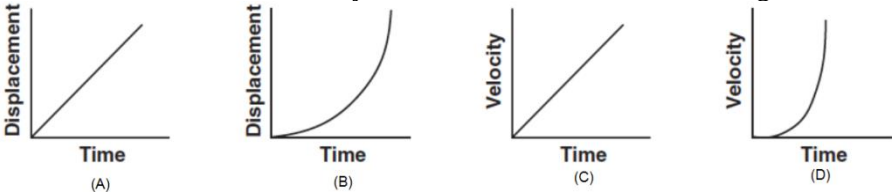
Newton's Laws Review **Name**_____
Honors Physics

Newton's 1st Law

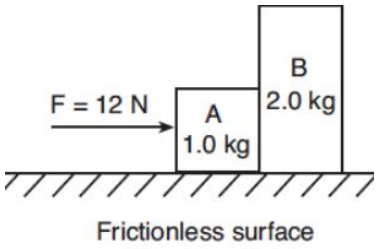
1. Which unit is equivalent to a newton per kilogram?
   a) m/s^2
   b) m/s
   c) kg·m/s
   d) $kg·m/s^2$
2. Which object has the most inertia?
   a) A 0.001-kilogram bumblebee traveling at 2 meters per second
   b) A 0.1-kilogram baseball traveling at 20 meters per second
   c) A 5-kilogram bowling ball traveling at 3 meters per second
   d) A 10-kilogram sled at rest
3. If the sum of all the forces acting on a moving object is zero, the object will
   a) slow down and stop
   b) change the direction of its motion
   c) accelerate uniformly
   d) continue moving with constant velocity
4. Which 2 graphs best show the motion of an object with a constant net force acting on it?



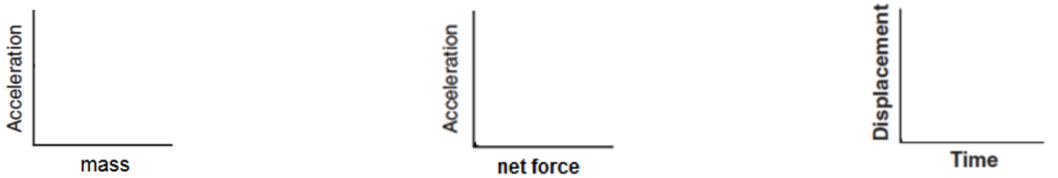
5. If the weight of an object on the Earth is 20 N, what is the mass of the object on the Moon, where the acceleration due to gravity is 1/6 of Earth's?
   a) 0.34 kg
   b) 2.04 kg
   c) 3.33 kg
   d) 20 kg

Newton's 2nd Law

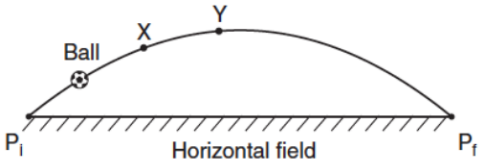
6. The diagram below shows a horizontal 12-newton force being applied to two blocks, A and B, initially at rest on a horizontal, frictionless surface. Block A has a mass of 1 kilogram and block B has a mass of 2 kilograms. The magnitude of the acceleration of block B is
   a) $6.0\ m/s^2$
   b) $2.0\ m/s^2$
   c) $3.0\ m/s^2$
   d) $4.0\ m/s^2$



7. Sketch the graph below that shows the relationship between mass and acceleration if the force applied is constant.
8. Sketch the graph below that shows the relationship between force and acceleration.
9. Sketch the graph below that shows the displacement versus time for an object with a net force on it, speeding up.



10. On the diagram, draw an arrow to represent the direction of the net force on the ball when it is at position X.
11. On the diagram, draw an arrow to represent the direction of the acceleration of the ball when it is at position Y.



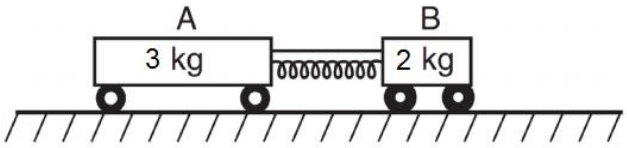
12. A 1200 kg car accelerates from rest to a speed of 26.0 m/s in 4.2 seconds.

a) Calculate the acceleration of the car

b) Calculate the net force on the car during this interval.

Newton's 3rd Law

13. If a 65-kilogram astronaut exerts a force with a magnitude of 50 newtons on a satellite that she is repairing, the magnitude of the force that the satellite exerts on her is
    a) 0 N
    b) 50 N less than her weight
    c) 50 N more than her weight
    d) 50 N
14. A 400-newton girl standing on a dock exerts a force of 100 newtons on a 10,000-newton sailboat as she pushes it away from the dock. How much force does the sailboat exert on the girl?
    a) 25 N
    b) 100 N
    c) 400 N
    d) 10,000 N
15. The diagram below shows a compressed spring between two carts initially at rest on a horizontal, frictionless surface. Cart A has a mass of 3 kilograms and cart B has a mass of 2 kilograms. A string holds the carts together. The string is cut and the carts move apart. The spring exerts a force of 5 N on cart A. Determine all of the values below.



Force on Cart A = _____ Force on Cart B = _____

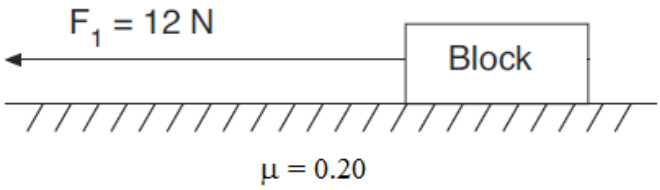
Acceleration of Cart A= _____ Acceleration of Cart A= _____

Friction

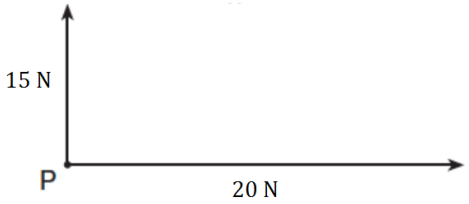
16. A box is pushed toward the right across a classroom floor. The force of friction on the box is directed toward the
    a) right
    b) left
    c) ceiling
    d) floor
17. The force required to start an object sliding across a uniform horizontal surface is larger than the force required to keep the object sliding at a constant velocity. The magnitudes of the required forces are different in these situations because the force of kinetic friction
    a) is greater than the force of static friction
    b) is less than the force of static friction
    c) increases as the speed of the object relative to the surface increases
    d) decreases as the speed of the object relative to the surface increases
18. The weight of a wood crate is 200 N and it is being pulled at a constant velocity of 3.0 m/s. The tension in the horizontal rope that is pulling the crate is 100 N. What is the frictional force on the crate?
    a) 100 N
    b) 200 N
    c) 300 N
    d) 900 N

19. One force, F_1 is applied to a block on a horizontal surface where the coefficient of friction is 0.20 as shown. The block has a mass of 3.0 kg. Determine all of the values below.

weight = _____
Normal force= _____
Frictional force = _____
Net force = _____
a = _____

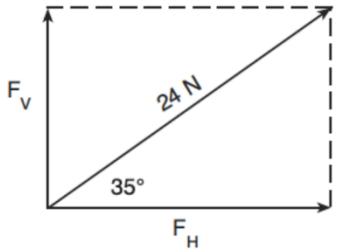


Vectors



20. Two forces are acting on a particle. One force is 15 N acting pulling North, and the other force is 20 N acting to the East. The magnitude of the resultant force on the particle is
    a) 5.0 N
    b) 17.5 N
    c) 25 N
    d) 35
21. Draw one vector that represents the direction of the net force on the particle in the example above?

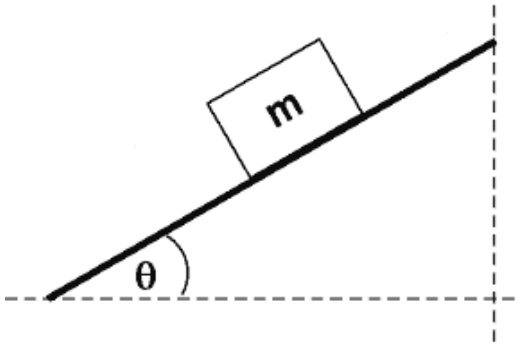
22. A 24 N force acts on a particle at an angle that is 35° above the horizontal. Determine the horizontal (F_H) and vertical (F_v) components of the force.



23. A 2.0 kg block is sitting at rest on an incline where the incline is 35° above the horizontal.

a) Draw and label all of the forces acting on the block.
b) Determine all of the values below

Weight = _____
$F_{\parallel}$ = _____
$F_{\perp}$ = _____
Friction = _____
Normal = _____
μ = _____



Air resistance and Terminal Velocity

24. A 60-kg skydiver is falling at a constant speed near the surface of Earth. The magnitude of the force of air friction acting on the skydiver is approximately
    a) 0 N
    b) 6 N
    c) 60 N
    d) 600 N

25. A skydiver that is falling at a terminal velocity of 65 m/s for 20 seconds has an acceleration of
    a) 0 m/s^2
    b) 3.25 m/s^2
    c) 9.8 m/s^2
    d) 65 m/s^2
26. A 75 kg skydiver is falling at a terminal velocity of 50 m/s. Draw a free body diagram and label the forces. Determine the values below.

    Weight = _____

    Air resistance = _____

    Net force = _____

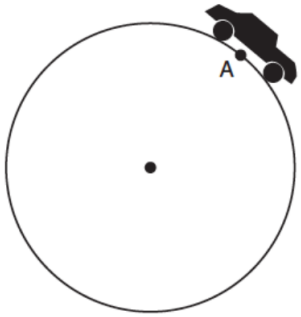
    Acceleration = _____

Circular Motion

27. The combined mass of a race car and its driver is 600 kilograms. Traveling at constant speed, the car completes one lap around a circular track of radius 160 meters in 36 seconds.
    a) Calculate the linear velocity of the car.

    b) Calculate the centripetal acceleration of the car.

    c) The following diagram shows a top view of the car as it travels clockwise around the track. At point A, draw a vector that represents the velocity of the car. Label the vector **v**.
    d) At point A, draw a vector that represents the centripetal force acting on the car. Label the vector **F**.



Universal Gravitation

28. What is the weight of a 2.00-kilogram object on the surface of Earth?
    a) 4.91 N
    b) 2.00 N
    c) 9.81 N
    d) 19.6 N
29. The mass of a 75.0 kg space probe on the Jupiter, where the surface gravity is about 25 m/s^2, is approximately
    a) 0.3 kg
    b) 3 kg
    c) 75 kg
    d) 1875 kg

30. As a mass is moved farther away from the surface of the Earth, the gravitational force on the object
    a) Increases
    b) Decreases
    c) Remains constant

31. The mass of the Sun is 1.99×10^{30} kg. Neptune, which has a mass of 1.03×10^{26} kg orbits the Sun at an average distance of 4.50×10^{12} meters. Calculate the gravitational force between these two objects.