ISP209 Exam 4A**(Blue Exam #)Calculator and Pencil only.** Name:________________
April 24, 2001 **No books or notes.** ID: ______________________

16(22). A mass, thrown straight upward from the ground, reaches a maximum displacement, $\mathbf{s} = +100\ \text{m}$. What is the acceleration, **a**, of mass at the highest point?

a) $-g$ (correct sign, opposite to **s**)

b) zero

c) $+g$

d) −10 m/s (wrong units)

e) 100 m/s^2

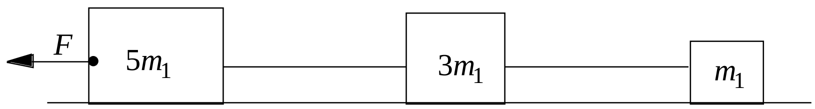


Figure for problems 17 & 18

17(23). As shown above, a force, F, accelerates three masses tied together with strings along a frictionless surface. The three masses have what magnitude of acceleration, a? (Hint: use Newton's 2nd law.)

a) $\frac{F}{3m_1}$ b) $\frac{F}{5m_1}$ c) $\frac{F}{8m_1}$ d) $\frac{F}{9m_1}$ e) $\frac{F}{10m_1}$

18(24). What is the net force acting on the $5m_1$ mass? $F = ma = 5m_1\left(\frac{F}{9m_1}\right) = \frac{5}{9}F$

a) $-F$ b) $\frac{F}{5}$ c) $\frac{5}{9}F$ d) $\frac{9}{5}F$ e) $\frac{F}{9}$

19(25). On a ball with a mass m = 0.5 kg, a force, F = 200 N, is applied for a time t = 0.1 s. Ignoring friction, at what speed can this ball be thrown?
(Hint: find **a**, using Newton's 2nd law, and then find **v**, using the 1st Motion Equation)

a) 4 m/s b) 40 m/s c) 400 m/s d) 4000 m/s e) 10 m/s

$$a = \frac{F}{m} = \frac{200\ \text{N}}{0.5\ \text{kg}} = 400\ \text{m/s}^2$$
$$v = v_0 + at = 0 + \left(400\ \text{m/s}^2\right)\left(0.1\ \text{s}\right) = 40\ \text{m/s}$$

20(26). For the ball of question 4 (19), how high can the ball be thrown above the point of release?
(Hint: use gravitational acceleration, **v** from problem 4(19), and the 2nd Motion Equation)

a) 8 m b) 80 m c) 800 m d) 8000 m e) 10 m

$$\mathbf{s} = \frac{v^2 - v_0^2}{2\mathbf{a}} = \frac{0 - \left(40\ \text{m/s}\right)^2}{2\left(-g\right)} = \frac{1600}{20}\ \text{m} = 80\ \text{m}$$

ISP209 Exam 4A**(Blue Exam #)Calculator and Pencil only.** Name:_______________
April 24, 2001 **No books or notes.** ID: ______________________

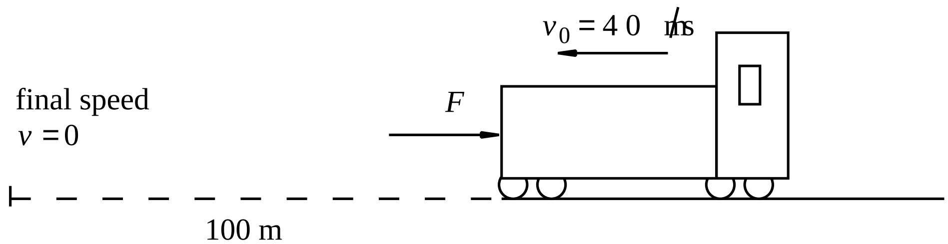


Figure for problems 21 - 24

A train weighing 10^6N, moving with a speed of 40 m/s, is slowed to $v = 0$, in a distance of 100 m, by a constant applied force, *F*, that is non-conservative.

21(27). Since a non-conservative force stops the train, which of the following cannot be the source of that force?
a) friction b) a cow e) an ideal spring c) a human d) an explosion

22(28). The force, *F*, is
a) an external force that conserves momentum.
b) an internal force that conserves momentum.
c) an external force that does not conserve momentum.
d) an internal force that does not conserve momentum.
e) gravity

23(29). The train has what acceleration, **a** ? (hint: use the 2nd Motion Eq.)
a) 4.5 m/s^2, left b) 4.5 m/s^2, right c) 8.0 m/s^2, left d) 8.0 m/s^2, right e) −10 m/s^2

$$\mathbf{a} = \frac{v^2 - v_0^2}{2\mathbf{s}} = \frac{0-(-40 \text{ m/s})^2}{2(-100 \text{ m})} = +8 \text{ m/s}^2$$ (same direction as **F**)

24(30). How long does it take for the train to stop. (hint, use the 3st Motion Eq.)
a) 1 s b) 2 s c) 3 s d) 4 s e) 5 s

$$\mathbf{s} = \tfrac{1}{2}(\mathbf{v}+\mathbf{v}_0)t; \quad t = \frac{2\mathbf{s}}{(\mathbf{v}+\mathbf{v}_0)} = \frac{200 \text{ m}}{40 \text{ m/s}} = 5 \text{ s}$$

ISP209 Exam 4A**(Blue Exam #)Calculator and Pencil only.** Name:________________
April 24, 2001 **No books or notes.** ID: ______________________

25(16). An object moves in a circle at a constant speed. The force that causes this motion must point in what direction?

a) toward the center of the circle

b) away from the center of the circle

c) forward along the direction of motion

d) opposite to the direction of motion

e) there is no net force, thus no direction.

26(17). As you begin to stop in an UP elevator, what force changes and how do you feel?

a) the force on your feet is stronger and you feel heavier

b) the force on your feet is weaker and you feel lighter

c) gravity gets weaker and you feel lighter

e) gravity get stronger and you feel heavier

e) you feel weightless

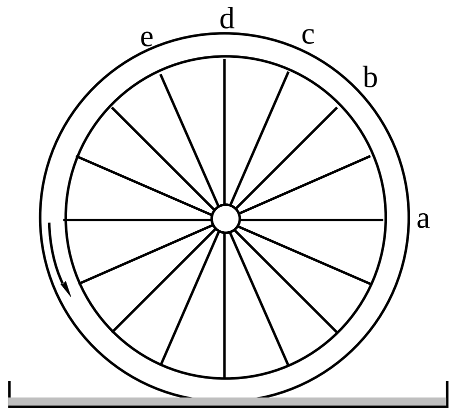
27(18). Two objects with different masses are dropped from the same height. Ignoring friction, do the two masses hit the ground at the same time, and why?

(a) The object with the larger acceleration hits the ground first.
(b) The object with the larger mass hits the ground first.
(c) The object with the larger size hits the ground first.
(d) The objects hit at the same time because the bigger mass has more force on it.
(e) The objects hit at the same time because the same force acts on both.

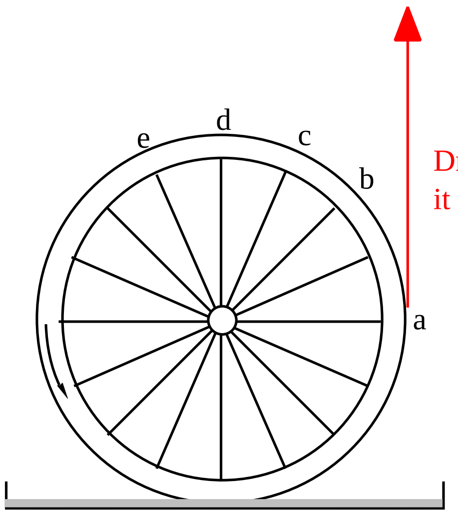
ISP209 Exam 4A**(Blue Exam #)Calculator and Pencil only.** Name:________________
April 24, 2001 **No books or notes.** ID: ______________________

28(19). A wheel shown at the right turns rapidly in a shallow pan of water, throwing water droplets off at various points around the circle. If the initial motion of a drop is straight upward, at which point is that drop released from the wheel?

(a) , (b) , (c) , (d) , (e)

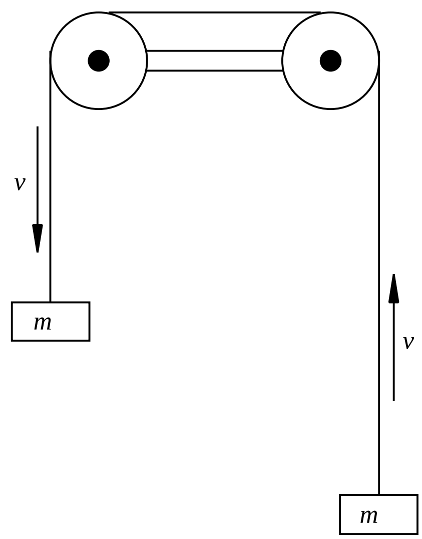


Wheel turns in a shallow pan of water.



Droplet moves in direction
it had when leaving the wheel!

29(20). Two masses, suspended from a string running over frictionless pulleys, move with *constant speed, v*, in the directions shown. What tension exists in the portions of the string attached to the masses?



a) *mg*
b) 2 *mg*
c) larger tension acts on mass moving down.
d) larger tension acts on mass moving upward.
e) none of the above

30(21). Which condition is impossible

a) velocity zero acceleration zero
b) velocity zero, acceleration non-zero (object turning around)
c) velocity non-zero, acceleration zero
d) velocity non-zero, acceleration non-zero
e) none of the above.