Name:_____Teacher: _____

AP Physics 1 Summer Work: Vectors and 1 D kinematics

Use the provided presentation, Vectors & Scalars to work through problems 1-13. Problems 14-24 are based on the information from Khan Academy, AP Physics 1, Unit 1 Kinematics.

Scalar and Vector Powerpoint: Vectors & Scalars

Khan Academy, AP Physics 1, Unit 1 Kinematics:

https://www.khanacademy.org/science/ap-college-physics-1/xf557a762645cccc5:kinematics

Vector Analysis problems 1-8

1. Find the X, Y component form of the following vectors:
   a. 35 m/s at 57° N of E

   b. 12 m at 34° S of W

   c. 8 m/s due South

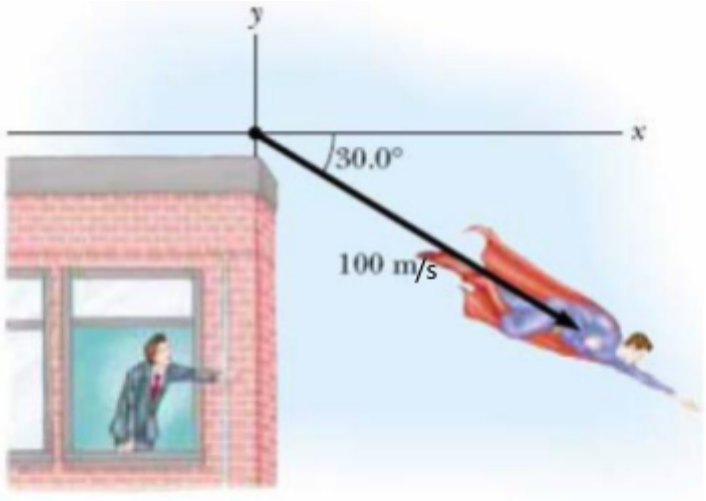
2. Find the **magnitude** and **direction** form of the following vectors:
   a. 5.7X + 3.4Y

   b. -10X + -3Y

   c. 12X + -20y

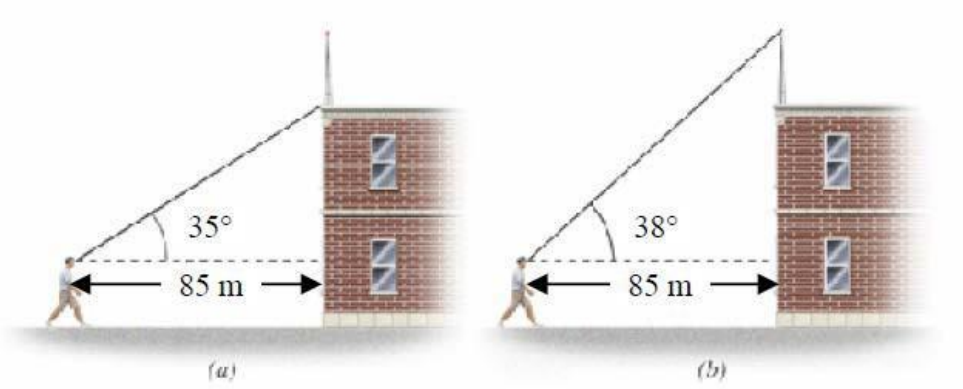
   d. -30X + 27Y

3. What is Superman's velocity in component form?

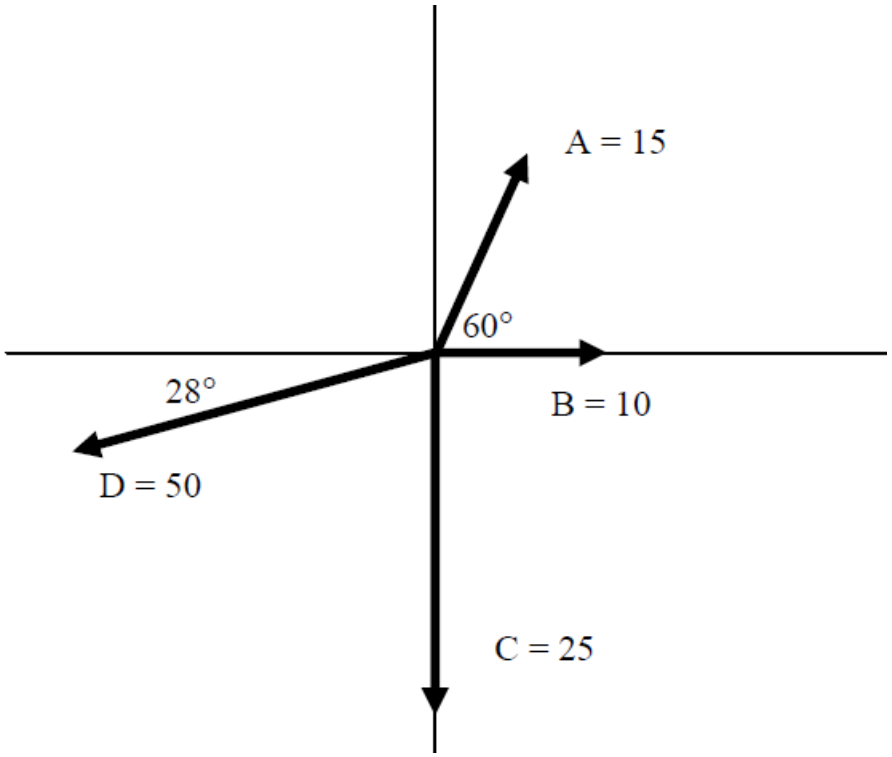


4. A hiker travels 16km North and 12km West. What is the magnitude and direction of the hiker's displacement?

5. What is the height of the antenna (only, not the building) on top of the building?



6. Fill in the chart below with the X and Y components of the following vectors:



	X	Y
A		
B		
C		
D		

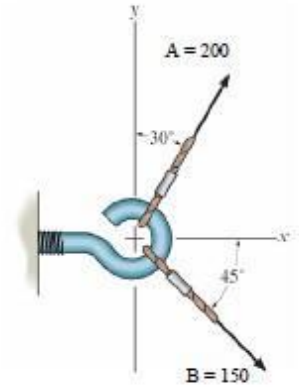
7. Find the resultant vector in magnitude and direction form of the following: (use vectors A B C D from the previous page)
   a. A + B + C + D

   b. A – C

c. D + (A – C)

d. B – A + C

8. Determine A + B for the scenario below:



Related Velocity Problems 9-13

9. A cannon is placed on a train traveling at 17m/s E. The cannon is fired, launching a cannonball at 50m/s W relative to the cannon. What is the resultant velocity of the cannonball to a viewer on the ground?

10. A plane flies at a rate of 600km/hr E into a sustained wind of 10km/hr W. What is the resultant velocity of the plane? How far will it go in 3 hrs?

11. A triathlete swims across a river with a velocity of 1.7m/s. The river has a current of 0.1m/s downstream and she lands 10m downstream from where she started. What is the width of the river?

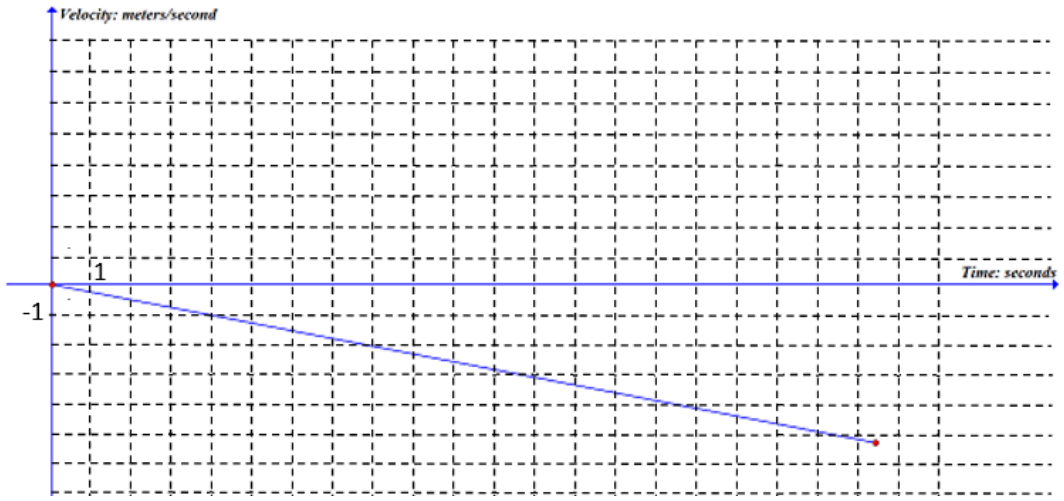
12. A plane wants to fly 250 km/hr due north. There is a crosswind of 20 km/hr W. What angle must it take (relative to due north) to maintain a due north resultant? What is the necessary magnitude of velocity relative to the air?

13. A captain drives a boat with a maximum speed of 30km/hr W directly across a body of water with a current downstream of 7 km/hr. At what angle has the captain positioned the boat to maintain his direction due W? What is the resultant velocity of the boat?

1 D Kinematics Problems 14-25: Khan Academy

******Complete Khan Academy work PRIOR to doing these problems******

For questions 14-17, use the graph below.



14. The graph below represents an object doing what? Use terms like "speeding up", "slowing down", and/or "remaining constant" to describe the motion in real life terms.

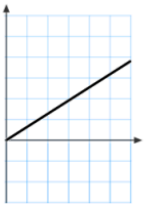
15. What is the average velocity from time t=4 to time t=8?

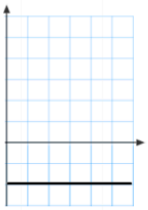
16. What is the acceleration of the object?

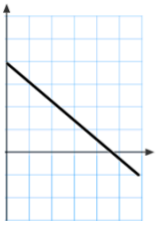
17. What is the displacement of the object over the first 4 seconds?

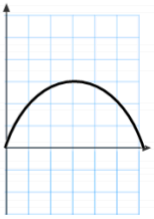
18. A rock is thrown straight up from the edge of a cliff. The rock reaches the maximum height of 15 m above the edge and then falls down to the bottom of the cliff 35 m below the cliff. What is the traveled distance of the rock?

19. Which of the following graphs represents the velocity as a function of time of an object thrown straight up?

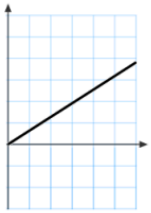
A. 

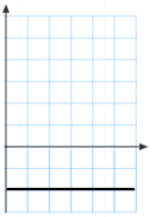
B. 

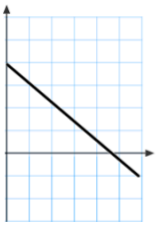
C. 

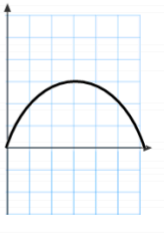
D. 

20. Which of the following graphs represents the acceleration as a function of time of an object thrown straight up?

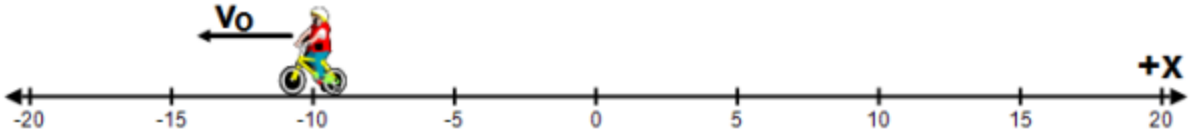
A. 

B. 

C. 

D. 

21. A bicyclist moves along a straight line with an initial velocity v_0 and slows down. Which of the following the best describes the signs set for the initial position, initial velocity and the acceleration?



	Initial position	Initial velocity	Acceleration
A.	Positive	Positive	Negative
B.	Negative	Positive	Negative
C.	Negative	Negative	Positive
D.	Negative	Negative	Negative

22. A car whose speed is 20 m/s passes a stationary motorcycle which immediately gives chase with a constant acceleration of 2.8 m/s^2.

a. How far will the motorcycle travel before catching the car?

b. How fast will it be going at that time?

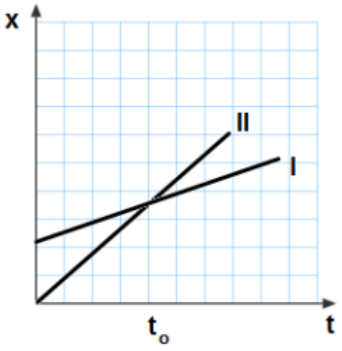
c. How does that compare to the car's velocity?

d. Draw the following graphs for the car: x(t), v(t), a(t).

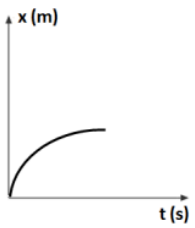
e. Draw the following graphs for the motorcycle: x(t), v(t), a(t).

Multiple Correct Problems – One or more answer is correct, choose all correct answers

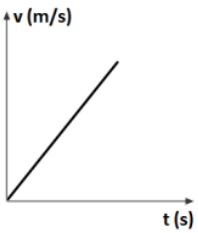
23. Position as a function of time of two moving objects is presented by the graph. Which of the following statements is true?
A. Object I has a greater velocity than object II
B. Object II has a greater velocity that object I
C. At time t0 they have the same velocity
D. At time t0 object II passes by object I



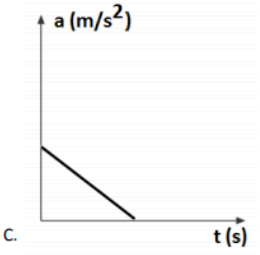
24. An object accelerates from rest at a constant rate. Which of the following graphs could be used to describe the motion of the object?



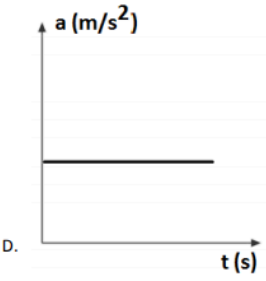
A.



B.



C.



D.