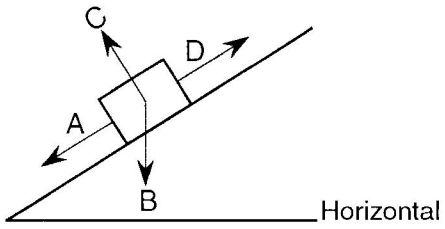
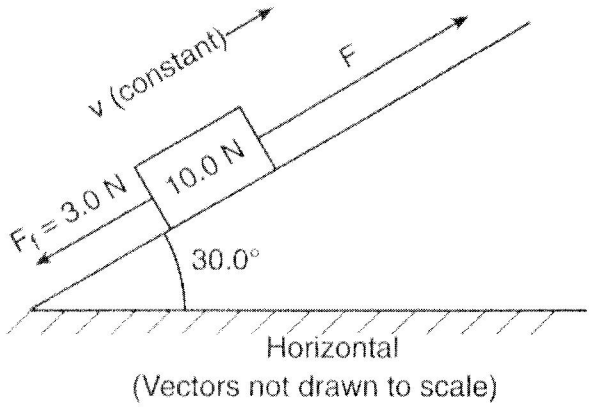
1. In the diagram below, a box is at rest on an inclined plane.



Which vector best represents the direction of the normal force acting on the box?

1) *A* 3) *C*
2) *B* 4) *D*

2. A block weighing 10.0 newtons is on a ramp inclined at 30.0° to the horizontal. A 3.0-newton force of friction, F_f, acts on the block as it is pulled up the ramp at constant velocity with force *F*, which is parallel to the ramp, as shown in the diagram below.



(Vectors not drawn to scale)

What is the magnitude of force *F*?

1) 7.0 N 3) 10 N
2) 8.0 N 4) 13 N

3. A student weighing 500. Newtons stands on a spring scale in an elevator. If the scale reads 520. Newtons, the elevator must be

1) accelerating upward
2) accelerating downward
3) moving upward at constant speed
4) moving downward at constant speed

4. The acceleration due to gravity on the surface of planet *X* is 19.6 meters per second^2. If an object on the surface of this planet weighs 980. newtons, the mass of the object is

1) 50.0 kg 3) 490. N
2) 100. kg 4) 908 N

5. 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
2) 1.6 m/s^2
3) 4.9 m/s^2
4) 9.8 m/s^2

6. If the mass of an object were doubled, its weight would be

1) halved 3) quadrupled
2) doubled 4) unchanged

7. 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

8. 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) $\frac{9F}{2}$

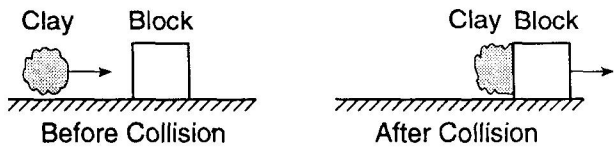
9. When a satellite is a distance R from the center of Earth, the force due to gravity on the satellite is F. What is the force due to gravity on the satellite when its distance from the center of Earth is $3R$?
   1) $\frac{F}{9}$
   2) $\frac{F}{3}$
   3) F
   4) $9F$

10. An object weighs 100. Newtons on Earth's surface. When it is moved to a point one Earth radius above Earth's surface, it will weigh
   1) 25.0 N
   2) 50.0 N
   3) 100. N
   4) 400. N

11. Which of the following objects has the greatest momentum?
   1) a 1-kg object moving at 200 m/sec
   2) a 10-kg object moving at 30 m/sec
   3) a 20-kg object moving at 20 m/sec
   4) a 100-kg object moving at 2 m/sec

12. If the speed of a moving object is doubled, which quantity associated with the object must also double?
   1) its momentum
   2) its kinetic energy
   3) its acceleration
   4) its gravitational potential energy

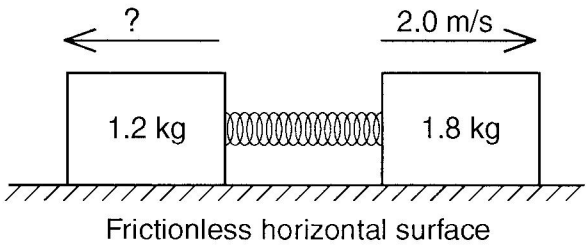
13. As shown in the diagrams below, a lump of clay travels horizontally to the right toward a block at rest on a frictionless surface. Upon collision, the clay and the block stick together and move to the right.



Compared to the total momentum of the clay and the block before the collision, the momentum of the clay-block system after the collision is
   1) less
   2) greater
   3) the same

14. A 2-kilogram object traveling 10 meters per second north has a perfect elastic collision with a 5-kilogram object traveling 4 meters per second south. What is the total momentum after collision?
   1) 0 kg-m/s
   2) 20 kg-m/s north
   3) 20 kg-m/s south
   4) 40 kg-m/s east

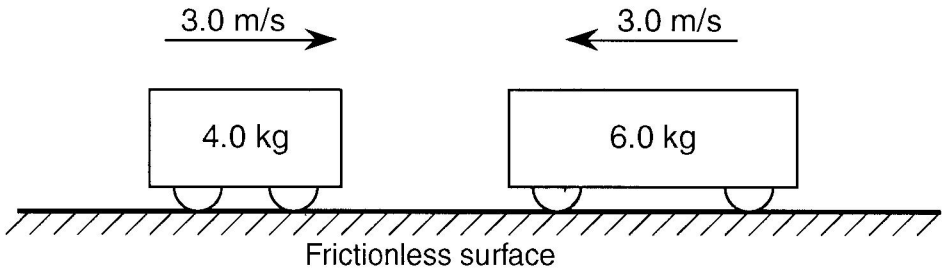
15. A 1.2-kilogram block and a 1.8-kilogram block are initially at rest on a frictionless, horizontal surface. When a compressed spring between the blocks is released, the 1.8-kilogram block moves to the right at 2.0 meters per second, as shown.



What is the speed of the 1.2-kilogram block after the spring is released?

1) 1.4 m/s
2) 2.0 m/s
3) 3.0 m/s
4) 3.6 m/s

16. The diagram below shows a 4.0-kilogram cart moving to the right and a 6.0-kilogram cart moving to the left on a horizontal frictionless surface.



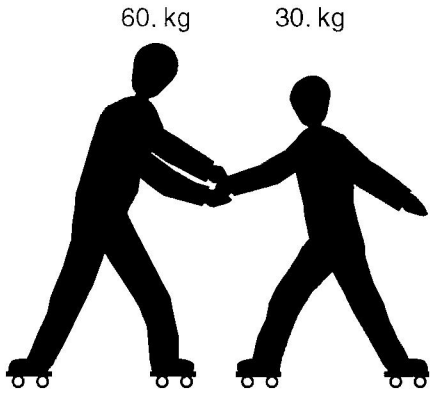
When the two carts collide they lock together. The magnitude of the total momentum of the two-cart system after the collision is

1) 0.0 kg•m/s
2) 6.0 kg•m/s
3) 15 kg•m/s
4) 30. kg•m/s

17. A 0.45-kilogram football traveling at a speed of 22 meters per second is caught by an 84-kilogram stationary receiver. If the football comes to rest in the receiver's arms, the magnitude of the impulse imparted to the receiver by the ball is

1) 1800 N•s
2) 9.9 N•s
3) 4.4 N•s
4) 3.8 N•s

18. In the diagram below, a 60.-kilogram rollerskater exerts a 10.-newton force on a 30.-kilogram rollerskater for 0.20 second.

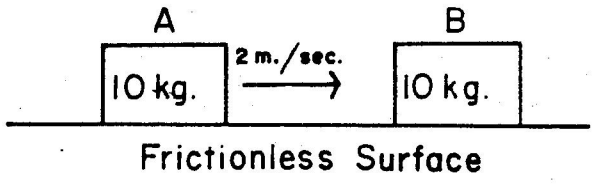


What is the magnitude of the impulse applied to the 30.-kilogram rollerskater?

1) 50. N•s
2) 2.0 N•s
3) 6.0 N•s
4) 12 N•s

Base your answers to questions **19** through **22** on the information and diagram below.

Block *A* moves with a velocity of 2 meters per second to the right, as shown in the diagram, and then collides elastically with block *B*, which is at rest. Block *A* stops moving, and block *B* moves to the right after the collision.



19. What is the combined momentum of blocks *A* and *B* before the collision?

1) 0 kg.-m/s
2) 10 kg.-m/s
3) 20 kg.-m/s
4) 40 kg.-m/s

20. What is the total change in momentum of blocks *A* and *B* ?

1) 0 kg.-m/s
2) 20 kg.-m/s
3) 40 kg.-m/s
4) 200 kg.-m/s

21. If block *A* is stopped in 0.1 second, the average force acting on block *A* is

1) 50 N
2) 100 N
3) 200 N
4) 400 N

22. If the blocks had remained together after collision, their velocity would have been

1) 1 m/s
2) 2 m/s
3) 0 m/s
4) .5 m/s

Practice Exam
Answer Key
[New Exam]

1. 3
2. 2
3. 1
4. 1
5. 2
6. 2
7. 3
8. 1
9. 1
10. 1
11. 3
12. 1
13. 3
14. 1
15. 3
16. 2
17. 2
18. 2
19. 3
20. 1
21. 3
22. 1