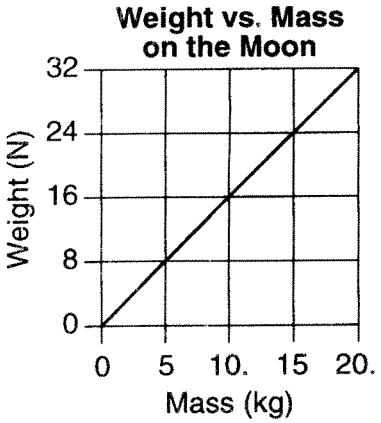
1. The weight of a 2.0-kilogram mass on planet *A* is 40 Newtons. The acceleration due to gravity on planet *A* is closest to
   (1) 20 m/s^2
   (2) 2.0 m/s^2
   (3) 80 m/s^2
   (4) 40 m/s^2

2. A 50-kilogram student, standing on the Earth, attracts the Earth with a force closest to
   (1) 0 N (3) 50 N
   (2) 5 N (4) 500 N

3. As a satellite is accelerated away from the Earth by a rocket, the satellite's mass
   (1) decreases (3) remains the same
   (2) increases

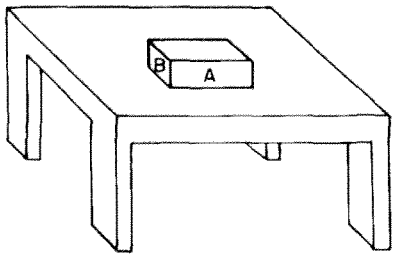
4. An astronaut weighs 500 newtons on Earth and 25 newtons on asteroid *X*. The acceleration due to gravity on asteroid *X* is approximately
   (1) 1 m/s^2
   (2) 2 m/s^2
   (3) 0.2 m/s^2
   (4) 0.5 m/s^2

5. The graph below shows the relationship between weight and mass for a series of objects on the Moon.



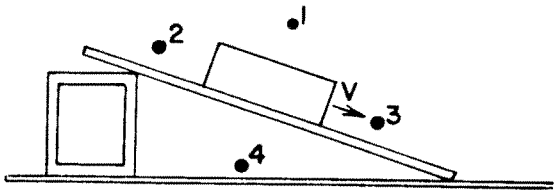
   The acceleration due to gravity on the Moon is approximately
   (1) 0.63 m/s^2
   (2) 1.6 m/s^2
   (3) 9.8 m/s^2
   (4) 32 m/s^2

6.



   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 (3) ½F
   (2) 2F (4) 4F

7. The diagram below represents a box shown sliding down an inclined plane. Toward which point will the force of friction on the box be directed?



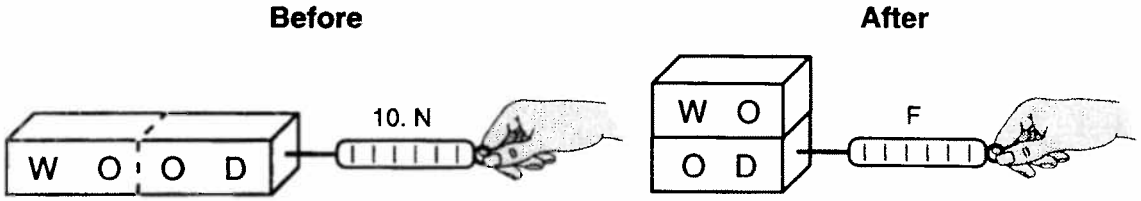
   (1) 1 (3) 3
   (2) 2 (4) 4

8. 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 (3) copper
   (2) brass (4) steel

The diagram below shows a student applying a 10.-newton force to slide a piece of wood at constant speed across a horizontal surface. After the wood is cut in half, one piece is placed on top of the other, as shown.



What is the magnitude of the force, *F*, required to slide the stacked wood at constant speed across the surface?

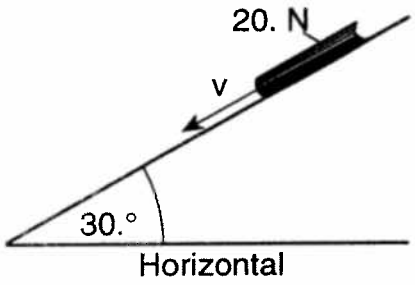
(1) 40 N (2) 20 N (3) 10 N (4) 5.0 N

10. When an object moves at a constant speed against friction on a horizontal tabletop, there is an increase in the object's

(1) temperature (3) potential energy

(2) momentum (4) acceleration

11. 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 (3) 10. N down the ramp

(2) 17 N up the ramp (4) 17 N down the ramp

12. As more force is applied to a steel box sliding on a steel surface, the coefficent of kinetic friction will

(1) decrease (3) remain the same

(2) increase

13. A box decelerates as it moves to the right along a horizontal surface, as shown in the diagram at the right.

Which vector best represents the force of friction on the box?

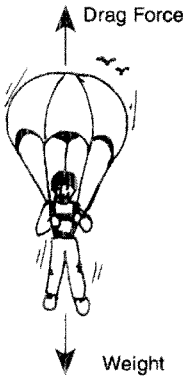
(1)

(2)

(3)

(4)

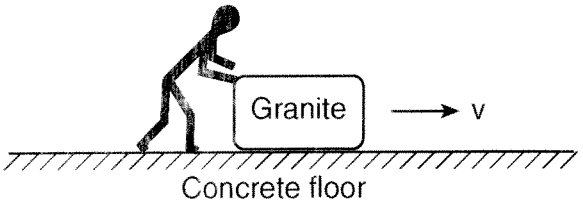
14. In the diagram below, the upward drag force acting on a parachute is equal in magnitude but opposite in direction to the weight of the parachutist and equipment.



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

15. The diagram below shows a granite block being slid at constant speed across a horizontal concrete floor by a force parallel to the floor.



Which pair of quantities could be used to determine the coefficient of friction for the granite on the concrete?

(1) mass and speed of the block
(2) mass and normal force on the block
(3) frictional force and speed of the block
(4) frictional force and normal force on the block