**2D Motion**
AP Physics B

Name _____
2-3a 3b-4 5-6a 6b-7

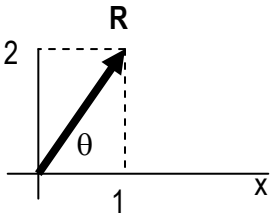
Multiple Choice: For the following questions, mark the best answer on your scantron. Each question is worth 1 point. NOTA means "none of these answers". Write on this test, it is your copy.

1 A 2-kilogram block rests at the edge of a platform that is 10 meters above level ground. The block is launched horizontally from the edge of the platform with an initial speed of 3 meters per second. Air resistance is negligible. The time it will take for the block to reach the ground is most nearly:
a. 0.3 s b. 1.0 s c. 1.4 s d. 2.0 s e. 3.0 s

2 Which of the following quantities is a vector quantity?
a. speed b. mass c. volume d. temperature e. NOTA

3 Solve the following vector equation: ← − ↑ = ?
a. ↖ b. ↗ c. ↙ d. ↘ e. 0

**Questions 4 and 5 refer to the diagram below, in which vector R has an x-component of 1 and a y-component of 2.**




4 The magnitude of vector R is given by the expression
a. $\sqrt{1^2+2^2}$ b. $\sqrt{1^2-2^2}$ c. $\sqrt{2^2-1^2}$ d. $\sqrt{1+2}$ e. $\sqrt{2-1}$

5 The angle θ that vector R makes with the x-axis is
a. $\sin^{-1}(1/2)$ b. $\cos^{-1}(1/2)$ c. $\tan^{-1}(1/2)$ d. $\tan^{-1}(2/1)$ e. $\sin^{-1}(2/1)$

6 A toy cannon launches a missile into the air. As the missile flies through the air...
a. the vertical speed changes and the horizontal speed changes
b. the vertical speed changes and the horizontal speed remains the same
c. the vertical speed remains constant and the horizontal speed changes
d. the vertical speed and the horizontal speed remains constant
e. the vertical speed is zero and the horizontal speed remains constant

7 Vector A = 20 m, 20°. Vector –3A would be equal to
a. 60 m, 20° b. –60 m, 20° c. 20 m, 200° d. 60 m, -60° e.none of these is correct

8 A projectile is fired horizontally with velocity $V_x$ at an altitude h. After hitting the ground, the projectile's net displacement in the horizontal direction is
a. $v_x\sqrt{\frac{2h}{g}}$ b. $\left(\frac{1}{v_x}\right)\sqrt{\frac{2h}{g}}$ c. $\sqrt{2gh}$ d. $\sqrt{v^2+2gh}$ e. $\left(\frac{1}{v_x}\right)\sqrt{\frac{2g}{h}}$

9 A football kicked high into the air will achieve the greatest horizontal displacement when it is kicked with a speed $v_i$ and angle θ of
a. 12 m/s @ 45° b. 14 m/s @ 45° c. 14 m/s @ 60° d. 12 m/s @ 30° e. 16 m/s @85°

10 A diver initially moving horizontally with speed v dives off the edge of a vertical cliff and lands in the water a distance d from the base of the cliff. How far from the base of the cliff would the diver have landed if the diver initially had been moving horizontally with speed 2v?

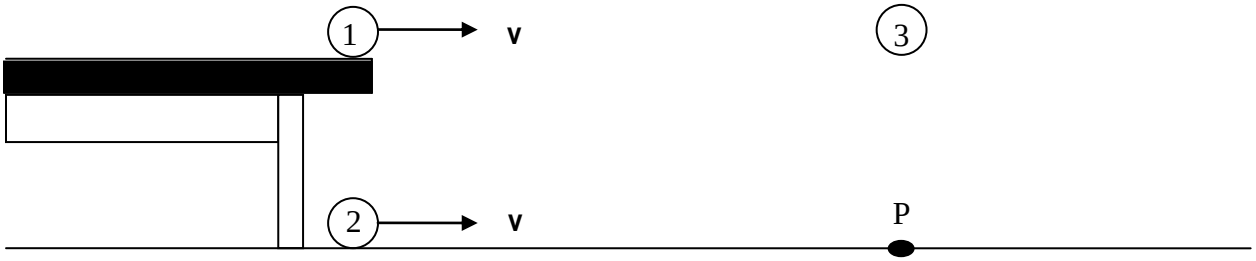
a. d b. 2d c. $\sqrt{2}$ d d. 4d e. can't be determined without the height of the cliff

11 Robin Hood aims his longbow horizontally at a target's bull's eye 30 m away. If the arrow strikes the target exactly 1.0 m below the bull's eye, how fast did the arrow move as it was shot from the bow? Assume air resistance is negligible.

a. 6.0 m/s b. 13 m/s c. 33 m/s d. 67 m/s e. 150 m/s

**Questions 12-14 refer to the diagram below.**

At t = 0,
ball 1 is launched horizontally off the table top with a speed v (landing at point P)
ball 2 starts at a point directly below ball 1 and rolls forward with constant speed v
ball 3 is dropped from rest from a height equal to that of the table top, h
All balls eventually hit point P.




12 Which ball or balls has the greatest initial Y velocity?

a. 1 b. 2 c. 3 d. 1 and 3 e. all have the same initial y velocity

13 Which ball or balls arrive at point P with the most speed?

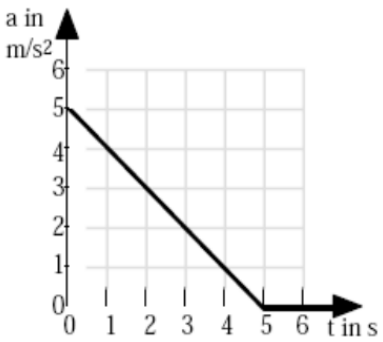
a. 1 b. 2 c. 3 d. 1 and 3 e. all arrive with the same speed

14 Suppose ball 1 leaves the table with twice its previous speed. As it continues forward in its trajectory, it will

a. pass over ball 3 while passing point P
b. pass under ball 3 while passing point P
c. hit ball 3 at some height above point P
d. land at a point only one-half the distance to point P
e. land at point P just as before

15 Starting from rest at time t = 0, a car moves in a straight line with an acceleration given by the accompanying graph below. What is the speed of the car at t = 3 s?

a. 1.0 m/s b. 2.0 m/s c. 6.0 m/s d. 10.5 m/s e. 12.5 m/s



AP Physics
2D and Vectors

Name:_____
Period: 2-3A 3B-4 5-6A 6B-7

The Dixie Dazzler attempts to launch himself out of a cannon and land safely in a pile of straw. He is launched from the top of an 8 meter building, at a speed of 30 m/s, and at an angle of 20°.

a) What are vertical and horizontal components of The Dazzler's launched velocity?

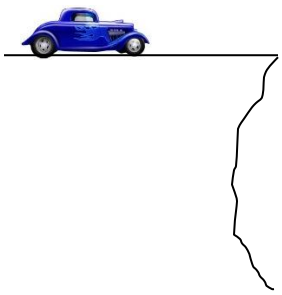
b) What is The Dazzler's maximum height reached from the ground?

c) How much time does it take The Dazzler to reach a maximum height?

d) How far should the pile of straw be placed from the edge of the building so The Dazzler lands safely?

e) How far from the base of the building should a flaming hoop be placed to take The Dazzler's trick to the next level?

Starting from rest, a car drives towards the end of a 70 m cliff. The car takes off with an acceleration of 8m/s/s, 30 m from the cliff's edge.



a) With what speed does the car drive off the cliff?

b) How long is the car in the air?

c) How far from the base of the cliff does the car land?

d) What is the velocity of the car 2 seconds after it leaves the cliff?