PreAP Two Dimensional Motion Test Review

1. Graphically add these vectors. (*You will need graph paper.)*

A = 48 at 60º; B = 32 at 170º; C = 44 at 155º; D = 55 at 100º
Graph: A +2B − 2C −D

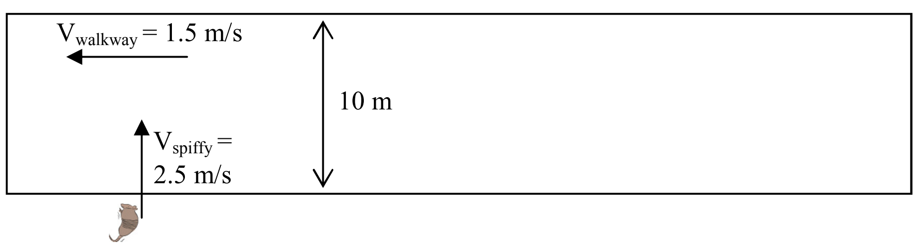
2. A person walks 15 m south, then 35 m west. Find their total displacement.

3. A person has these individual displacements: horizontal: 12,520 m; vertical −8,335 m. Find their total displacement.

4. Vector or scalar?

A. ____ Number of cards on a table
B. ____ Mass
C. ____ Money in a bank account
D. ____ Velocity of an ocean current
E. ____ Force on a car
F. ____ Acceleration of a car
G. ____ Steps you take in a race
H. ____ Displacement
I. ____ Distance travelled
J. ____ Pressure

5. A stunt plane takes off from an airport flying 125 m/s at an angle of 20° from the ground. The plane tries to drop a bag of money into a get away car following below them on the runway. At the same time a helicopter is filming the action, rising up vertically at the same rate as the plane. What is the velocity of the helicopter and car?



6. Spiffy the Armadillo gets lost and ends up in an abandoned part of an airport. Spiffy can walk 2.5 m/s and tries to cross a walk way that is moving 1.5 m/s to the left.

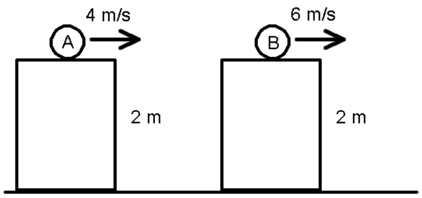
A. How long does it take for him to get across?

B. How far down the walkway does he get off?

C. What is his total displacement?

D. What is his total velocity while on the walkway?

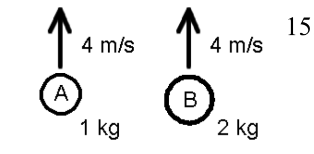
E. Which way would he have to walk to get straight across?



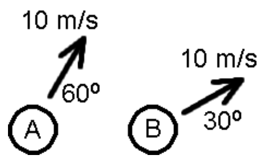
12. Find how far away both balls land.

7. Greatest acceleration when it leaves the table?
8. Lands first?
9. Lands farther away?
10. Greatest initial velocity?
11. Greatest initial y-direction velocity?

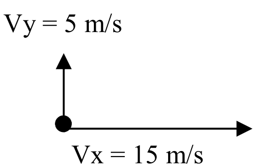
13. What kind of projectile motion is this?
14. Give at least three other examples.



15. Which has greater max height?

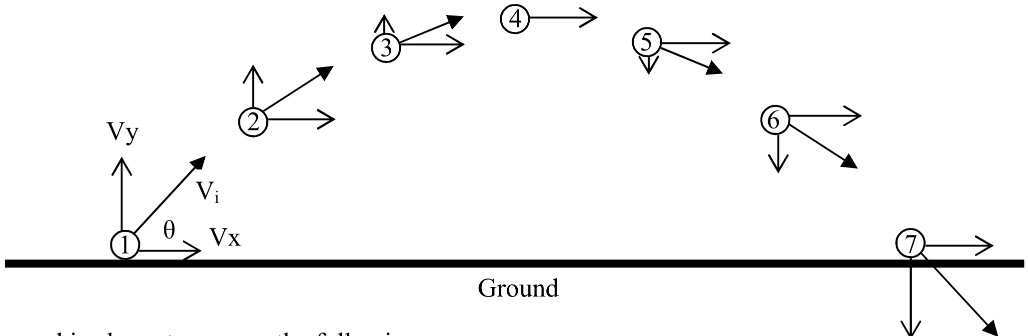


16. Greatest initial velocity?
17. Greatest x velocity?
18. Greatest y velocity?
19. Greatest max height?
20. Greatest hang time?
21. Greatest range.



22. A projectile's x and y velocities are given.
    A. What is its initial velocity?

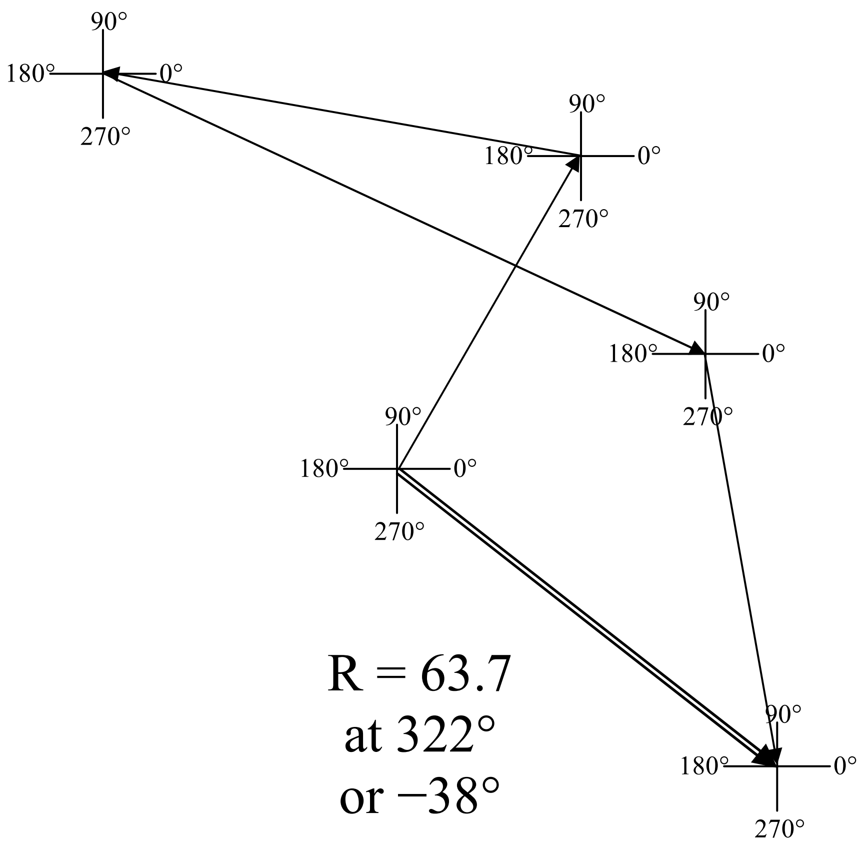
    B. What its range?



23. Use the graphic above to answer the following.
    A. What is the acceleration at 4?
    B. What is the total velocity at 4?
    C. What is the y velocity at 4?
    D. How would you find the speed at 5?
    E. What is the x velocity at 6?
    F. What is a_x at 6?
    G. What is a_y at 1?
    H. Where is the speed greater: at 2 or 7?
    I. If Vi = 20 m/s and θ = 50°, find the final x velocity.

24. That plucky Phil is not done, yet! He builds his own catapult by bending a coconut tree. He launches himself going 24 m/s at an angle of 38°. He wants to launch himself over the hunter's fence of the hunter. What is the height of the fence, if he just grazes the top?

25. When Phil crosses over the fence he ends up landing on the ground at the same velocity and angle. He lands on a ground level trampoline, just as he planned. He worked it out to end up in the bedroom of the hunter. The house is 8 m away from the trampoline. How high up is the window of the bedroom?


90°
180°
0°
270°
R = 63.7
at 322°
or −38°

PreAP Two Dimensional Motion Test Review

1. Graphically add these vectors. (*You will need graph paper.*)

   A = 48 at 60°; B = 32 at 170°; C = 44 at 155°; D = 55 at 100°
   Graph: A +2B − 2C −D

2. A person walks 15 m south, then 35 m west. Find their total displacement.

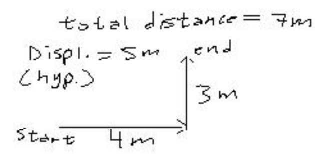
   $X = -35m$
   $y = -15m$ total = pyth = 38.1m at $\theta = 23.2 + 180 = 203.2°$ (3rd Q)

3. A person has these individual displacements: horizontal: 12,520 m; vertical −8,335 m. Find their total displacement.

   mag = 15,040m $\theta = -33.6°$ (4th Q)

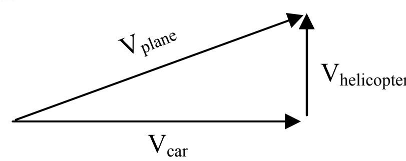
4. Vector or scalar?

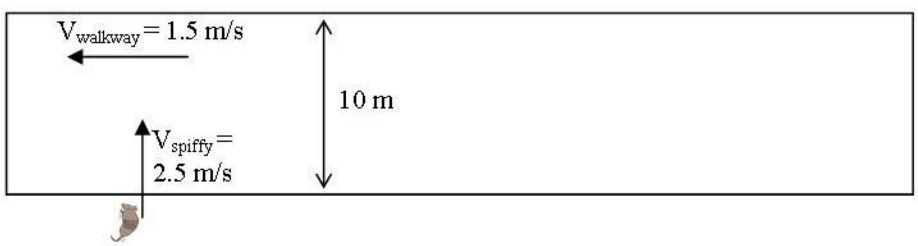
   A. S Number of cards on a table
   B. S Mass
   C. S Money in a bank account (but could be neg.)
   D. V Velocity of an ocean current
   E. V Force on a car (can cancel each other)
   F. V Acceleration of a car
   G. S Steps you take in a race
   H. V Displacement
   I. S Distance travelled
   J. S Pressure press. on both sides of your body doesn't cancel.



5. A stunt plane takes off from an airport flying 125 m/s at an angle of 20° from the ground. The plane tries to drop a bag of money into a get away car following below them on the runway. At the same time a helicopter is filming the action, rising up vertically at the same rate as the plane. What is the velocity of the helicopter and car?

   hel. = $125 \sin 20° = 42.75$ m/s car = cos = 117.4 m/s





6. Spiffy the Armadillo gets lost and ends up in an abandoned part of an airport. Spiffy can walk 2.5 m/s and tries to cross a walk way that is moving 1.5 m/s to the left.

   A. How long does it take for him to get across?
   y-dir. quest. $S = \frac{D}{T}$ $T = \frac{D}{S} = \frac{10m}{2.5} = 4$ sec

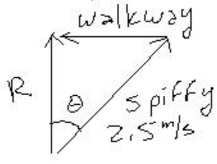
   B. How far down the walkway does he get off?
   x-dir. quest. $D = ST = 1.5(4) = 6$ m

   C. What is his total displacement? vector ques

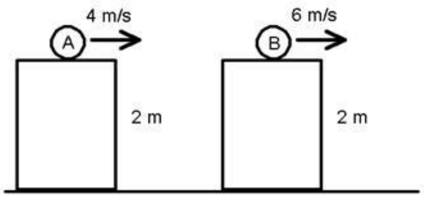
   mag = 11.7m
   $\theta = \tan^{-1}\left(\frac{10}{-6}\right) = -59°$
   $+180°$
   $121°$ (2nd Q)

   D. What is his total velocity while on the walkway?
   1.5 m/s ← ↑ 2.5 m/s mag = 2.9 m/s at 121°
   or $S = \frac{D}{T} = 11.7/4 = 2.9$ m/s

   E. Which way would he have to walk to get straight across?



   $\sin\theta = \frac{1.5}{2.5}$
   $\theta = \sin^{-1}(1.5/2.5) = 36.9°$
   $90 - 36.9 = 53.1°$
   from +X-axis.



7. Greatest acceleration when it leaves the table? same
8. Lands first? same (same Δy)
9. Lands farther away? B ($V_x \uparrow$)
10. Greatest initial velocity? B ($V_{iy}=0$; $V_x=6$)
11. Greatest initial y-direction velocity? same ($V_y=0$)

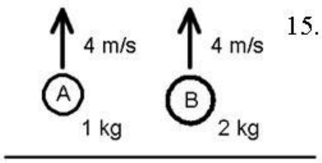
12. Find how far away both balls land.

$\Delta y = V_i t + \frac{1}{2}at^2$
$-2 = -4.9t^2$
$t = .64$ sec

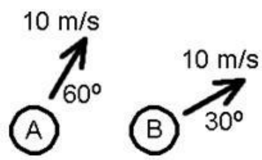
$\Delta x_A = 4(.64)$
$= 2.56$ m
$\Delta x_B = 3.83$ m

13. What kind of projectile motion is this? horizontally launched
14. Give at least three other examples.

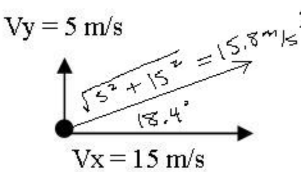
O - say, a monkey being dropped from a plane into a volcano/ A person riding a bike off of a building. A stork dropping a baby while in level flight. A person losing a booger while walking down the road. A head lice falling out a Bubba Gill's hair while riding his motor bike.



15. Which has greater max height?
same. $a=-g$ for both



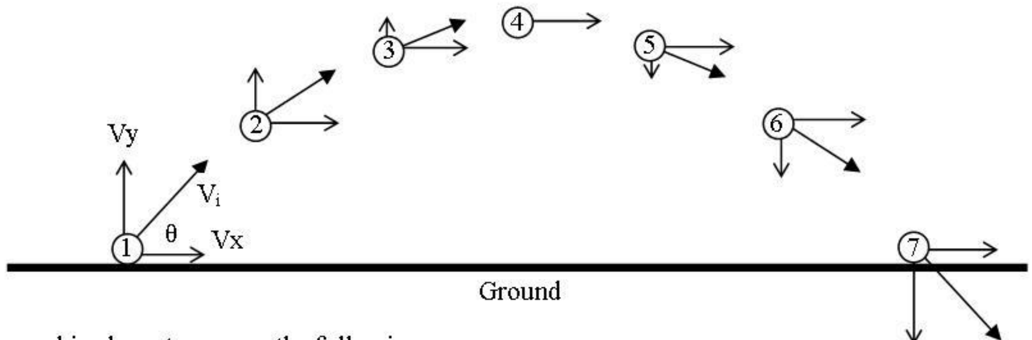
16. Greatest initial velocity? same
17. Greatest x velocity? B
18. Greatest y velocity? A
19. Greatest max height? A
20. Greatest hang time? A
21. Greatest range. same (both are 15° from 45°)



22. A projectile's x and y velocities are given.
   A. What is its initial velocity?
   pyth = 15.8 m/s at 18.4°
   B. What its range?

$V_f = V_i + at$
$-5 = 5 - 9.8t$
$\frac{-10}{-9.8} = 1.02$ sec

$S = \frac{D}{T}$
$D = 15(1.02)$
$= 15.3$ m



23. Use the graphic above to answer the following.
   A. What is the acceleration at 4? $a_y=-g$ $a_x=0$
   B. What is the total velocity at 4? V_x
   C. What is the y velocity at 4? 0 m/s
   D. How would you find the speed at 5? pyth the
   E. What is the x velocity at 6? $V\cos\theta$
   F. What is a_x at 6? 0 m/s²
   G. What is a_y at 1? $-g$
   H. Where is the speed greater: at 2 or 7?
   V_x is same
   $|V_y|$ is $\uparrow$ at 7
   I. If Vi = 20 m/s and θ = 50°, find the final x velocity.
   same as init. $V_x = 20\cos 50° =$

24. That plucky Phil is not done, yet! He builds his own catapult by bending a coconut tree. He launches himself going 24 m/s at an angle of 38°. He wants to launch himself over the hunter's fence of the hunter. What is the height of the fence, if he just grazes the top?

$a=-g$
$V_{yi} = 24\sin 38° = 14.8$ m/s
$V_{yf} = 0$ m/s
$\Delta y =$ _____

$V_f^2 = V_i^2 + 2a\Delta y$
$0 = 14.8^2 - 19.6\Delta y$
$\Delta y = 11.2$ m

25. When Phil crosses over the fence he ends up landing on the ground at the same velocity and angle. He lands on a ground level trampoline, just as he planned. He worked it out to end up in the bedroom of the hunter. The house is 8 m away from the trampoline. How high up is the window of the bedroom?

y-dir.
$V_{yi} = 14.8$ m/s
$a = -g$
$\Delta y = V_i t + \frac{1}{2}at^2$
$\Delta y = 14.8(.423) - 4.9(.423)^2$
$= 5.3$ m

x-dir
$V_x = 18.91$ m/s
$\Delta x = 8$ m
$S = \frac{D}{T}$ $T = \frac{D}{S} = \frac{8}{18.91}$
$= .423$ sec