

Quiz 10
Motion

Name: _____ Group: _____

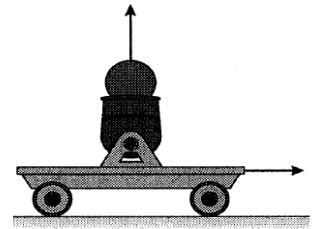
1. Two balls are released at the same time on the two tracks shown below. Which ball wins?

- a. **The ball on the low road**
- b. The ball on the high road
- c. They tie



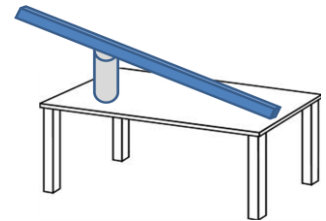
2. What will happen if the cart rolls at a constant speed and then shoots a ball straight up?

- a. The ball will land behind the cart
- b. **The ball will land in the cart.**
- c. The ball will land in front of the cart.
- d. Depends on the initial velocity of the cart.



3. A cart with very nice wheels is rolling down the ramp shown. The cart will

- a. speed up at a rate equal to when falling straight down
- b. **speed up at a rate less than when falling straight down**
- c. travel at a constant speed.
- d. slow down.

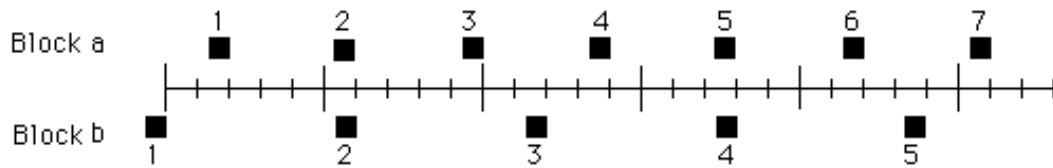


4. The position of one block at successive 1-second time intervals is represented by the numbered squares in the figure below. The block is moving toward the right.

- a. The block's speed is constant.
- b. **The block's speed is increasing.**
- c. The block's speed is decreasing.
- d. The block's speed is increasing and then constant.
- e. Not enough information is given to answer the question.

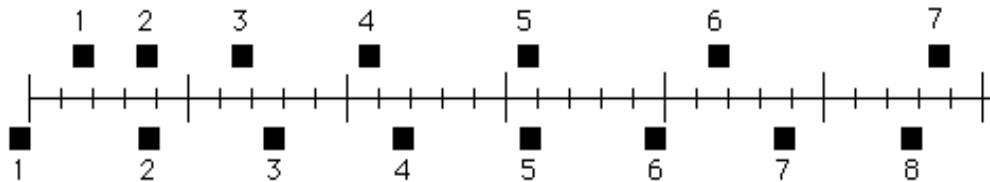


5. The positions of two blocks at successive 1-second time intervals are represented by the numbered squares in the figure below. The blocks are moving toward the right.



The accelerations of the blocks are related as follows:

- The acceleration of "a" is greater than the acceleration of "b".
 - The acceleration of "a" equals the acceleration of "b". Both accelerations are greater than zero.
 - The acceleration of "b" is greater than the acceleration of "a".
 - The acceleration of "a" equals the acceleration of "b". Both accelerations are zero.**
 - Not enough information is given to answer the question.
6. The positions of two blocks at successive 1-second time intervals are represented by the numbered squares in the figure below. The blocks are moving toward the right.

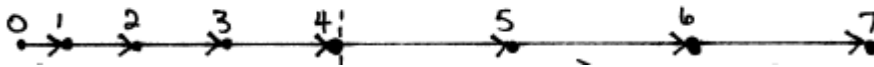


Do the blocks ever have the same speed?

- No.
 - Yes, at instant 2.
 - Yes, at instant 5.
 - Yes, at instants 2 and 5.
 - Yes, at some time during the interval 3 to 4.**
7. A big rock dropped from the roof of Ross Hall to the grass below
- is going its maximum speed immediately after release.
 - reaches a maximum speed quite soon after release.
 - reaches its maximum speed about half way to the ground.
 - reaches its maximum speed just before it hits the ground.**
8. A student throws a baseball to a friend who's standing on the top of Ross Hall. The baseball is thrown perfectly so that it reaches the top of its flight just as it reaches the person on the roof. The baseball
- is going its maximum speed immediately after release.**
 - reaches a maximum speed quite soon after release.
 - reaches its maximum speed about half way to the roof.
 - reaches its maximum speed just before the person on the roof catches it.

9. Which of the motion diagrams to the right could be a dust particle settling to the floor at constant speed? A. 0 ● B. 0 ● C. 0 ●
- a. A 1 ●
- b. B** 2 ● 1 ●
- c. C 3 ● 2 ● 1 ●
- d. None of them 4 ● 3 ● 2 ●
10. Which of the motion diagrams to the right could be a descending rocket slowing to make a soft landing on Mars? 4 ● 3 ●
- a. A 5 ● 5 ● 4 ●
- b. B
- c. C** 5 ● 5 ● 5 ●
- d. None of them

11. The diagram below shows an object



- a. moving at a constant speed
- b. speeding up
- c. slowing down
- d. speeding up and then moving at a constant speed**
- e. moving at a constant speed and then slowing down.
12. When a ball is thrown up into the air with an initial velocity of 10 m/s, what is its velocity at the top of its flight?
- a. $v = 0 \text{ m/s}$
- b. $v = -10 \text{ m/s}$
- c. $v = 10 \text{ m/s}$
- d. Not enough information is given.
13. When a ball is thrown up into the air, what is its acceleration at the top of its flight?
- a. $a = 0 \text{ m/s}^2$
- b. $a = -9.8 \text{ m/s}^2$**
- c. $a = 9.8 \text{ m/s}^2$
- d. Not enough information is given.

14. A book is resting on your desk. Consider the following forces:

1. A downward force of gravity.
2. An upward force exerted by the surface.

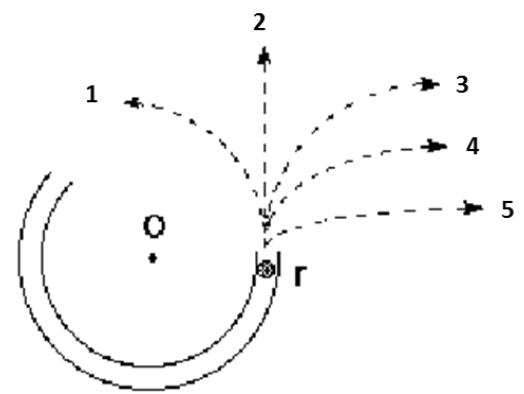
Which of the above forces are acting on the book?

- a. 1 only
 - b. 2 only
 - c. **Both 1 and 2**
 - d. Neither
15. A large truck collides head-on with a small compact car. During the collision:
- a. the truck exerts a greater amount of force on the car than the car exerts on the truck.
 - b. the car exerts a greater amount of force on the truck than the truck exerts on the car.
 - c. neither exerts a force on the other, the car gets smashed simply because it gets in the way of the truck.
 - d. the truck exerts a force on the car but the car does not exert a force on the truck.
 - e. **the truck exerts the same amount of force on the car as the car exerts on the truck.**

A large box is pulled with a constant horizontal force. As a result, the box moves across a level floor at a constant speed.

16. The pull:
- a. has the same magnitude as the weight of the box.
 - b. is greater than the weight of the box.
 - c. **has the same magnitude as the total force which resists the motion of the box.**
 - d. is greater than the total force which resists the motion of the box.
 - e. is greater than either the weight of the box or the total force which resists its motion.
17. If the pulling suddenly stops, then the box will:
- a. immediately come to a stop.
 - b. continue moving at a constant speed for a while and then slow to a stop.
 - c. **immediately start slowing to a stop.**
 - d. continue at a constant speed.
 - e. increase its speed for a while and then start slowing to a stop.
18. If, *instead*, the horizontal force pulling the box is doubled. The box's speed:
- a. **continuously increases.**
 - b. will be double the speed but still constant.
 - c. is greater and constant, but not necessarily twice as great.
 - d. is greater and constant for awhile and increases thereafter.
 - e. increases for a while and constant thereafter.

19. Which path in the figure at right would the ball most closely follow after it exits the channel at "r" and moves across the frictionless table top?

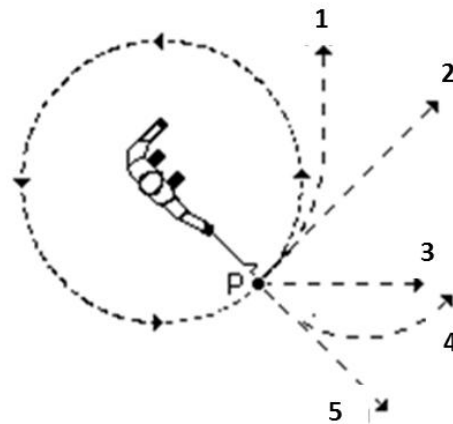


- a. Path 1
- b. Path 2**
- c. Path 3
- d. Path 4
- e. Path 5

20. A steel ball is attached to a string and is swung in a circular path in a horizontal plane as illustrated in the accompanying figure.

At the point P indicated in the figure, the string suddenly breaks near the ball.

If these events are observed from directly above as in the figure, which path would the ball most closely follow after the string breaks?



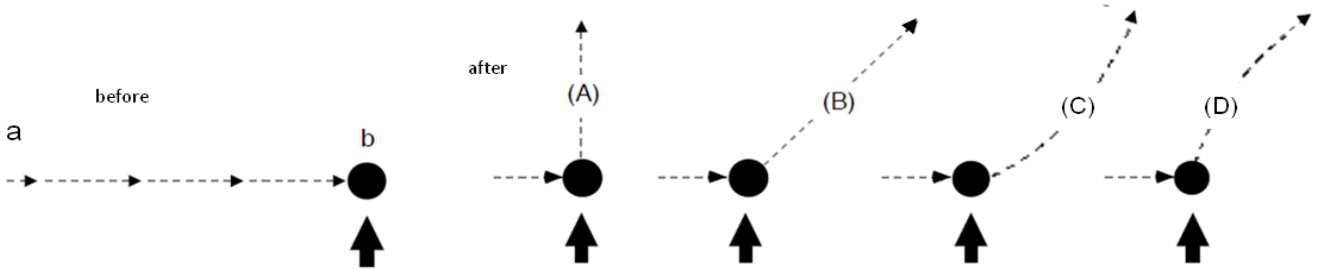
- a. Path 1
- b. Path 2**
- c. Path 3
- d. Path 4
- e. Path 5

21. A boy throws a steel ball straight up. Consider the motion of the ball only when it is no longer touching the boy's hand but before it touches the ground. Assume that air resistance is negligible.

The force(s) acting on the ball is (are):

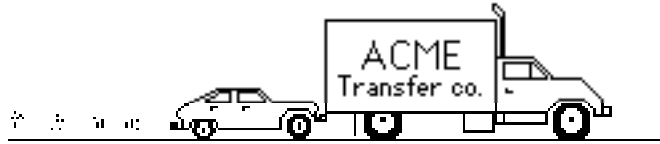
- a. a downward force of gravity and a steadily decreasing upward force.
- b. a steadily decreasing upward force *after* it leaves the boy's hand until it reaches its highest point; on the way down there is a steadily increasing downward force of gravity.
- c. a downward force of gravity and a steadily decreasing upward force *after* it leaves the boy's hand until it reaches its highest point; on the way down there is only a downward force of gravity.
- d. a downward force of gravity only.**
- e. none of the above.

The figure depicts a bar of soap sliding on a horizontal wet floor with constant speed in a straight line from point "a" to point "b". You are looking down on the bar of soap. When the soap reaches point "b," it receives a kick in the direction of the heavy print arrow.

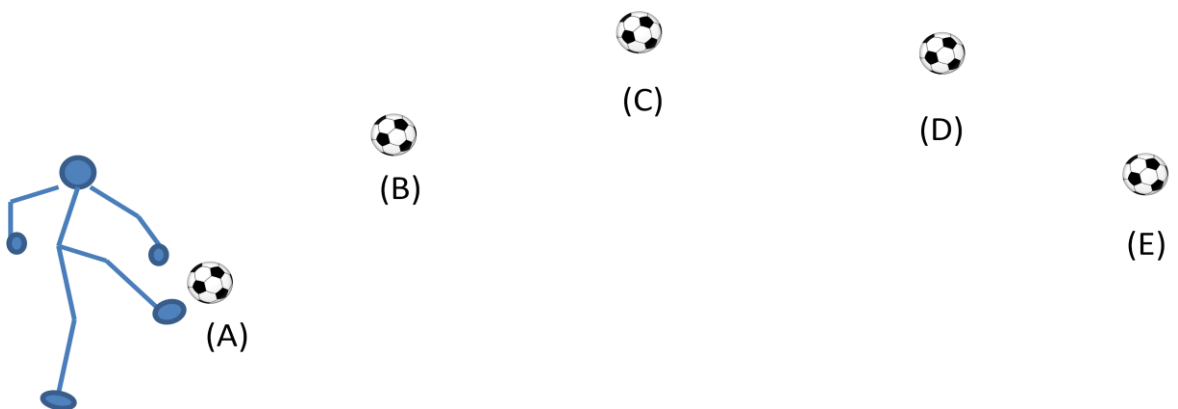


22. Which path would the bar of soap most closely follow after receiving the kick? **Path B**
23. The kick results in the soap's speed being
- faster than before the kick.**
 - the same as before the kick.
 - slower than before the kick.
 - not enough information
24. When the foot is no longer touching the soap, the speed of the soap:
- is constant. The wet soap floor combo is frictionless. You can figure this out since it was going at a constant speed before it was kicked.**
 - continuously increases.
 - continuously decreases.
 - increases for a while and decreases thereafter.
 - is constant for a while and decreases thereafter.
25. When the foot is no longer touching the soap, the main force(s) acting on the soap is (are):
- a downward force of gravity.
 - a downward force of gravity, and a force in the direction of motion.
 - a downward force of gravity, an upward force exerted by the surface, and a force in the direction of motion.
 - a downward force of gravity and an upward force exerted by the surface.**
 - none. (No forces act on the soap.)
26. Despite a very strong wind, a tennis player manages to hit a tennis ball with her racquet so that the ball passes over the net and lands in her opponent's court. Consider the following forces:
- A downward force of gravity.
 - A force by the "hit".
 - A force exerted by the air.
- Which of the above forces is (are) acting on the tennis ball after it has left contact with the racquet and before it touches the ground?
- 1 only.
 - 1 and 2.
 - 1 and 3.**
 - 2 and 3.
 - 1, 2, and 3.

A large truck breaks down out on the road and receives a push back into town by a small compact car as shown in the figure below.

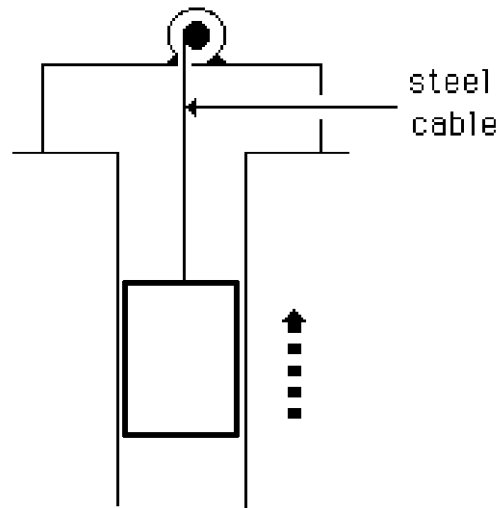


27. While the car, still pushing the truck, is speeding up to get up to cruising speed:
- the amount of force with which the car pushes on the truck is equal to that with which the truck pushes back on the car.**
 - the amount of force with which the car pushes on the truck is smaller than that with which the truck pushes back on the car.
 - the amount of force with which the car pushes on the truck is greater than that with which the truck pushes back on the car.
 - the car's engine is running so the car pushes against the truck, but the truck's engine is not running so the truck cannot push back against the car. The truck is pushed forward simply because it is in the way of the car.
 - neither the car nor the truck exert any force on the other. The truck is pushed forward simply because it is in the way of the car.
28. After the car reaches the constant cruising speed at which its driver wishes to push the truck:
- the amount of force with which the car pushes on the truck is equal to that with which the truck pushes back on the car.**
 - the amount of force with which the car pushes on the truck is smaller than that with which the truck pushes back on the car.
 - the amount of force with which the car pushes on the truck is greater than that with which the truck pushes back on the car.
 - the car's engine is running so the car pushes against the truck, but the truck's engine is not running so the truck cannot push back against the car. The truck is pushed forward simply because it is in the way of the car.
 - neither the car nor the truck exert any force on the other. The truck is pushed forward simply because it is in the way of the car.
29. A soccer player kicks a ball on a calm day. **Position A – immediately after it's no longer touching the foot.**



At which of the points shown is the ball moving the fastest?

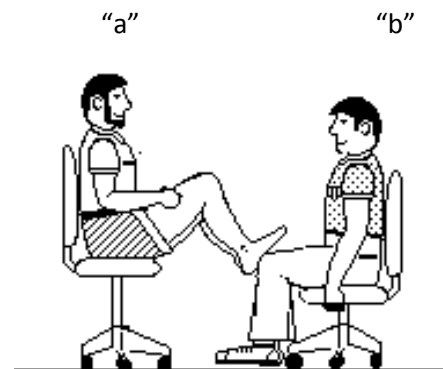
30. An elevator is being lifted up an elevator shaft at a **constant speed** by a steel cable as shown in the figure below. All frictional effects including air resistance are negligible. In this situation, forces on the elevator are such that:
- the upward force by the cable is greater than the downward force of gravity.
 - the upward force by the cable is equal to the downward force of gravity.**
 - the upward force by the cable is smaller than the downward force of gravity.
 - none of the above.



Elevator going up
at a constant speed

31. In the figure, student "a" has a mass of 95 kg and student "b" has a mass of 77 kg. They sit in identical office chairs facing each other.

Student "a" places his bare feet on the knees of student "b". Student "a" then suddenly pushes outward with his feet, causing both chairs to move. During the push and while the students are still touching one another:



- neither student exerts a force on the other.
- student "a" exerts a force on student "b", but "b" does not exert any force on "a".
- each student exerts a force on the other, but "b" exerts the larger force.
- each student exerts a force on the other, but "a" exerts the larger force.
- each student exerts the same amount of force on the other.**

32. A boy throws a baseball straight up (very high) and then catches the ball when it comes back down. 5 ●
4 ●

a. Draw a motion diagram of the baseball after it is no longer touching the boy's hand on its way up to the top of its flight. 3 ●
2 ●

1 ●

0 ●

b. Draw a motion diagram of the baseball on the way back down until just before the boy catches it. 0 ●
1 ●

2 ●

They look exactly the same except for the numbering to let the reader know where the diagram begins and which way the object is headed. 3 ●

4 ●

5 ●

33. Explain in detail *why* objects fall at the same rate on earth if air resistance is neglected. *Hint:* There are two competing concepts at work.

Concept 1 Weight: Weight is the measure of how hard gravity pulls on an object. Gravity pulls harder on heavier objects. If this were the only effect, heavier objects would fall faster.

Concept 2 Inertia: Inertia is caused by mass. An object with a larger mass is harder to get moving and harder to slow down. If inertia were the only effect, lighter objects would fall faster.

Both of these phenomena balance each other perfectly and all objects fall at the same rate (as long as there is no air resistance.)