Name:_____

Date:_____

$\Delta x = v_{0,x}t + \frac{1}{2}a_X t^2$ or $\Delta y = v_{0,y}t + \frac{1}{2}a_y t^2$

$\Delta x = \frac{1}{2}(v_f + v_0)t$ or $\Delta y = \frac{1}{2}(v_f + v_0)t$

$v_f = v_0 + at$

$v_f^{\,2} = v_0^{\,2} + 2a\Delta x$ or $v_f^{\,2} = v_0^{\,2} + 2a\Delta y$

$\theta_v = tan^{-1}\left(\frac{v_y}{v_x}\right)$ for a vector $\bar{v}$

$\Sigma F = ma$

$F_W = mg$

$F_F = \mu_s F_N$ or $\mu_k F_N$

(10 Points) A 180-kg display case is being pushed by three people toward the right. The coefficient of static friction between the floor and the feet of the display case is 0.650.

a) How much force must each person exert to set the display case in motion?
b) If they continue applying this force and the case begins to accelerate at 2.00 m/s^2, what is the coefficient of kinetic friction between the floor and the feet of the case?

(15 Points) A 120-kg crate is situated on a ramp with an incline of 25^o.

a) If there were no friction, what would be the acceleration of the crate down the ramp?
b) How far would the crate slide down the ramp after reaching a velocity of 5.0 m/s from rest?
c) If friction is present and the crate is accelerating at half the rate from part a, what is the coefficient of kinetic friction between the crate and the ramp?

(10 Points) A sailboat sails for 110 m at 30° N of E, then for 70 m directly north, and then for 50 m at 65° N of W. Determine

a) the magnitude of the boat's resultant displacement.
b) the direction of the boat's resultant displacement.

(15 Points) A soccer ball, initially at rest, is kicked directly toward a fence from a point 32.0 m away. The velocity of the ball as it leaves the kicker's foot is 20.0 m/s at an angle of 35.0° above the horizontal. The top of the fence is 2.40 m high. Assume air resistance is negligible.

a) Determine the time it takes for the ball to reach the plane of the fence.
b) Will the ball hit the fence? If so, how far below the top of the fence will it hit? If not, how far above the top of the fence will it pass?

(Bonus) A soccer player runs 15 m straight down the pitch with the ball close to her feet, and then passes the ball to her teammate, who is standing 30 m away at an angle of 35^{o} from the direction of her motion. Determine

a) the magnitude of the ball's resultant displacement.
b) the direction of the ball's resultant displacement.

1. Starting from rest, object 1 falls freely for 4.0 s, and object 2 falls freely for 8.0 s. Compared to object 1, object 2 falls
A) half as far.
B) twice as far.
C) three times as far.
D) four times as far.

2. Which one of the following statements is true concerning the motion of an ideal projectile launched at an angle above the horizontal?
A) The vertical velocity decreases on the way up and increases on the way down.
B) The vertical velocity decreases on the way up and also decreases on the way down.
C) The velocity at the top of the trajectory is zero.
D) The object's velocity remains constant during the entire flight.

3. A stone is thrown horizontally with an initial velocity of 30 m/s from a bridge. Find the stone's velocity when it enters the water 4 s later, assuming that air resistance is negligible.
A) 30 m/s
B) 40 m/s
C) 50 m/s
D) 60 m/s

4. A 12.0-kg box starts at rest and reaches a velocity of 3.45 m/s after traveling 12.0 m. What was the magnitude of the force exerted on the box?
A) 0.0410 N
B) 0.496 N
C) 2.95 N
D) 19.0 N
E) 5.95 N

5. A 5.0-kg box slides across the floor with an initial velocity of 5.0 m/s. If the coefficient of kinetic friction between the box and the floor is 0.10, after how much time will the box come to a stop?
A) 0 s
B) 5.1 s
C) 3.2 s
D) −3.2 s
E) −5.1 s

6. The same net force is applied to object A and object B. Object A has three times the mass of object B. Which of the following is correct?
A) Object A has one-third the acceleration of object B.
B) Object A has three times the acceleration of object B.
C) Object A has the same acceleration as object B.
D) Object A doesn’t move, whereas object B does.

7. In 1971, astronaut Alan Shepard hit two golf balls on the Moon, where the gravitational acceleration is lower by a factor of 6. By what factor would the range of each golf ball differ from that of a golf ball hit on Earth with the same initial velocity?
A) ⅙
B) 6
C) 12
D) 36

8. A car traveling at a speed of v_0 applies its brakes, skidding to a stop over a distance x. Assuming that the deceleration due to the brakes is constant, what would be the skidding distance of the same car if it were traveling with four times the initial speed?
A) 4x
B) 8x
C) 16x
D) 32x

9. A track star in the long jump goes into the jump at 12 m/s and launches herself at 20.0° above the horizontal. How long is she in the air before returning to the ground?
A) 0.42 s
B) 0.83 s
C) 1.2 s
D) 1.5 s

10. A raft on a river is being guided by two currents, one of which applies a force of 125 N directed north and the other of which applies a force of 175 N directed west. What is the direction of the net force on the raft?
A) 35.5°
B) 54.5°
C) 125°
D) 144°