Sample Test

Name _____

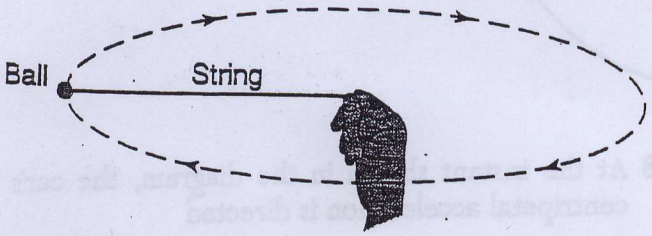
Centripetal Force

centripetal accel.

Gravity

1 to 3

Base your answers to questions 59 through 61 on the diagram below. The diagram shows a student spinning a 0.10-kilogram ball at the end of a 0.50-meter string in a horizontal circle at a constant speed of 10. meters per second. [Neglect air resistance.]



Note that question 59 has only three choices.

59 If the magnitude of the force applied to the string by the student's hand is increased, the magnitude of the acceleration of the ball in its circular path will

(1)

1 decrease
2 increase
3 remain the same

60 The magnitude of the centripetal force required to keep the ball in this circular path is

(2)

(1) 5.0 N
(2) 10. N
(3) 20. N
(4) 200 N

61 Which is the best description of the force keeping the ball in the circular path?

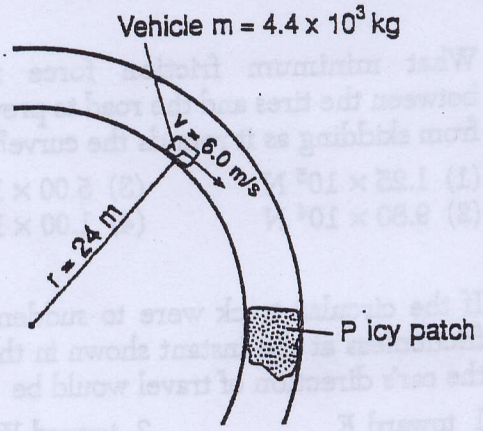
(3)

1 perpendicular to the circle and directed toward the center of the circle
2 perpendicular to the circle and directed away from the center of the circle
3 tangent to the circle and directed in the same direction that the ball is moving
4 tangent to the circle and directed opposite to the direction that the ball is moving

4 & 5

Base your answers to questions 56 and 57 on the information and diagram below.

A vehicle travels at a constant speed of 6.0 meters per second around a horizontal circular curve with a radius of 24 meters. The mass of the vehicle is 4.4×10^3 kilograms. An icy patch is located at *P* on the curve.



56 What is the magnitude of the frictional force that keeps the vehicle on its circular path?

(4)

(1) 1.1×10^3 N
(2) 6.6×10^3 N
(3) 4.3×10^4 N
(4) 6.5×10^4 N

57 On the icy patch of pavement, the frictional force on the vehicle is zero. Which arrow best represents the direction of the vehicle's velocity when it reaches icy patch *P*?

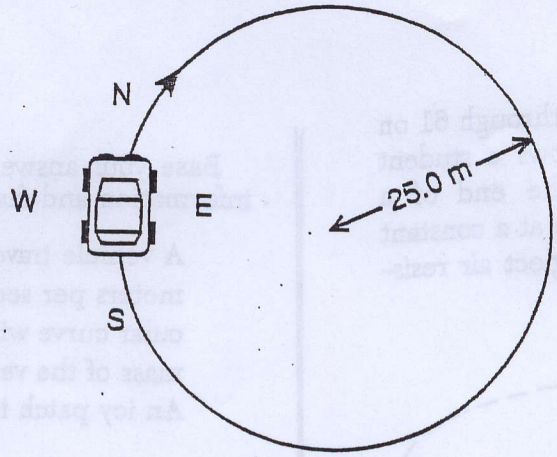
(5)

(1) →
(2) ←
(3) ↑
(4) ↓

Base your answers to questions 56 through 59 on the information and diagram below.

A 1.00×10^3-kilogram car is driven clockwise around a flat circular track of radius 25.0 meters. The speed of the car is a constant 5.00 meters per second.

6 to 9



56 What minimum friction force must exist between the tires and the road to prevent the car from skidding as it rounds the curve?

(6)

(1) 1.25×10^5 N
(2) 9.80×10^4 N
(3) 5.00×10^3 N
(4) 1.00×10^3 N

57 If the circular track were to suddenly become frictionless at the instant shown in the diagram, the car's direction of travel would be

(7)

1 toward E
2 toward N
3 toward W
4 a clockwise spiral

58 At the instant shown in the diagram, the car's centripetal acceleration is directed

(8)

1 toward E
2 toward N
3 toward W
4 clockwise

59 Which factor, when doubled, would produce the greatest change in the centripetal force acting on the car?

(9)

1 mass of the car
2 radius of the track
3 velocity of the car
4 weight of the car

An amusement park ride moves a rider at a constant speed of 14 meters per second in a horizontal circular path of radius 10. meters. What is the rider's centripetal acceleration in terms of g, the acceleration due to gravity?

(1) 1g
(2) 2g
(3) 3g
(4) 0g

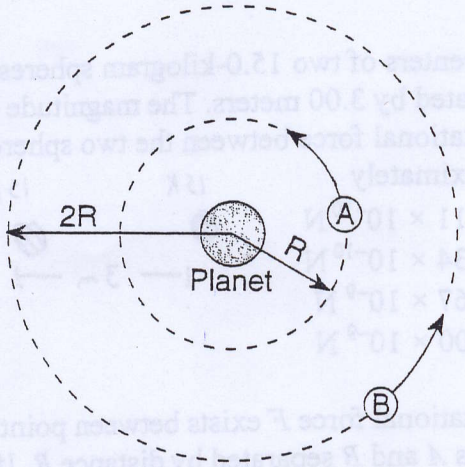
Note 1g = 10 m/s² of acceleration

Gravity

10) As the distance between two objects increases, the gravitational force of attraction between them will

(1) decrease
(2) increase
(3) remain the same

11) The diagram below represents two satellites of equal mass, *A* and *B*, in circular orbits around a planet.

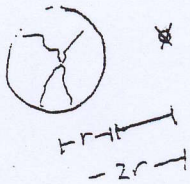


Compared to the magnitude of the gravitational force of attraction between satellite *A* and the planet, the magnitude of the gravitational force of attraction between satellite *B* and the planet is

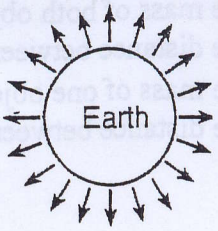
(1) half as great
(2) twice as great
(3) one-fourth as great
(4) four times as great

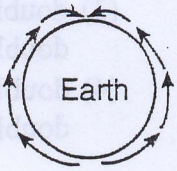
12) A satellite weighs 200 newtons on the surface of Earth. What is its weight at a distance of one Earth radius above the surface of Earth?

(1) 50 N
(2) 100 N
(3) 400 N
(4) 800 N

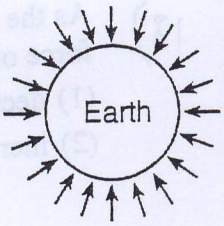


13) Which diagram best represents the gravitational field lines surrounding Earth?

(1)


(3)


(2)


(4)


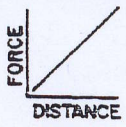
14) If the distance between a spaceship and the center of the Earth is increased from one Earth radius to 4 Earth radii, the gravitational force acting on the spaceship becomes approximately

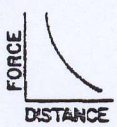
(1) 1/16 as great
(2) 1/4 as great
(3) 16 times greater
(4) 4 times greater

15) Two objects of fixed mass are moved apart so that they are separated by three times their original distance. Compared to the original gravitational force between them, the new gravitational force is

(1) one-third as great
(2) one-ninth as great
(3) three times greater
(4) nine times greater

16) Which graph best represents the gravitational force between two point masses as a function of the distance between the masses?

(1)


(3)


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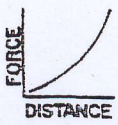
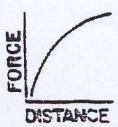


(4)


17) The gravitational force of attraction between two objects would be increased by

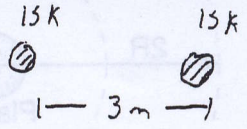
(1) doubling the mass of both objects, only
(2) doubling the distance between the objects, only
(3) doubling the mass of both objects and doubling the distance between the objects
(4) doubling the mass of one object and doubling the distance between the objects

18) As the mass of a body increases, its gravitational force of attraction on the Earth

(1) decreases
(2) increases
(3) remains the same

19) The centers of two 15.0-kilogram spheres are separated by 3.00 meters. The magnitude of the gravitational force between the two spheres is approximately

(1) 1.11×10^{-10} N
(2) 3.34×10^{-10} N
(3) 1.67×10^{-9} N
(4) 5.00×10^{-9} N

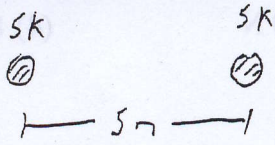


20) Gravitational force F exists between point objects A and B separated by distance R. If the mass of A is doubled and distance R is tripled, what is the new gravitational force between A and B?

(1) $\frac{2F}{9}$
(2) $\frac{2F}{3}$
(3) $\frac{3F}{2}$
(4) $\frac{9F}{2}$

21) What is the magnitude of the gravitational force between two 5.0-kilogram masses separated by a distance of 5.0 meters?

(1) 5.0×10^{0} N
(2) 3.3×10^{-10} N
(3) 6.7×10^{-11} N
(4) 1.3×10^{-11} N



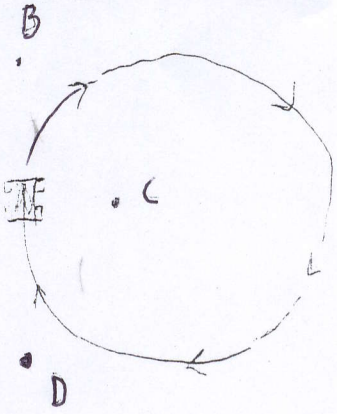
Answers

1 - 2
2 - 3
3 - 1
4 - 2
5 - 4
6 - 4
7 - 2
8 - 1
9 - 3
10 - 2
10 - 1
11 - 3
12 - 1
13 - 4
14 - 1
15 - 2
16 - 3
17 - 1
18 - 2
19 - 3
20 - 1
21 - 3

Name _____

Problem 1 -

A car travels around a circular track of radius 50 meters. The car completes a revolution around the track in 20 seconds. The car has a mass Of 1200 kg.



A - What distance does the car travel in 1 revolution around the track. [1]

d=_____ meters

B - What is the cars velocity as it rounds the track. (Show equ. With sub. & units) [2]

C - What is the size (magnitude) of the Cars centripetal acceleration. (Show equ. With sub. & units) [2]

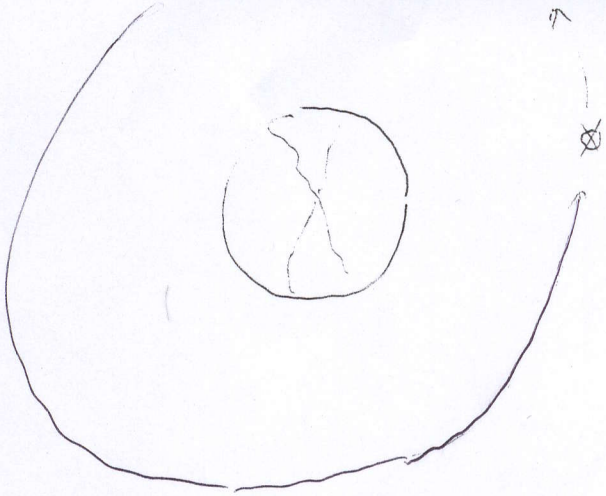
D - I the position shown which direction does the centripetal force point. What is the size of the centripetal force.

Direction ⇒ _____ F_c ⇒ _____ N

E - If the maximum frictional force (Static wall) the tires and track surface is 10000 newtons, Can this car go around this track at this speed without skidding off ? Explain [1]

Problem 2 -

A 100 kg communications satellite is placed in orbit, When in this orbit the Satellite experiences a attractive force toward the Earth of 61 Newtons, and orbits with a speed of 3956 m/s.



- Find the distance between the center of the Earth & center of satellite.
  (show equ. With sub. & units) [3]

- If a meteorite crashed into the satellite So that its mass doubled and was moved closer to the Earth by 2X what would happen to the gravitational force between the satellite and Earth. [1]

Long problems

1- (A) - $2\pi r$

$2(3.14)(50m) = 314m$

(B) $V = \frac{d}{t} = \frac{314m}{20sec}$

$= 15.7 m/s$

(C) $a_c = \frac{v^2}{r}$

$a_c = \frac{(15.7 m/s)^2}{50m}$

$a_c = 4.9 m/s^2$

(D) Direct = C

$F_c = 1200K\,(4.9 m/s^2)$

$= 5915N$

E - Yes 5915 much less than static wall 10,000N

2- $M_{Earth} = 5.98 \times 10^{24} Kg$

(A)

$F_g = G \frac{M_E m_{sat}}{r^2}$

$G(N) = 6.67 \times 10^{-11} N\frac{m^2}{Kg^2}$ $\frac{(5.98 \times 10^{24} Kg)(100 Kg)}{r^2}$

$r = 2,557,105$ meter

(B) closer 2X

$F_{gravity}$ up by 4X