Part 1. *(1.0 point each)*

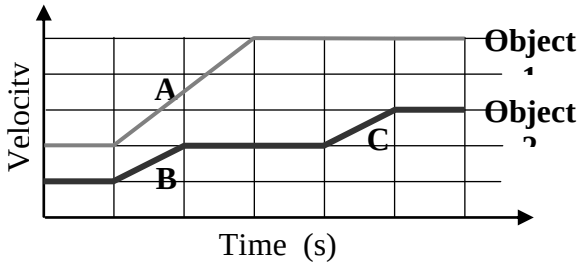
Please circle ◯ the correct answer, to the nearest number for quantitative questions, for each of the following:

1. Complete the following statement: An inertial reference frame is one in which

A) Newton's first law of motion is valid. B) the frame is accelerating.
C) the inertias of objects within the frame are zero.
D) the acceleration due to gravity is greater than zero m/s^2.
E) Newton's third law of motion is not valid.

2. The graph shows the velocities of two objects of equal mass as a function of time. Net forces $\mathbf{F}_A$, $\mathbf{F}_B$, and $\mathbf{F}_C$ acted on the objects during intervals A, B, and C, respectively. Which one of the following choices is the correct relationship between the magnitudes of the net forces?

A) $F_B = F_C > F_A$.
B) $F_C > F_B > F_A$.
C) $F_A = F_B = F_C$.
D) $F_A > F_B = F_C$
E) $F_A > F_B > F_C$.



3. A **15 N** net force is applied for **6.0 s** to a **12 kg** box initially at rest. What is the speed of the box at the end of the **6.0 s** interval?

A) 1.8 m/s. B) 15 m/s. C) 7.5 m/s. D) 3.0 m/s. E) 30 m/s.

4. An apple crate with a weight of **225 N** accelerates along a *frictionless* surface as the crate is pulled with a force of **14.5 N** as shown in the drawing. What is the horizontal acceleration of the crate?

A) 1.40 m/s^2. B) 0.597 m/s^2
C) 0.427 m/s^2 D) 1.29 m/s^2
E) 0.644 m/s^2

5. A book is resting on the surface of a table. Consider the following four forces that arise in this situation:

(***1***) the force of the earth pulling on the book
(***2***) the force of the table pushing on the book
(***3***) the force of the book pushing on the table
(***4***) the force of the book pulling on the earth

The book has an acceleration of 0 m/s^2. Which pair of forces, excluding "action-reaction" pairs, must be equal in magnitude and opposite in direction?

A) *1* and *3*. B) *1* and *4*. C) *2* and *3*. D) *1* and *2*. E) *2* and *4*.

6. A **2.00 kg** projectile is fired at an angle of **20.0°**. What is the magnitude of the force exerted on the projectile when it is at the highest position in its trajectory? Neglect any effects of air resistance.

A) 14.7 N B) 9.80 N C) 4.90 N D) 0 N E) 19.6 N

7. A **10 kg** block is set moving with an initial speed of **6 m/s** on a rough horizontal surface. If the force of friction is **20 N**, approximately how far does the block travel before it stops?

A) 1.5 m. B) 9 m C) 6 m D) 18 m E) 3 m

8. A **2.0 N** force acts horizontally on a **10 N** block that is initially at rest on a horizontal surface. The coefficient of static friction between the block and the surface is **0.50**. What is the magnitude of the frictional force that acts on the block?

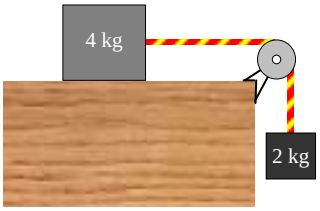
A) 2 N. B) 0 N. C) 5 N. D) 8 N. E) 10 N.

9. A **2.0 N** rock slides on a frictionless inclined plane. Which one of the following statements is true concerning the normal force that the plane exerts on the rock?

A) The normal force is less than 2.0 N, but greater than zero Newton.
B) The normal force is zero Newton.
C) The normal force is 2.0 N.
D) The normal force is greater than 2.0 N.
E) The normal force *increases* as the angle of inclination, θ, is *increased*.

10. A **4 kg** block is connected by means of a *massless* rope to a **2 kg** block as shown in the figure. Complete the following statement: If the **4 kg** block is to begin sliding, the coefficient of static friction between the **4 kg** block and the surface must be

A) less than 0.5, but greater than zero.
B) greater than 1, but less than 2.
C) greater than 0.5, but less than 1.
D) less than zero.
E) greater than 2.



11. A car traveling at **20 m/s** rounds a curve so that its centripetal acceleration is **5 m/s^2**. What is the radius of the curve?

A) 80 m. B) 4 m. C) 8 m. D) 160 m. E) 640 m.

Part 2:

Please read each of the following questions carefully and show your work in the space provided. Include the appropriate units with your answer. ***(2 points each)***

P1. A **2150 kg** truck is traveling along a straight, level road at a constant speed of **55.0 km/h** when the driver removes his foot from the accelerator. After **21.0 s**, the truck's speed is **33.0 km/h**. What is the magnitude of the average net force acting on the truck during the **21.0 s** interval?

Answer (with units) _____

P2. A **0.25 kg** ball attached to a string is rotating in a horizontal circle of radius **0.5 m**. If the ball revolves twice every second, what is the tension in the string?

Answer (with units) _____

P3. A crate rests on the flatbed of a truck that is initially traveling at **15 m/s** on a level road. The driver applies the brakes and the truck is brought to a halt in a distance of **38 m**. If the deceleration of the truck is constant, what is the **minimum coefficient** of friction between the crate and the truck that is required to keep the crate from sliding?

Answer (with units) _____

Good Luck

Some useful constants:

$$g = 9.81\ m/s^2$$