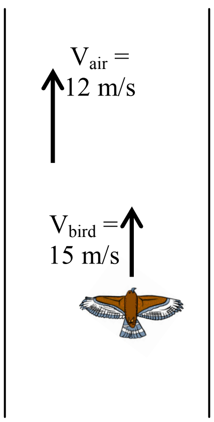
Due Wed., Oct 6 (B-day)
Due Thurs., Oct 7 (A-day)

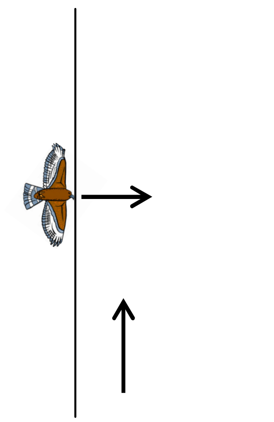
2010-11 PreAP Two Dimensions 5

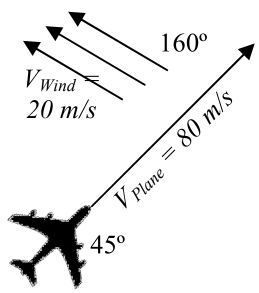
1. *Given these vectors: A = 425 m at 75°; B = 68 m at 130°; C = 91 m at 319°; D = 213 m at 234°. If R = A − 3B + 2C + D, Give R in meters and degrees: R =

2. Given these vectors: A = 125 m at 125°; B = 48 m at 330°; C = 100 m at 28°; D = 210 m at 212°. If R = −2A + B − 3C +2D, Give R in meters and degrees: R =

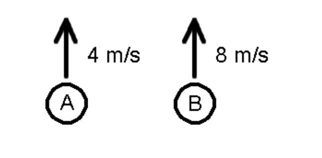


3. A bird has a velocity of 15 m/s in still air. The bird enters a canyon that has an airstream with a velocity of 12 m/s north.
   A. What is the velocity of the bird relative to the ground if the bird flies with the air?
   B. What is the velocity of the bird relative to the ground if the bird flies against the air?
   C. What if the bird enters the air stream moving directly east? (*Magnitude and direction, of course.)*
   D. If the canyon is 48 m wide, how long does it take the bird get across?
   E. How far up the canyon has the bird been pushed by the air?
   F. At what direction must the bird have to aim to get directly across the river. (*Directly across the canyon is Lazy's path*.)

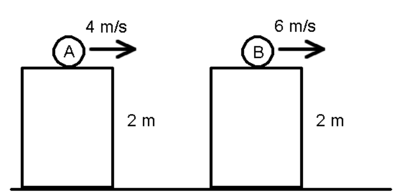




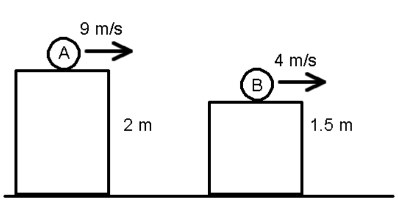
4. A plane moving 80 m/s at 45° encounters a wind moving 20 m/s at 160°. Realizing that this is just adding vectors, calculate the plane's total speed relative to the ground.



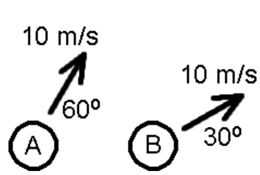
5. Object A or B?
   A. _____ Which has the greatest vertical acceleration?
   B. _____ Which has the greater maximum height?



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



7. Which has the greatest "hang time": object A or B?



8. Object A or B?
   A. _____ Has the greatest Vy?
   B. _____ Is in the air for the most time?
   C. _____ Has the greatest Vx?

9. Which kind of projectile motion problem: I—horizontally launched; II—how high; III ground-to-ground?

   A. _____ A rock is launched from a sling shot going 15 m/s at 65°. The ceiling is 10 m tall. Does it hit the ceiling?

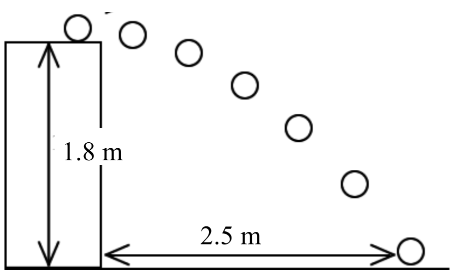
   B. _____ A bicyclist riding 8 m/s drops a rock from their hand, which is 0.8 m above the road. How far away does the rock land?

   C. _____ A rabbit hops 4.2 m/s at an angle of 30° with each hop. How far apart are the rabbit's hops?

10. A. Solve for part A above.

    B. Solve for the time to the top of the arch.

    C. Now that you have the time, in the x-direction solve for how far in the x-direction the top of the arch is.

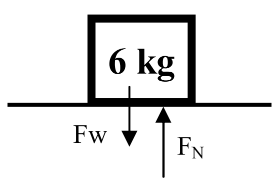


11. * A projectile is shot horizontally from the top of a 1.8 m tall table. It lands 2.5 m away. Calculate how fast it was shot.

12. A ball rolls off of a 95 cm tall table (change to meters). It lands 165 cm away. How fast was it rolling along the table before it rolled off?

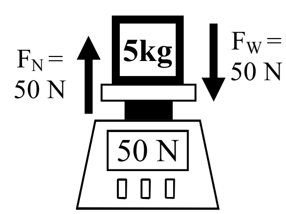
13. An 6 kg object is sitting on a table.
    A. What is the weight of the object?

    B. *What is the normal force acting up on the object?



The normal force is the supporting force of a surface pushing again an object. Without a normal force the object would break thru the surface.

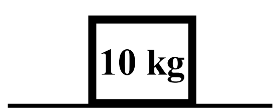
If there are no other forces, then the scale has to support the weight of the object: $F_N = F_W$.



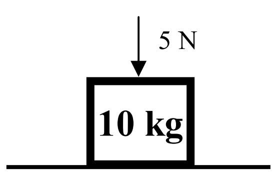
$F_N = F_W = 50$ N

The scale shows the magnitude of the normal force.

14. A 10 kg object is now sitting on a table. Calculate the weight and normal force acting on the object. Also show arrows.



15. How much is the normal force if you push down on the object with 5 N?



Q1: −3B = 204 at 310°; 2C = 182 at 319°. So, R = (425 m at 75°) + (204 at 310°) + (182 at 319°) + (213 m at 234°)
Q11: Δy = −1.8 m; Vyi = 0 m/s; t = 0.606 sec; Since S = D/T, then S = 2.5/0.606 = 4.125 m/s.
Q13: Fw = 6(9.8) = 58.8 N, so the table must support 58.8 N. So F_N = 58.8 N.