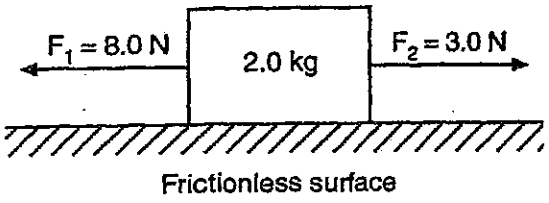
Midterm Practice 2

Name _____

1. Two forces are applied to a 2.0-kilogram block on a frictionless horizontal surface, as shown in the diagram below.



The acceleration of the block is

(1) 1.5 m/s^2 to the right
(2) 2.5 m/s^2 to the left
(3) 2.5 m/s^2 to the right
(4) 4.0 m/s^2 to the left

2. As the mass of an object decreases, its inertia will

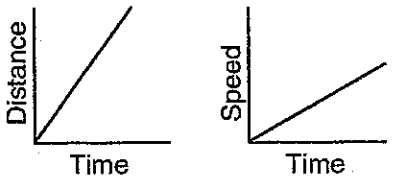
(1) decrease
(2) increase
(3) remain the same

3. In which situation is the net force on the object equal to zero?

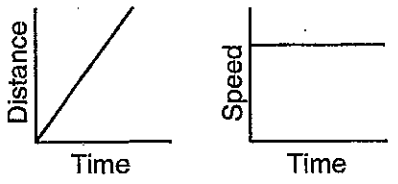
(1) a satellite moving at constant speed around Earth in a circular orbit
(2) an automobile braking to a stop
(3) a bicycle moving at constant speed on a straight, level road
(4) a pitched baseball being hit by a bat

4. Which two graphs represent the motion of an object on which the net force is zero?

(1)



(2)



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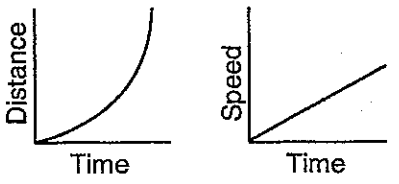

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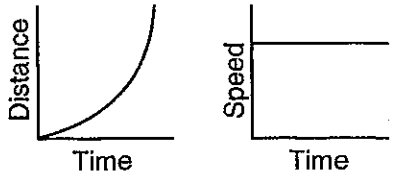


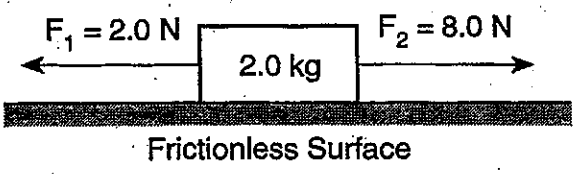
5. What force is necessary to give a 2.0-kilogram mass initially at rest an acceleration of 5.0 meters per second^2?

(1) 0.4 N
(2) 2.5 N
(3) 10 N
(4) 20 N

6. An object with a mass of 0.5 kilogram starts from rest and achieves a maximum speed of 20 meters per second in 0.01 second. What average unbalanced force accelerates this object?

(1) 1,000 N
(2) 10 N
(3) 0.1 N
(4) 0.001 N

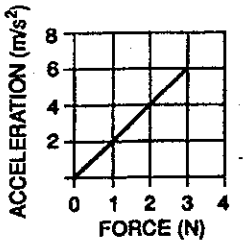
7. Two forces are applied to a 2.0-kilogram block on a frictionless horizontal surface, as shown in the diagram below.



The acceleration of the block is

(1) 5.0 m/s^2 to the right
(2) 5.0 m/s^2 to the left
(3) 3.0 m/s^2 to the right
(4) 3.0 m/s^2 to the left

8. In the graph below, the acceleration of an object is plotted against the unbalanced force on the object.



What is the object's mass?

(1) 1 kg (3) 0.5 kg
(2) 2 kg (4) 0.2 kg

9. In an automobile collision, a 44-kilogram passenger moving at 15 meters per second is brought to rest by an air bag during a 0.10-second time interval. What is the magnitude of the average force exerted on the passenger during this time?

(1) 440 N (3) 4400 N
(2) 660 N (4) 6600 N

10. A person kicks a 4.0-kilogram door with a 48-newton force causing the door to accelerate at 12 meters per seconds. What is the magnitude of the force exerted by the door on the person?

(1) 48 N (3) 12 N
(2) 24 N (4) 4.0 N

11. A baseball bat moving at high velocity strikes a feather. If air resistance is neglected, compared to the force exerted by the bat on the feather, the force exerted by the feather on the bat will be

(1) smaller (3) the same
(2) larger

12. 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 (3) 1.67×10^{-9} N
(2) 3.34×10^{-10} N (4) 5.00×10^{-9} N

13. The magnitude of the gravitational force between two objects is 20. Newtons. If the mass of each object were doubled, the magnitude of the gravitational force between the objects would be

(1) 5.0 N (3) 20. N
(2) 10. N (4) 80 N

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

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

(1)


(3)


(2)


(4)


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

17. A 60.-kilogram astronaut weighs 96 Newtons on the surface of the Moon. The acceleration due to gravity on the Moon is

(1) 0.0 m/s^2 (3) 4.9 m/s^2
(2) 1.6 m/s^2 (4) 9.8 m/s^2

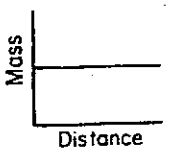
18. An astronaut weighs 500 newtons on Earth and 25 newtons on asteroid X. The acceleration due to gravity on asteroid X is approximately

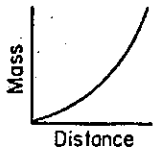
(1) 1 m/s^2 (3) 0.2 m/s^2
(2) 2 m/s^2 (4) 0.5 m/s^2

19. What is the weight of a 5.0-kilogram object at the surface of the Earth?

(1) 5.0 kg (3) 49 N
(2) 25 N (4) 49 kg

20. Which graph represents the relationship between the mass of an object and its distance from the Earth's surface?

(1)


(3)


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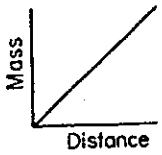

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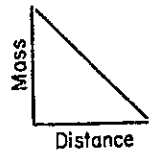
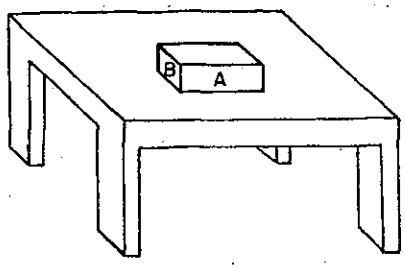


21.


In the diagram above, surface *A* of the wooden block has twice the area of surface *B*. If it takes *F* Newtons to keep the block moving at constant speed across the table when it slides on surface *A*, what force is needed to keep the block moving at constant speed when it slides on surface B?

(1) F
(2) 2F
(3) ½F
(4) 4F

22. The table below lists the coefficients of kinetic friction for four materials sliding over steel.

Material	μ_k
aluminum	0.47
brass	0.44
copper	0.36
steel	0.57

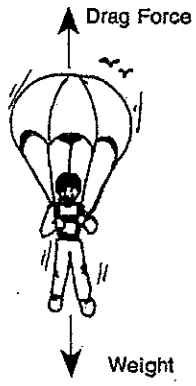
A 10.-kilogram block of each of the materials in the table is pulled horizontally across a steel floor at constant velocity. Which block would require the smallest applied force to keep it moving at constant velocity?

(1) aluminum
(2) brass
(3) copper
(4) steel

23. If a 30-newton force is required to accelerate a 2-kilogram object at 10 meters per second^2, over a level floor, then the magnitude of the frictional force acting on the object is

(1) 0 N
(2) 10 N
(3) 20 N
(4) 30 N

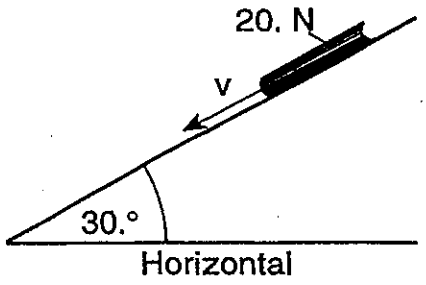
24. In the diagram below, the upward drag force acting on a parachute is equal in magnitude but opposite in direction to the weight of the parachutist and equipment.



As a result of the forces shown, the parachutist may be moving

(1) downward with decreasing speed
(2) downward at constant speed
(3) upward with decreasing speed
(4) upward with constant acceleration

25. A book weighing 20. Newtons slides at constant velocity down a ramp inclined 30.° to the horizontal as shown in the diagram below.



What is the force of friction between the book and the ramp?

(1) 10. N up the ramp
(2) 17 N up the ramp
(3) 10. N down the ramp
(4) 17 N down the ramp

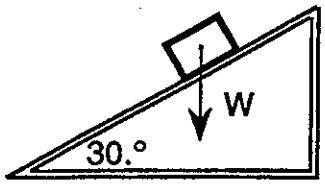
26. A 50.-newton horizontal force is needed to keep an object weighing 500. newtons moving at a constant velocity of 2.0 meters per second across a horizontal surface. The magnitude of the frictional force acting on the object is

(1) 500. N
(2) 450. N
(3) 50. N
(4) 0 N

27. According to your reference table, *Approximate Coefficents of Friction,* what is the minimum horizontal force needed to start a 300. kilogram steel block on a steel table in motion?
(1) 5.70 N (3) 1710 N
(2) 7.40 N (4) 2220 N

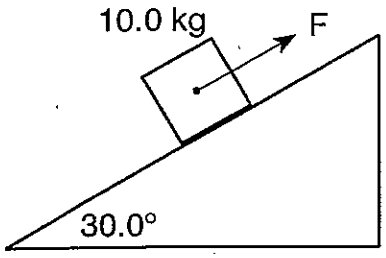
28. Jill is pulling a 200. newton sled through the snow at constant velocity using a horizontal force of 10. newtons. What is the kinetic coefficient of friction of the sled on the snow?
(1) 0.02 (3) 0.20
(2) 0.05 (4) 20

29. In the diagram below, the weight of a box on a plane inclined at 30.° is represented by the vector *W*.



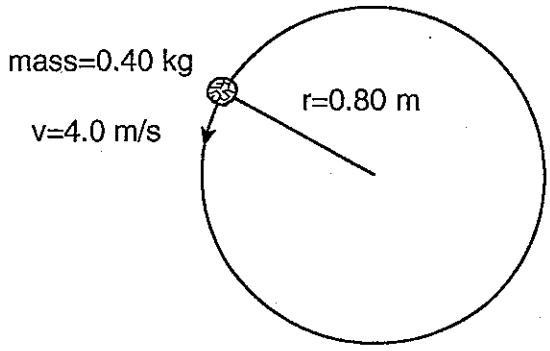
What is the magnitude of the component of the weight (*W*) that acts parallel to the incline?
(1) *W* (3) 0.87 *W*
(2) 0.50 *W* (4) 1.5 *W*

30. The diagram below shows a 10.0-kilogram mass held at rest on a frictionless 30.0° incline by force *F*.



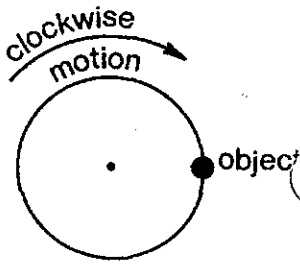
What is the approximate magnitude of force *F*?
(1) 9.81 N (3) 85.0 N
(2) 49.1 N (4) 98.1 N

31. The diagram below represents a 0.40-kilogram stone attached to a string. The stone is moving at a constant speed of 4.0 meters per second in a horizontal circle having a radius of 0.80 meter.



The magnitude of the centripetal acceleration of the stone is
(1) 0.0 m/s^2 (3) 5.0 m/s^2
(2) 2.0 m/s^2 (4) 20. m/s^2

32. The diagram to the right shows an object traveling clockwise in a horizontal, circular path at constant speed.

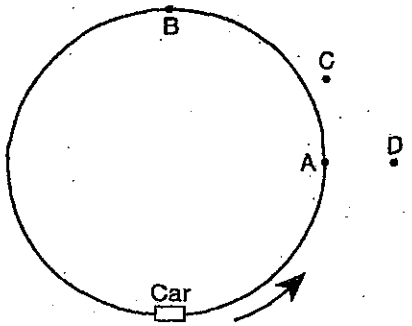


Which arrow best shows the direction of the centripetal acceleration of the object at the instant shown?
(1) ← (3) ↓
(2) → (4) ↑

33. An object travels in a circular orbit. If the speed of the object is doubled, its centripetal acceleration will be
(1) halved (3) quartered
(2) doubled (4) quadrupled

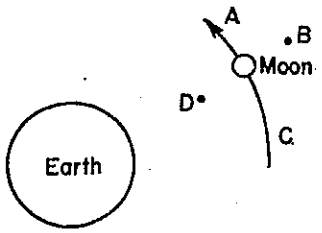
34. A motorcycle of mass 100 kilograms travels around a flat, circular track of radius 10 meters with a constant speed of 20 meters per second. What force is required to keep the motorcycle moving in a circular path at this speed
(1) 200 N (3) 2000 N
(2) 400 N (4) 4000 N

35. A convertible car with its top down is traveling at constant speed around a circular track, as shown in the diagram below.



When the car is at point *A*, if a passenger in the car throws a ball straight up, the ball could land at point
(1) *A* (3) *C*
(2) *B* (4) *D*

Base your answers to questions **36** through **38** on the diagram below which represents the moon in a circular orbit around the earth.
Mass of the earth = 6.0×10^{24} kg.
Mass of the moon = 7.3×10^{23} kg.

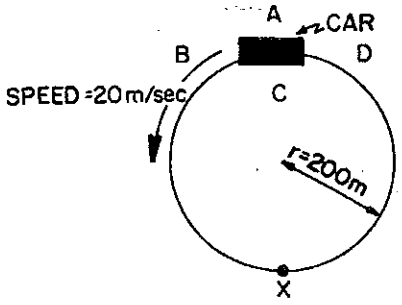


36. The direction of the centripetal force on the moon is toward point
(1) *A* (3) *C*
(2) *B* (4) *D*

37. If an astronaut has a mass of 91 kilograms on the earth his mass on the moon would be
(1) 11 kg. (3) 70 kg.
(2) 45 kg. (4) 91 kg.

38. Compared to the force of the earth on the moon, the magnitude of the force of the moon on the earth is
(1) 10^{-2} as great (3) 10^{1} as great
(2) the same (4) 10^{2} as great

Base your answers to questions **39** through **41** on the diagram below which represents a car of mass 1,000 kilograms traveling around a horizontal circular track of radius 200 meters at a constant speed of 20 meters per second.

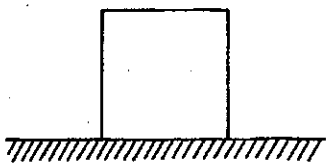


39. When the car is in the position shown, the direction of its centripetal acceleration is toward
(1) *A* (3) *C*
(2) *B* (4) *D*

40. The magnitude of the centripetal force acting on the car is closest to
(1) 100 N (3) 2,000 N
(2) 1,000 N (4) 4,000 N

41. If additional passengers were riding in the car, at the original speed, the car's centripetal acceleration would be
(1) less (3) the same
(2) greater

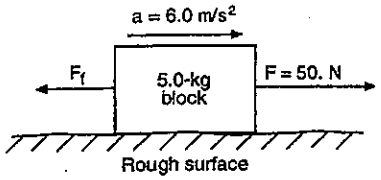
42. An aluminum block weighing 20. newtons, sliding from left to right in a straight line on a horizontal steel surface, is acted on by a 2.4-newton friction force. The block will be brought to rest by the friction force in a distance of 10. meters.



a On the diagram of the block, draw an arrow to identify the direction of *each* force acting on the block while it is still moving, but is being slowed by the friction force. Identify *each* force by appropriately labeling the arrow that represents its line of direction.

b Determine the magnitude of the acceleration of the block as it is brought to rest by the friction force. [Show all work.]

43. The diagram below shows a 5.0-kilogram block accelerating at 6.0 meters per second^2 along a rough horizontal surface by the application of a horizontal force, F, of 50. newtons.



What is the magnitude in newtons of the force of friction, F_f, acting on the block?

1. A 30 Newton wood block is being pulled across a flat wooden table by a force of 12 Newtons. What is the acceleration of the block?

2. A 4 kg mass slides down a 30^0 incline at a constant speed of 4 m/s. Find the coefficient of kinetic friction between the mass and the incline.