Sciduck's SSSS

Div. C Hovercraft Test

Names _____

School _____

Team # _____

Score ___ / 25

Use 2 significant figures unless stated otherwise.
Incorrect units will lead to a ½ point deduction.
Each question is worth one point.

Proctors: Please print this side single-sided so test takers have more work space.

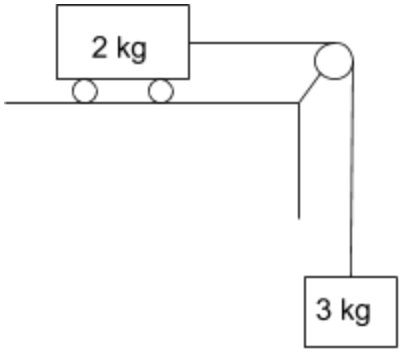
Newton's Laws of Motion

1. An invisible force accelerates a ball through space to the right with 10 N. A second invisible force is applied so the ball moves to the right at a constant velocity. What was the magnitude of the second force?

a. 0 N
b. 10 N
c. 20 N
d. 30 N

2. What is the acceleration of an elevator if a 510 N person appears to weigh 570 N when the elevator is accelerating upward?

3. What is the acceleration of this system?



4. Which of the following could be a free-body diagram of an object traveling at a constant velocity to the right?

a.


b.


c.


d.


5. A 280N sled is pulled with a 150N force at an angle of 35° to the horizontal.
If μ_k is 0.20, find the acceleration.

Kinematics

6. Give an example of an object having zero velocity and nonzero acceleration.

7. An angry SciOly rival perched a height *h* above the ground in a tree drops a tomato directly above your head as you run beneath the tree with a speed of *v*. If *g* represents the acceleration of gravity, what is distance the tomato will hit the ground behind you?

a. $\sqrt{\frac{hv}{g}}$

b. $\sqrt{\frac{hv^2}{3g}}$

c. $\sqrt{\frac{hv^2}{g}}$

d. $\sqrt{\frac{hv^2}{2g}}$

e. $\sqrt{\frac{2hv^2}{g}}$

8. Person A weighs 60. kg and person B weighs 70. kg. They both have a vertical jump of 1.1 m. Who spends the longest time in the air?

a. Person A
b. Person B
c. They spend the same time in the air
d. Not enough information given

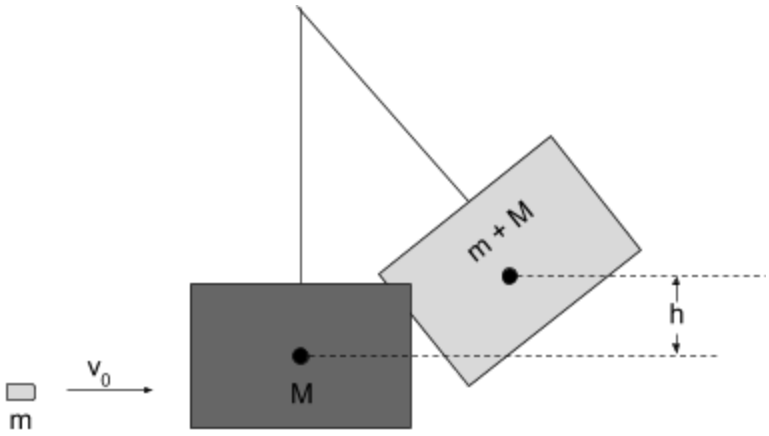
9. (Use 3 sig figs) A ball is thrown at an angle of 37.0 to the horizontal with a speed of 62.0 m/s. How high will the ball be when it is 273 m away?

10. (Use 3 sig figs) What is the velocity of the ball (from Problem 9) when it is 273m away?

Energy & Momentum

11. A bullet is fired into a block at rest that is free to move as shown below. Find the initial velocity v_0 given the following variables:

- Height = h
- Mass of block = M
- Mass of bullet = m
- Acceleration due to gravity = g



12. How much work must be done to stop a 1300kg car traveling at 110 km/h?

13. A skier, starting from rest, slides down a frictionless 35° incline whose vertical height is 190m. How fast is she going when she reaches the bottom?

14. A 5.0kg object moving 3.0m/s to the right collides with a 3.0kg moving 2.0m/s to the left collide and stick. What is the velocity of the resulting velocity?

15. How much kinetic energy was lost during the collision in Problem 14?

Fluid Mechanics

16. What will happen as a result of blowing air in between the pop cans (from behind the pop cans)?
    a. They will stay stationary
    b. They will move forward only, toward the camera
    c. They will move toward each other and forward
    d. They will move away from each other and forward

17. High cholesterol in the blood can cause plaques to form on the walls of blood vessels. Suppose a plaque reduces the effective radius of an artery by 25%. How does this partial blockage affect the speed of blood through the artery?
    a. Speed decreases by 25%
    b. Speed decreases by 80%
    c. Speed increases by 25%
    d. Speed increases by 80%

18. A rectangular air mattress is 2.0m by 0.50m by 0.08m thick. If it has a mass of 2.3kg, what additional mass can it support in the water?

19. How fast does water flow from a hole at the bottom of a very wide, 5.2m deep storage tank filled with water? Ignore viscosity.

20. What gauge pressure in the water mains is necessary if a firehose is to spray water to a height of 15m?

Design and History

21. What new design idea did V. F. Casey of America propose in 1925 to create an air cushion?

22. In what year was an Air Cushion Vehicle first proposed?

23. Put these in the order in which they were developed in ACV history: (A) flexible bag, (B) skirt, (C) segmented bag, (D) flexible skirt.

24. The largest hovercraft can hold up to 555 tons, what is the name of the class? What country produced it?

25. What month and year did was there announcement of restarting the production of the above class craft?