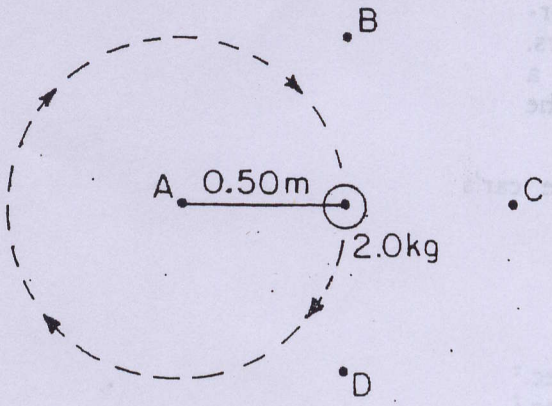
Centripetal & Gravity
Test

Name_____

Base your answers to questions 67 through 70 on the diagram below which represents a 2.0-kilogram mass moving in a circular path on the end of a string 0.50 meter long. The mass moves in a horizontal plane at a constant speed of 4.0 meters per second.



(1) 67 The force exerted on the mass by the string is
(1) 8 nt
(2) 16 nt
(3) 32 nt
(4) 64 nt

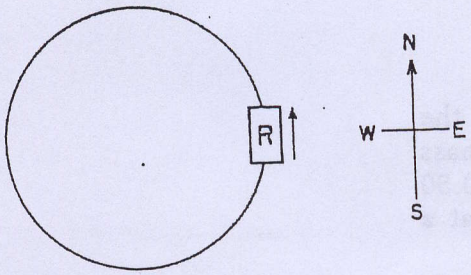
(2) 68 In the position shown in the diagram, the velocity of the mass is directed toward point
(1) *A*
(2) *B*
(3) *C*
(4) *D*

(3) 69 The centripetal force acting on the mass is directed toward point
(1) *A*
(2) *B*
(3) *C*
(4) *D*

(4) 70 The speed of the mass is changed to 2.0 meters per second. Compared to the centripetal acceleration of the mass when moving at 4.0 meters per second, its centripetal acceleration when moving at 2.0 meters per second would be
1 half as great
2 twice as great
3 one-fourth as great
4 four times as great

5 to 8

Base your answers to *a* through *e* on the information below.



The diagram represents a flat (unbanked) circular racetrack whose radius is 250. meters. Racing car *R* is moving around the track at a uniform speed of 40.0 meters per second. The mass of the car is 2.00×10^3 kilograms.

(5) At the instant shown in the diagram, the car's acceleration is directed toward the

1) north
2) south
3) east
4) west

(6) The magnitude of the car's acceleration is

1) 0.025 m./sec.^{2}
2) 1.60 m./sec.^{2}
3) 6.40 m./sec.^{2}
4) 12.8 m./sec.^{2}

(7) The centripetal force necessary to keep the car in its circular path is provided by

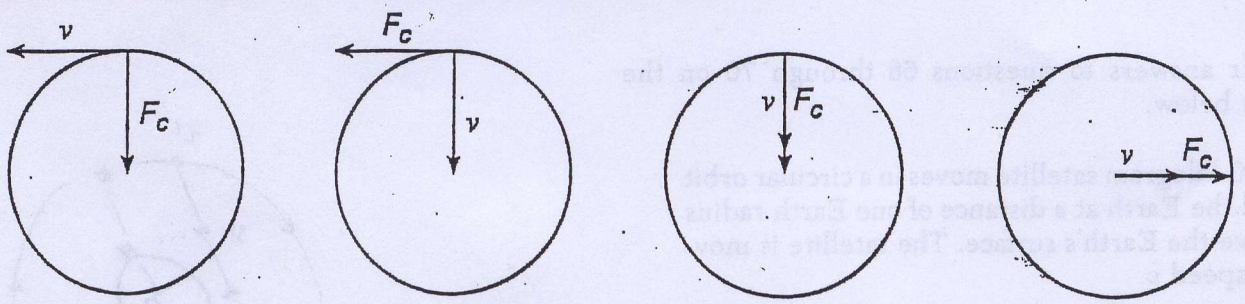
1) the engine
2) the brakes
3) friction
4) the stability of the car

(8) If the speed of the car were 50.0 meters per second, the magnitude of the centripetal force would be

1) 4.00×10^2 nt.
2) 1.00×10^1 nt.
3) 2.00×10^4 nt.
4) 4.00×10^4 nt.

9 & 10

A 1.0×10^3-kilogram car travels at a constant speed of 20. meters per second around a horizontal circular track. Which diagram correctly represents the direction of the car's velocity (v) and the direction of the centripetal force (F_c) acting on the car at one particular moment?



(1) (2) (3) (4)

(9) If the radius of the track in question 6 is 40 meters, What is the cars centripetal acceleration.

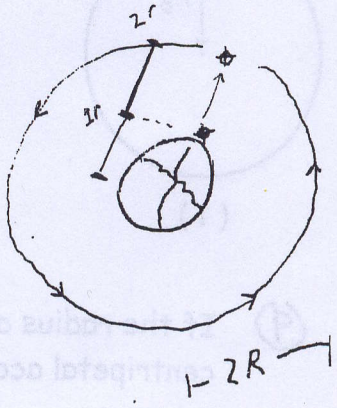
1) 0.5 m/s^2 2) 2 m/s^2 3) 4 m/s^2 4) 10 m/s^2 5) 20 m/s^2

(10) **True or False** - If the mass of the car in the problem were to go up The centripetal acceleration would also go up.

11 to 15

Base your answers to questions 66 through 70 on the information below.

A 100-kilogram satellite moves in a circular orbit around the Earth at a distance of one Earth radius (r) above the Earth's surface. The satellite is moving at speed v.



from surface to 2R.

1) 66 The centripetal acceleration of the satellite can be expressed as

(1) $a = \frac{f}{m}$ (3) $a = \frac{v}{t}$

(2) $a = \frac{v^2}{2r}$ (4) $a = \frac{v^2}{\sqrt{r}}$

2) 67 Compared to the weight of the satellite on the Earth's surface, the weight of the satellite in orbit is

1 the same
2 twice as great
3 one-fourth as great
4 one-half as great

13) 68 If g is the acceleration of gravity at the Earth's surface, the centripetal acceleration of the satellite in orbit will be

(1) 1 g
(2) 2 g
(3) ½ g
(4) ¼ g

Note that questions 69 and 70 have only three choices.

14) 69 If the radius of the satellite's orbit is decreased, the centripetal force acting on the satellite will

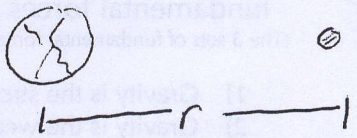
1 decrease
2 increase
3 remain the same

15) 70 If the radius of the satellite's orbit is decreased, the mass of the satellite will

1 decrease
2 increase
3 remain the same

16+17

(16) Two planets are a certain distance r apart. If the distance between the planets were to Go up 3 times then the gravitational force Between them would -



1) Go up 3X
2) Go Down 3X
3) Go up 9X
4) Go down 9X

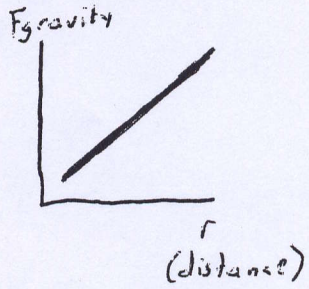
(17) Referring to question 16 If the mass of one Planet were to double, and the other planet Were to triple. Then the gravitational force The planets would - (Note: distance is still R)

1) Up 2X
2) Up 3/2X
3) Up 6X
4) Up 36X

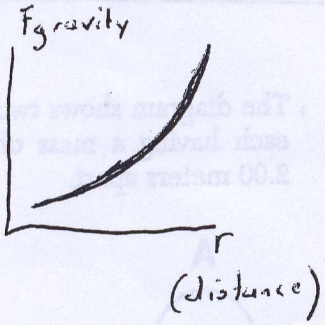
---

(18) Which of the following graphs best represents the relationship between the gravitational force between two objects and the distance between their centers.

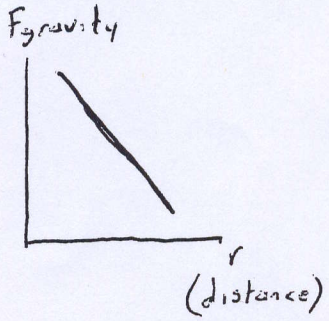
1)



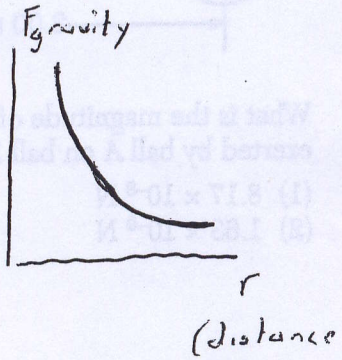
3)



2)



4)



(19) Which of the following about gravity compared to the other two fundamental forces ?

(The 3 sets of fundamental forces are – Gravitational Force, Electric & Magnetic Forces, and Nuclear Forces)

1) Gravity is the strongest and the longest range.
2) Gravity is the weakest and the longest range.
3) Gravity is the weakest and the shortest range.
4) Gravity is the strongest and the shortest range.

---

(20) Which of the following scientists 1st developed the idea that the gravity is an attractive force that not only governs the motion of objects on Earth but also the stars & the planets.

1) Newton 2) Copernicus 3) Cavendish 4) Einstein

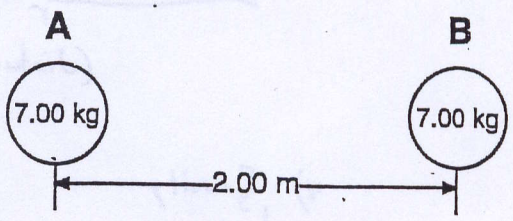
---

(21) Which of the following scientists found the value for the Universal Gravitational Constant $G = 6.67 \times 10^{-11} N \frac{m^2}{kg^2}$

1) Newton 2) Copernicus 3) Cavendish 4) Einstein

---

(22) The diagram shows two bowling balls, *A* and *B*, each having a mass of 7.00 kilograms, placed 2.00 meters apart.



What is the magnitude of the gravitational force exerted by ball *A* on ball *B*?

(1) 8.17×10^{-9} N
(2) 1.63×10^{-9} N
(3) 8.17×10^{-10} N
(4) 1.17×10^{-10} N

23 & 24

(23) A scientist notices two dust particles floating through the air have a force of attraction for one another. The mass of each particle is 1×10^{-9} kg and the distance between the particles is .1 meters. What is the gravitational force of attraction these particles have for one another ?

1) 6.67×10^{-25} Newtons
2) 6.67×10^{-26} Newtons
3) 6.67×10^{-27} Newtons
4) 6.67×10^{-28} Newtons

(24) What is true for these two dust particles -

1) The force of attraction between them is probably due to gravity because the force of gravity is stronger than any possible electric forces

2) The force of attraction between them is probably due to electric charge because the electrical force tends to be much is stronger than the gravitational force.

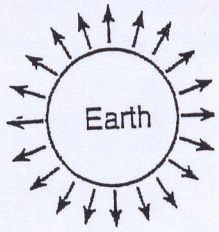
3) The electric force and gravitational force the dust particles have for one another is about equal.

4) The force can't be because of gravity because gravity would make the particles repel.

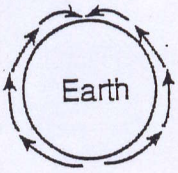
---

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

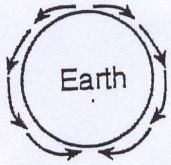
(1)



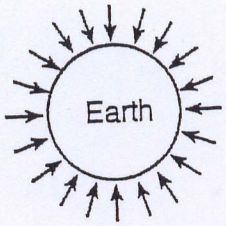
(3)



(2)



(4)

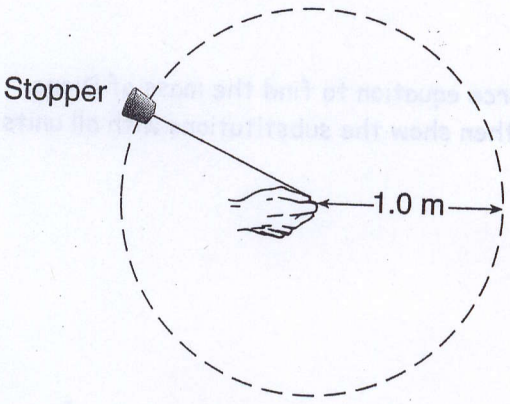


Long Problems - Name _____

1)

Base your answers to questions 59 and 60 on the information below.

In an experiment, a 0.028-kilogram rubber stopper is attached to one end of a string. A student whirls the stopper overhead in a horizontal circle with a radius of 1.0 meter. The stopper completes 10. revolutions in 10. seconds.



(Not drawn to scale)

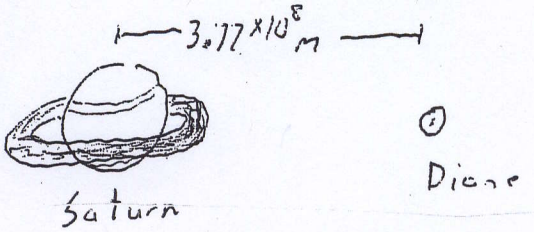
(A) Determine the speed of the whirling stopper.

Show equation with substitution and units in substitution & on answer (2 credits)

(B) Calculate the magnitude of the centripetal force on the whirling stopper. [Show all work, including the equation and substitution with units.] [2]

(C) State a change that would make the centripetal force On the stopper go up by 4X (1 credit

2) On of the moons of Saturn is named Dione. This moon is 3.77×10^8 meters when in orbit. The gravitational force Dione experiences while in orbit is 2.7×10^{20} Newtons. The mass of Saturn is 5.7×10^{26} kg.



A - Set up the gravitational force equation to find the mass of Dione. Start with the equation & then show the substitutions with all units attached (2 credits)

B - Solve the equation to find the mass of Dione. (1)

C - State a change that would increase the gravitational force on Dione 4 times. (1)

D - Compared to the force Saturn pulls on Dione with, The force That Dione pulls on Saturn with is - *(Greater, Less, The Same)* (1)