Name: _____ Total Points: _____
(Last) (First)

Physics 201

Exam 1

Write also your name in the appropriate box of the scantron

Name: _____ Total Points: _____
(Last) (First)

Multiple choice questions

Answer all of the following questions. Read each question carefully. **Fill the correct bubble on your scantron sheet**. Each question has exactly one correct answer. All questions are worth the same amount of points.

1. A plane goes 300 km from A to B in a straight line, immediately turns around, and returns to B. The time for this round trip is 2 hour. The magnitude of the average velocity of the plane for this round trip is

A. **0 km/h**
B. **100 km/h**
C. **150 km/h**
D. **200 km/h**
E. Cannot be calculated without knowing the acceleration

2. A car, initially at rest, travels 20m in 4s along a straight line with constant acceleration. The acceleration of the car (in m/s^2) is

A. **0.4**
B. **1.3**
C. **2.5**
D. **4.9**
E. **9.8**

3. At a stoplight, a truck traveling at 15m/s passes a car as it starts from rest. The truck travels at constant velocity and the car accelerates at $3m/s^2$. How many seconds will it take for the car to catch up to the truck?

A. **5**
B. **10**
C. **15**
D. **20**
E. **25**

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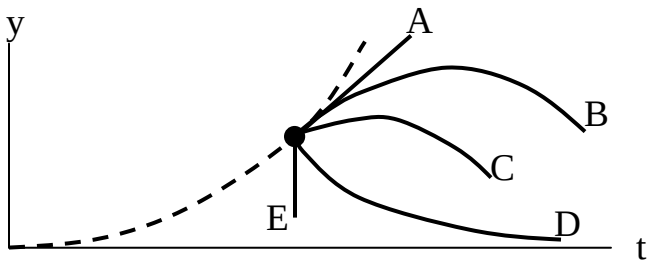
4. An elevator is moving upward with constant acceleration. The dashed curve shows the position y of the ceiling of the elevator as a function of the time t. At the instant indicated by the dot, a bolt breaks loose and drops from the ceiling. Which curve best represents the position of the bolt as a function of time?



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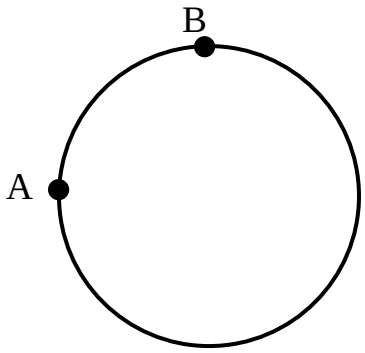
5. On a circular track, a car starts from rest at point A and moves in a clockwise direction with increasing speed. What is the direction of the acceleration vector at A?



A. Undefined: the acceleration is zero

B. 

C. 

D. 

E. 

6. Referring to the car of the previous question, what would be a valid direction of the acceleration at point B?

A. Undefined: the acceleration is zero

B. 

C. 

D. 

E. 

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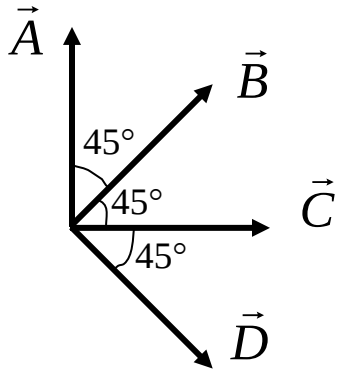
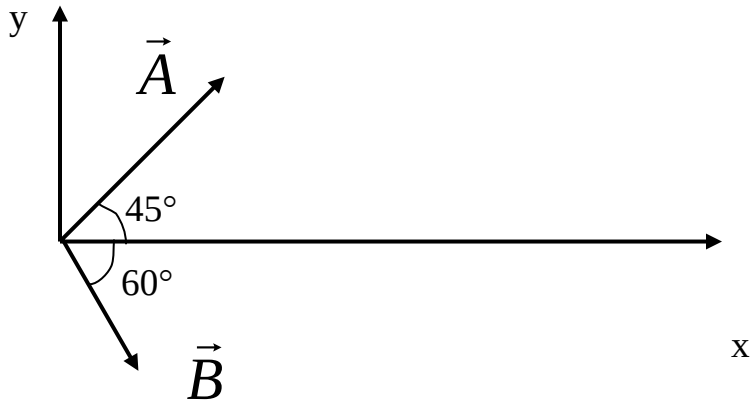
(Last) (First)

7. Four vectors $\vec{A}, \vec{B}, \vec{C}, \vec{D}$ all have the same magnitude. The angle θ between adjacent vectors is 45° as shown. The correct vector equation is



A. $\vec{A} - \vec{B} - \vec{C} + \vec{D} = 0$
B. $\vec{B} - \sqrt{2}\vec{C} + \vec{D} = 0$
C. $\vec{A} + \vec{B} = \vec{B} + \vec{D}$
D. $\vec{A} + \vec{B} + \vec{C} + \vec{D} = 0$
E. $\vec{A} + \sqrt{2}\vec{B} + \vec{C} = 0$

8. In the diagram, $\vec{A}$ has magnitude 12 m and $\vec{B}$ has magnitude 8 m. The x component of $\vec{A} + \vec{B}$ is about



A. **4.5 m**
B. **8.5 m**
C. **12.5 m**
D. **14.5 m**
E. **20 m**

Name: _____ Total Points: _____
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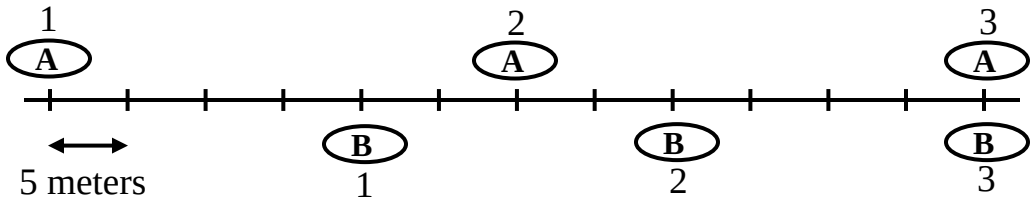
9. Two objects, A and B, move with constant speed relative to a straight line. The strobe diagram shows the positions of the objects at instant 1-3, separated by one-second time intervals. (Note that each tick mark on the diagram represents 5 meters.)



At instant 2 what is the direction of the instantaneous velocity of object B in the frame of reference of object A?

A. to the left
B. to the right
C. Undefined: the velocity is zero

10. Still referring to the problem of the previous question, at instant 2, what is the magnitude of the instantaneous velocity of object B in the frame of reference of object A?

A. 0 m/s
B. 10 m/s
C. 20 m/s
D. 30 m/s
E. 50 m/s

Name: _____ Total Points: _____
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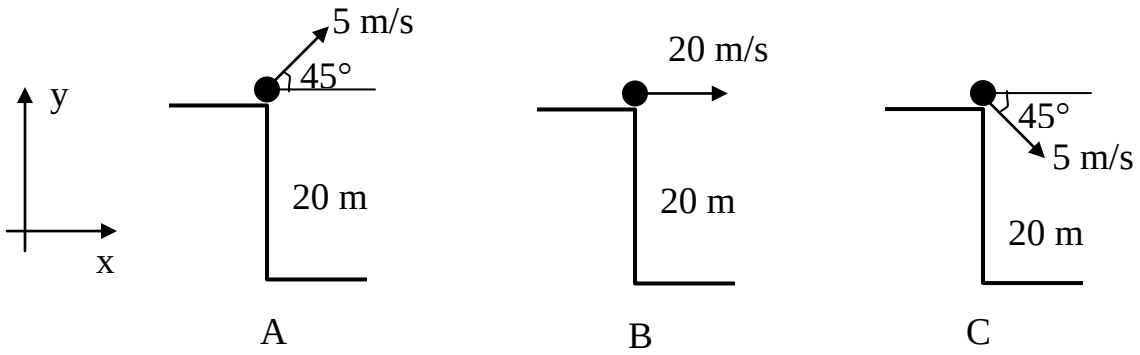
Questions 11 through 18 all refer to the same problem.

A baseball is thrown from the top of a cliff as shown below. The cliff height is marked in each case. Answer the following questions, referring to these cases. Take g=10 m/s^2.



A B C

D (Assume that the ball doesn't touch the cliff on its way down).

E

11. In which case will the baseball remain in the air the longest amount of time?

12. In which case will the baseball remain in the air the shortest amount of time?

Name: _____ Total Points: _____
(Last) (First)

13. In which case will the baseball go the farthest in the x direction?

14. Consider cases B and E only
In which case will the baseball remain in the air the longest amount of time?

A. case B
B. case E
C. Same amount of time for both

15. If you wanted to make the ball go farther in the x direction, in case B, you could

A. increase the magnitude of the initial velocity
B. change the angle between the initial velocity and the x direction to +4 (i.e. the initial velocity is directed upward at a 45° angle).
C. move to a higher cliff
D. A and B
E. A, B and C

All questions 16 through 18 refers to case D (take $g=10m/s^2$)

16. Determine how many seconds it takes for the baseball to hit the ground

A. 1.9
B. 2.7
C. 3.2
D. 3.8
E. 4.8

17. What is the magnitude of the velocity when the ball hits the ground?

A. 0 m/s
B. 5 m/s
C. 10.7 m/s
D. 15.8 m/s
E. 22.4 m/s

Name: _____ Total Points: _____
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18. What is the direction of the acceleration when the baseball is at its highest point?

A. Undefined: the acceleration is zero.
B. x
C. –x
D. y
E. –y