized by constant velocity.
C) The car is characterized by constant acceleration.
D) The car has a velocity vector that points along the radius of the circle.
E) The car has an acceleration vector that is tangent to the circle at all times.

A rock is twirled on a string at a constant speed. The direction of its acceleration at point P is



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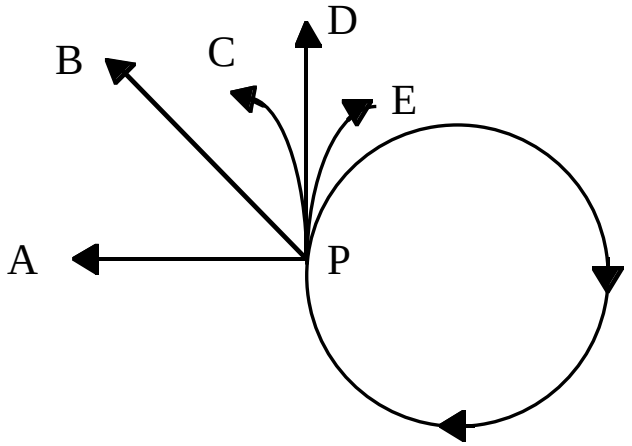
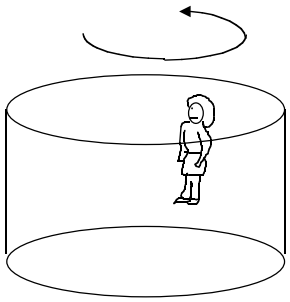
A girl attaches a rock to a string which she then swings clockwise in a horizontal circle. The string breaks at point P on the sketch which shows a view from above. What path will the rock follow?

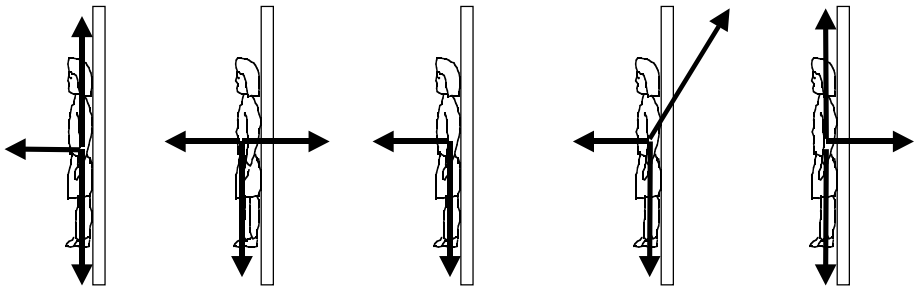


A boy is whirling a stone around his head by means of a string. The string makes one revlution every second and the tension in the string is *T*. The boy then speeds up the stone, keeping the radius of the circle unchanged so that the string makes two complete revolutions every second. What happens to the tension in the string?

A) It remains unchanged
B) It is reduced to half of its original value.
C) It is increased to twice its original value.
D) It is reduced to one-fourth of its original value.
E) It is increased to four times its original value.

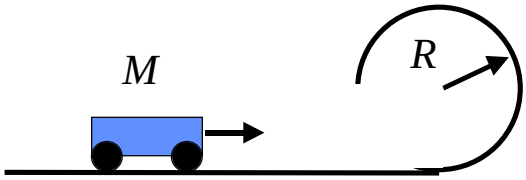
A rider in an amusement park ride, the "barrel of fun" finds herself stuck with her back to the wall. Which diagram correctly shows the forces acting on her?





A) B) C) D) E)

A cart of mass M travels along a straight horizontal track. As suggested in the figure, the track then bends into a vertical circle of radius R.
Which expression determines the minimum speed that the car must have at the top of the track if it is to remain in contact with the track?



A) $v = MgR$ B) $v^2 = 2gR$ C) $v = gR$
D) $v = 2gR$ E) $v^2 = gR$

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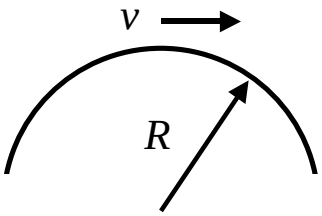
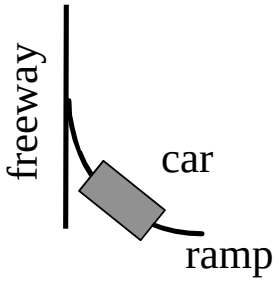
A plane is travelling at 200 m/s following the arc of a vertical circle of radius *R*. At the top of its path, the passengers experience "weightlessness". To one significant figure, what is the value of *R*?



A) 200 m
B) 1,000 m
C) 2,000 m
D) 4,000 m
E) 40,000 m

A car is speeding up as it enters the freeway on a circular entrance ramp as shown in the figure at right. What is the direction of the acceleration of the car when it is at the point indicated?



A)  B)  C)  D)  E) 

A spaceship is traveling to the moon. At what point is it beyond the pull of the earth's gravity? The mas of the moon is 1/80 the mass of the earth, and the surface gravity of the moon is 1/6 that of the earth.

A) When it gets out of the atmosphere.
B) When it is half-way there.
C) When it is 5/6 of the way there.
D) When it is 79/80 of the way there.
E) It is never beyond the pull of earth's gravity.

The Moon does not fall to Earth because

A) It is in Earth's gravitational field
B) The net force on it is zero.
C) It is beyond the main pull of Earth's gravity.
D) It is being pulled by the Sun and planets as well as by Earth.
E) None of the above.

Chapter 5

Two satellites *A* and *B* of the same mass are going around the earth in concentric orbits. The distance of satellite *B* from the earth is twice that of satellite *A*. What is the ratio of the centripetal force acting on *B* to that acting on *A*?

A) 1/8
B) 1/4
C) 1/2
D) $1/\sqrt{2}$
E) 1

Two satellites *A* and *B* of the same mass are going around the earth in concentric orbits. The distance of satellite *B* from the earth is twice that of satellite *A*. What is the ratio of the tangential speed of *B* to that of *A*?

A) 1/2
B) $1/\sqrt{2}$
C) 1
D) $\sqrt{2}$
E) 2

Chapter 5

The earth exerts the necessary centripital force on an orbiting satellite to keep it moving in a circle at constant speed. Which statement best explains why the speed of the satellite does not change even though there is a net force exerted on it?

A) The acceleration of the satellite is zero.
B) The centripital force has a magnitude of mv^2/r.
C) The centripital force is canceled out by the reaction force.
D) The centripital force is always perpendicular to the velocity.
E) The satellite is in equilibrium, which means there is no net force acting on it.

An astronaut is inside a space shuttle in orbit around the earth. She is able to float inside the shuttle because

A) her weight is zero, and her shuttle's weight is zero.
B) the force of gravity is very small on the astronaut.
C) she and her shuttle move with the same constant velocity.
D) she and her shuttle move with the same centripetal acceleration.
E) The force of the earth on the spaceship and the force of the spacehip on the earth cancel because they are equal in magnitude and opposite in direction.

A satellite encircles Mars at a distance above its surface equal to 3 times the radius of Mars. The acceleration of gravity of the satellite, as compared to the acceleration of gravity on the surface of Mars, is

A) zero.

B) the same

C) one-third as much.

D) one-ninth as much.

E) one-sixteenth as much.