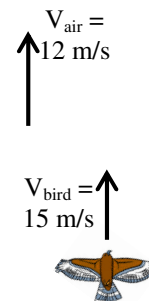
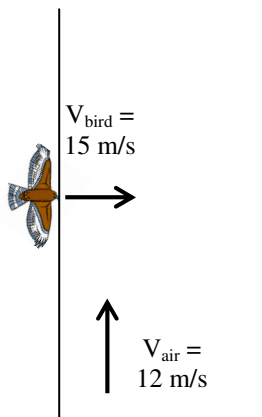
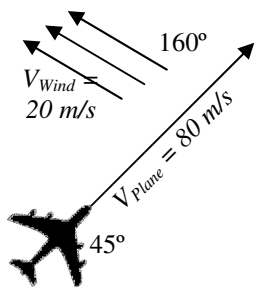


## 2011 PreAP Two Dimensions 9

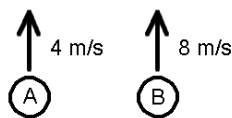
1. \*Given these vectors:  $A = 425 \text{ m at } 75^\circ$ ;  $B = 68 \text{ m at } 130^\circ$ ;  $C = 91 \text{ m at } 319^\circ$ ;  $D = 213 \text{ m at } 234^\circ$ . If  $R = A - 3B + 2C + D$ , Give R in meters and degrees:  $R =$
  
2. Given these vectors:  $A = 125 \text{ m at } 125^\circ$ ;  $B = 48 \text{ m at } 330^\circ$ ;  $C = 100 \text{ m at } 28^\circ$ ;  $D = 210 \text{ m at } 212^\circ$ . If  $R = -2A + B - 3C + 2D$ , Give R in meters and degrees:  $R =$
  
3. A bird has a velocity of 15 m/s in still air. The bird enters a canyon that has an airstream with a velocity of 12 m/s north. *(Let me walk you thru this.)*
  - A. \* What is the velocity of the bird relative to the ground if the bird flies with the air?
  - B. \* What is the velocity of the bird relative to the ground if the bird flies against the air?
  - C. What if the bird enters the air stream moving directly east? *(Magnitude and direction, of course.) (You have two vectors at  $90^\circ$  to each other: add them together.)*



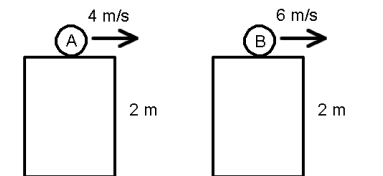
- D. \* If the canyon is 48 m wide, how long does it take the bird get across? *(Realize that this is just an x-direction question, so only use x-direction #s.)*
  
- E. How far up the canyon has the bird been pushed by the air? *(“..up the canyon” tells you that this is a y-direction question, so only use y-direction #s AND the x-direction time you just calculated.)*



4. A plane moving 80 m/s at  $45^\circ$  encounters a wind moving 20 m/s at  $160^\circ$ .
  - A. Is the x-direction of the wind blowing with the plane or against the plane?
  - B. So, is the plane’s x-velocity faster or slower when in the wind?
  - C. Is the y-direction of the wind blowing with the plane or against the plane?
  - D. So, is the plane’s y-velocity faster or slower when in the wind?
  - E. \* Realizing that this is just adding vectors, calculate the plane’s total speed relative to the ground. *(Follow the “Adding Vector” notes exactly if you need help.)*



5. Object A or B?
  - A. \_\_\_ Which has the greatest vertical acceleration?
  - B. \_\_\_ Which has the greater maximum height?



6. Object A or B?
  - A. \_\_\_ Hits the ground first?
  - B. \_\_\_ Has the greatest initial y-velocity?
  - C. \_\_\_ Has the greatest range (greatest  $\Delta x$ )?
  - D. \_\_\_ Has the greatest magnitude of velocity when it hits the ground (moving fastest)?

Q1:  $-3B = 204$  at  $310^\circ$ ;  $2C = 182$  at  $319^\circ$ . So,  $R = (425 \text{ m at } 75^\circ) + (204 \text{ at } 310^\circ) + (182 \text{ at } 319^\circ) + (213 \text{ m at } 234^\circ)$   
3A)  $27 \text{ m/s}$  (they are flowing in the same direction)    3B)  $3 \text{ m/s}$  south or  $-3 \text{ m/s}$  (bird is faster than the air)  
3D)  $3.2 \text{ sec}$   
4E) Just do sin and cos as always. Totals:  $V_x = 37.8 \text{ m/s}$      $V_y = 63.4 \text{ m/s}$ . Find the mag and direction.