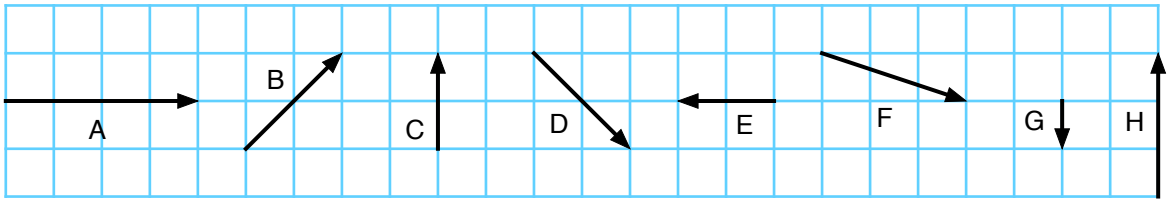
Vector Review

Questions 1 to 5 refer to the following vectors:



1. Which pairs of vectors have the same length, but different directions?

2. Which pairs of vectors are in the same direction, but different lengths?

3. Which pairs of vectors are in the opposite directions?

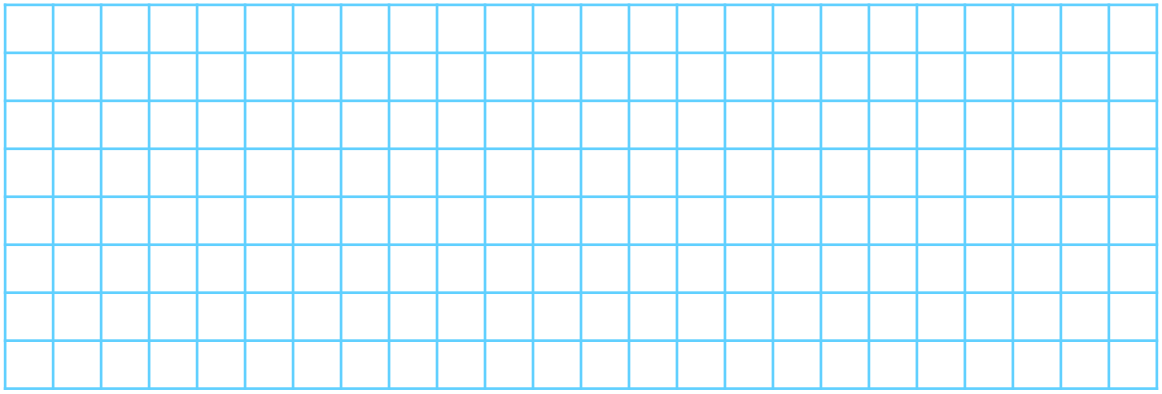
4. What are the components of each of the vectors?

A_x = _____ & A_y = _____ B_x = _____ & B_y = _____ C_x = _____ & C_y = _____

D_x = _____ & D_y = _____ E_x = _____ & E_y = _____ F_x = _____ & F_y = _____

G_x = _____ & G_y = _____ H_x = _____ & H_y = _____

5. Using the vectors above above, show the following (and make sure to label the vectors and clearly show the resultants):
   a) **A** + **C** b) **B** + **D** c) **B** + **E** d) **C** + **F** 4) **A** + **H** + **E**



6. Calculate the speeds of the velocities with the given components:
   a. v_x = 12 m/s v_y = 20 m/s b. v_x = 15 m/s v_y = –15 m/s

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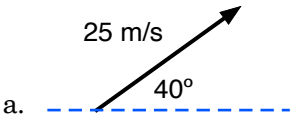
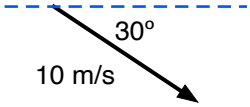
7. Calculate the components for each of the velocities:

a. 

v_x = _____ m/s

v_y = _____ m/s

b. 

v_x = _____ m/s

v_y = _____ m/s

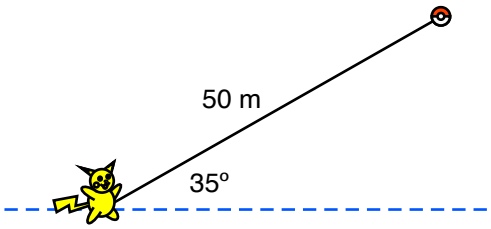
c. A ball is kicked with a velocity of 25 m/s at an angle of 65° above the horizontal.

v_x = _____ m/s v_y = _____ m/s

d. A pen is thrown with an initial velocity of 15 m/s at an angle of 25° below the horizontal.

v_x = _____ m/s v_y = _____ m/s

8. Pikachu sees a Pokeball 50 meters away, as shown in the diagram above (which is NOT to scale.) He runs straight to the Pokeball in 9 seconds.



a. How fast did Pikachu move?

b. What are the components of Pikachu's displacement?

c. What are the components of Pikachu's velocity? (Notice there are two ways you can do this!)

9. A plane has a velocity with a horizontal component of 35 m/s East and a vertical component of 20 m/s North. After 2 hours, how far away is it from its starting point?

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10. A runner runs with a velocity of 9 m/s in the direction of 55° North of East for 50 seconds. What were the components of the runner's displacement?

11. A beetle walked in a straight line for 45 seconds. It's displacement had a horizontal component of 2.5 meters and a vertical component of 4 meters. How fast did the beetle walk?

12. A river flows due West with a current of 4 m/s. A boater can always travel with a water speed of 7 m/s.
    a. What is the fastest resultant velocity the boater can have? In what direction must she point the boat?

    b. What is the slowest resultant velocity the boater can have? In what direction must she point the boat?

    c. If she points her boat due North, what is her resultant speed? Include a sketch showing how the vectors add.

    d. If she points her boat due North, and the river is 150 meters across, how long will it take her to cross the river? Be careful!

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e. From part c and d, she drifted West with the current. How far West did she drift?

f. Lastly, let's imagine she realizes there is a current and wants to land exactly across from her starting point. Roughly in what direction should she point herself? Draw a skectch that shows how she could have her resultant velocity be due north.

g. From part f, would this trip take longer, shorter or the same time compared to your answer from part d? Explain.