

Chapter 3 Vectors Worksheets

1. Find the X and Y components of the following:

A. 35 m/s at 57° from the x-axis.

B. 12 m/s at 34° S of W

[X: 19.1 m/s Y: 29.4 m/s]

C. 8 m/s South

[X: -10 m/s Y: -6.7 m/s]

D. 20 m/s 275° from the x-axis

[X: 0 m/s Y: -8 m/s]

[X: 1.75 m/s Y: -20 m/s]

2. Find the resultant vector (mag and dir) given the following information:

A. $A_x = 5.7, A_y = 3.4$

[|A| = 6.6, $\theta = 30.8^\circ$ from x-axis]

B. $B_x = -10, B_y = -3$

[|B| = 10.4, $\theta = 196.7^\circ$ from x-axis]

C. $C_x = 12, C_y = -20$

[|C| = 23.3, $\theta = 300^\circ$ from x-axis]

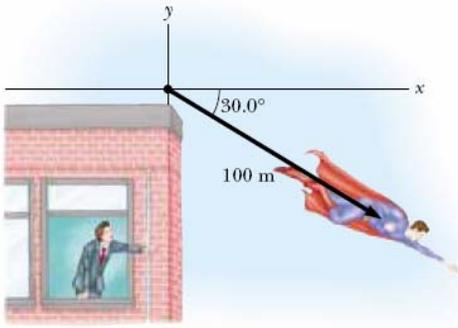
D. $-30\mathbf{i} + 27\mathbf{j}$

[|D| = 40.4, $\theta = 138^\circ$ from x-axis]

E. $48\mathbf{i} - 12\mathbf{j}$

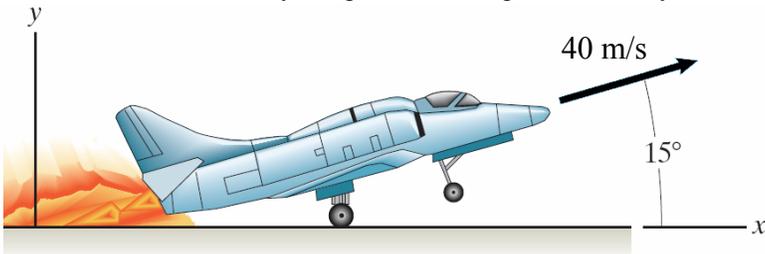
[|E| = 49.5, $\theta = 346^\circ$ from x-axis]

3. What are Superman's x and y components?



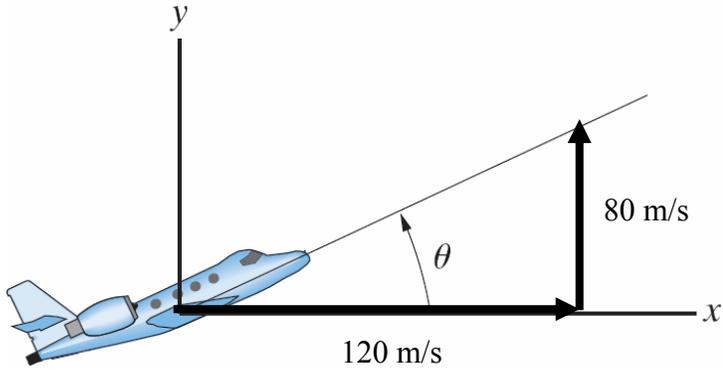
$$[x = 86.6 \text{ m}, y = -50 \text{ m}]$$

5. What are the x and y components of the plane's velocity?



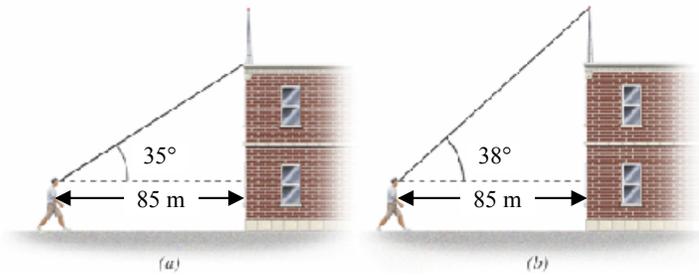
$$[v_x = 38.6 \text{ m/s } v_y = 10.4 \text{ m/s}]$$

6. How fast is the plane traveling? What is the angle θ ?



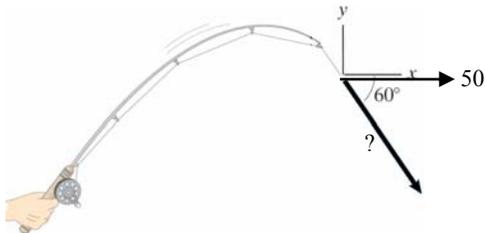
[$v = 144 \text{ m/s}$ $\theta = 33.7^\circ$]

7. How high above the person's head is the roof? The antenna?

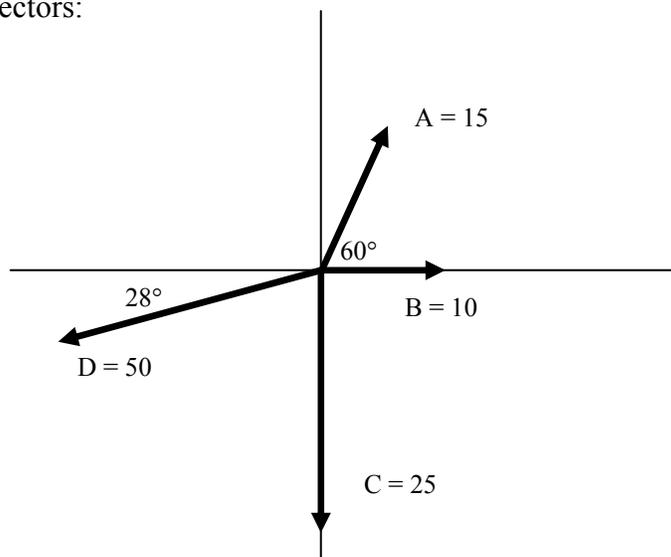


[roof: 59.5 m, antenna: 66.4 m]

8. If the force on the fishing line has an x-component equal to 50, what is the force on the line?



Observe the following vectors:



A. Construct an X-Y chart for all vectors:

	X	Y
A		
B		
C		
D		

B. Find the resultant (mag and dir) of the following:

$$A + B + C + D$$

$$A - C$$

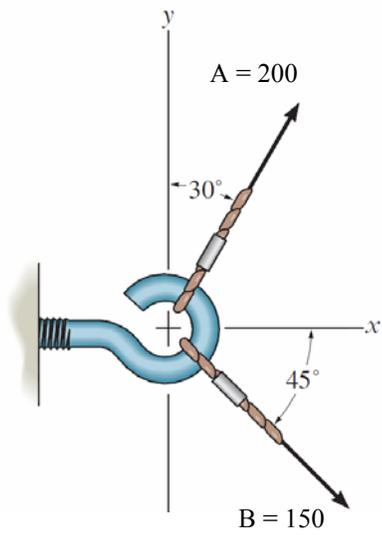
$$D + 2C$$

$$\begin{aligned} ||R|| &= 29 \\ \theta &= 157^\circ \text{ from x} \\ &(23^\circ \text{ N of W}) \end{aligned}$$

$$\begin{aligned} ||R|| &= 38.7 \\ \theta &= 78.8^\circ \text{ from x} \\ &(78.8^\circ \text{ N of E}) \end{aligned}$$

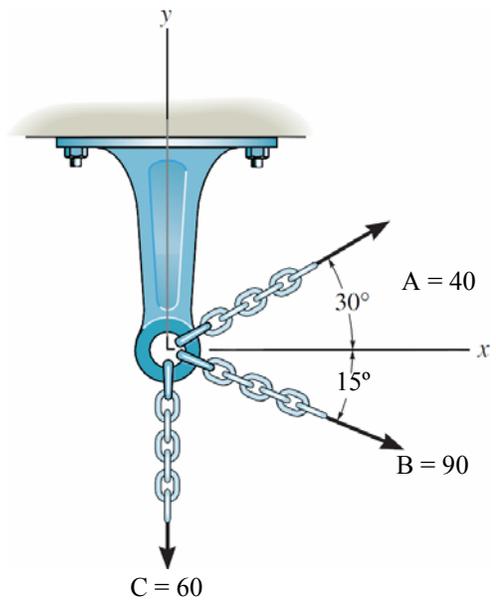
$$\begin{aligned} ||R|| &= 51.4 \\ \theta &= 211^\circ \text{ from x} \\ &(31^\circ \text{ S of W}) \end{aligned}$$

Determine the A+B for the following:



[217 @ 18.1° N of E]

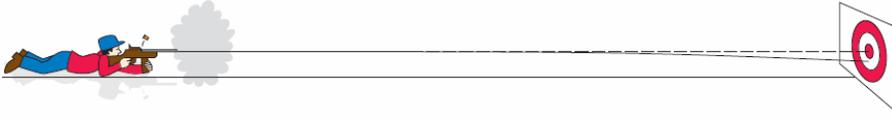
Determine the A+B+C for the following:



[137 @ 27.5° S of E]

Chapter 3 Projectiles Worksheets

1. A bullet shot at $800. \text{ m/s}$ *horizontally* hits a target that is $180. \text{ m}$ away. How far does the bullet fall before it hits the target?

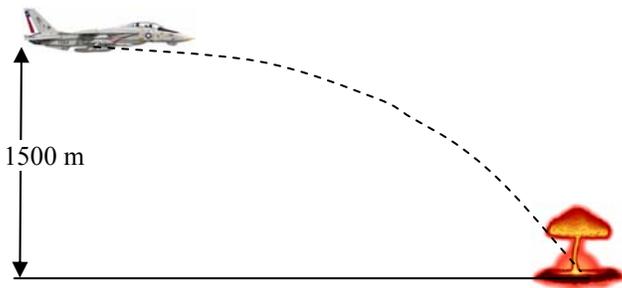


[0.250 m]

2. A student throws a ball (horizontally) out of a window that is 8.0 m above the ground. Another student who was 10.0 m away caught it. What was the initial velocity of the ball?

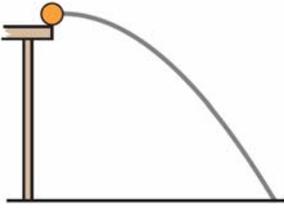
[7.8 m/s]

3. Maverick and Goose are flying a training mission in their F-14. They are flying at an altitude of $1500. \text{ m}$ and are traveling at 688 m/s (mach 2). They release their bomb and head for home.
- A. How long will it be before the bomb hits the ground?
 - B. How far (on the ground) from where they released it will it land?



A. [17.5 s]
B. [12040 m]

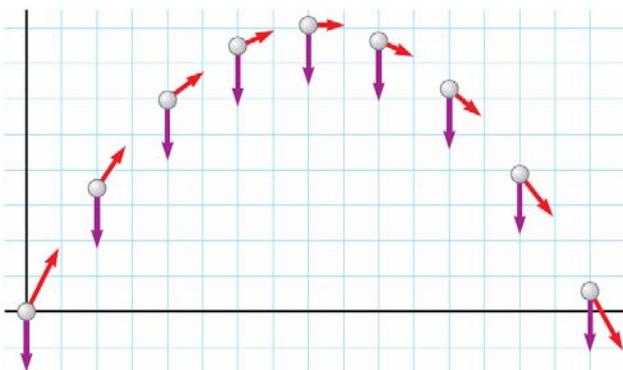
4. A ball is rolling across a table at a velocity of 3.5 m/s. It rolls off the edge and lands 1.5 m from the base of the table.
- How long was it in the air?
 - How high is the table?



A. [0.43 s]
B. [0.91 m]

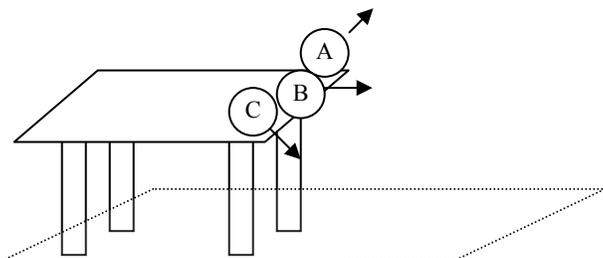
5. A soccer ball is kicked at an angle of 35° and it lands on even ground.
- What angle will produce the same range?
 - Which angle of the two will produce the highest ball?
 - Which angle of the two will produce the ball that is in the air the longest?
 - What angle in this situation would produce the furthest range?

6. On the following diagram draw and label:



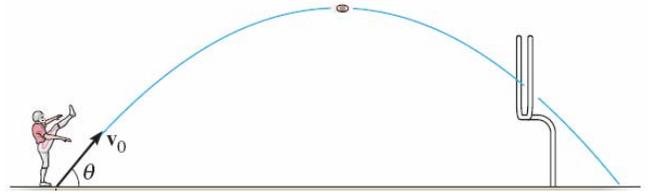
Trajectory Max height Range
 v_x v_y accel.
 Where $v_y=0$

7. Which ball will hit the ground 1st? Last? Land further away from the base? Why?



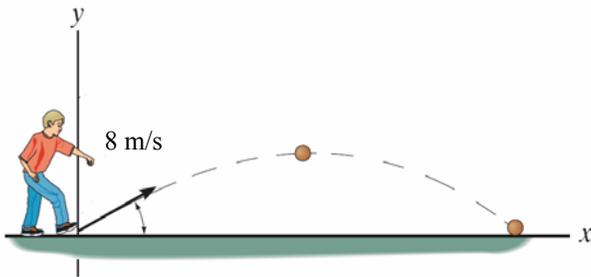
8. A football is kicked on flat ground at a velocity of 15 m/s at an angle of 25° .

- A. How long will it be in the air?
- B. How far away will it land?
- C. How high will it go?
- D. What will be its velocity after 0.25 s?
- E. What other angle will produce the same range?



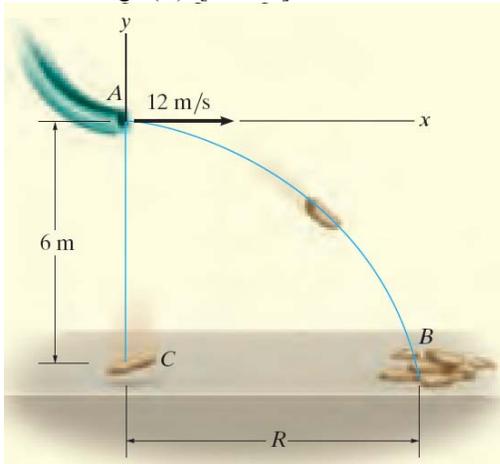
- A. 1.3 s
- B. 18 m
- C. 2.1 m
- D. 14.1 m/s
- E. 65°

9. A soccer ball is kicked at 8.0 m/s. It lands on the ground after being in the air for 0.85 seconds. At what angle was it kicked?
Assume level ground.....



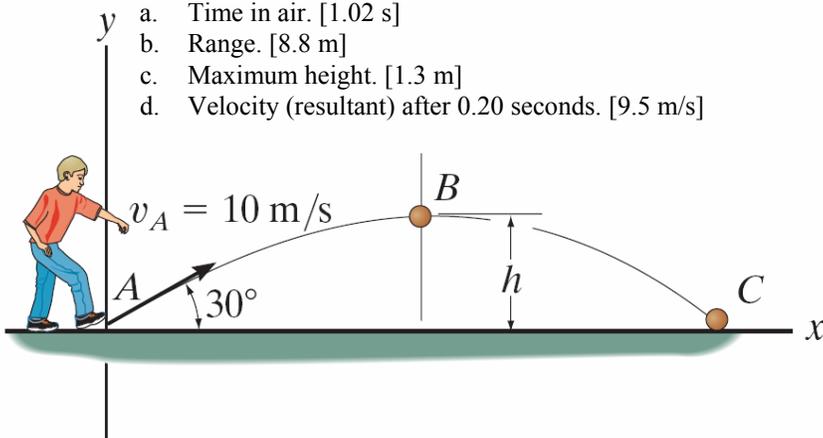
[31.4°]

10. A peanut slide off a chute at 12 m/s.
- Find time in air. [1.1 s]
 - Range (R). [13.3 m]

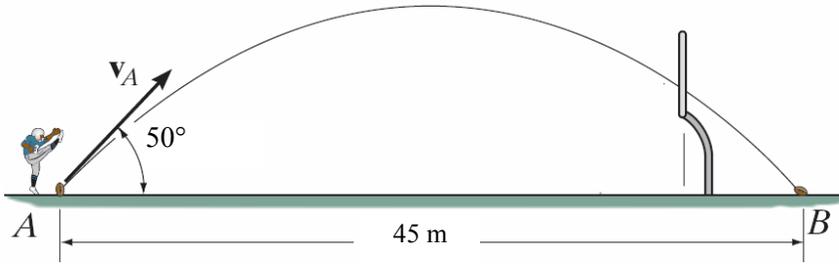


11. For the kicked ball find:

- Time in air. [1.02 s]
- Range. [8.8 m]
- Maximum height. [1.3 m]
- Velocity (resultant) after 0.20 seconds. [9.5 m/s]



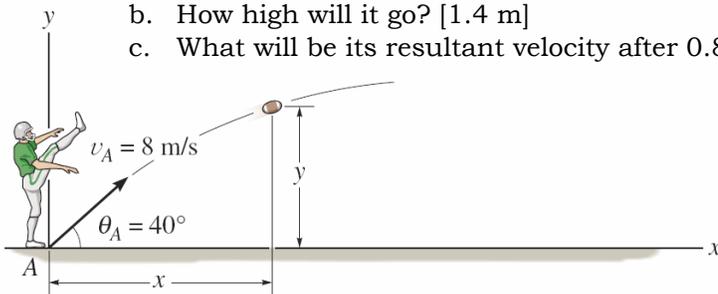
12. Find v_A



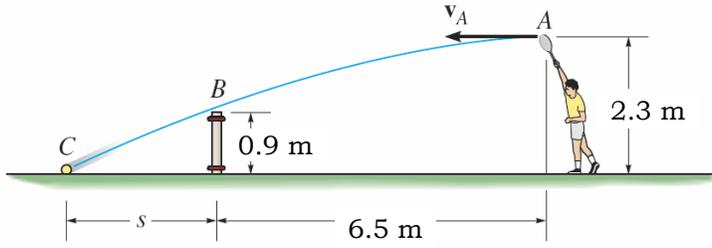
[21.2 m/s]

13. A football is kicked as shown.

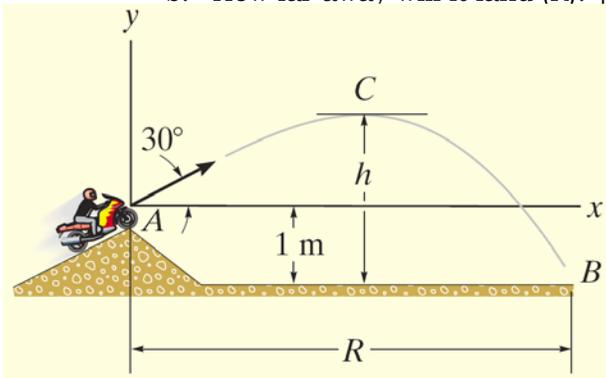
- How long will it be in the air? [1.04 s]
- How high will it go? [1.4 m]
- What will be its resultant velocity after 0.80 s? [6.7 m/s]



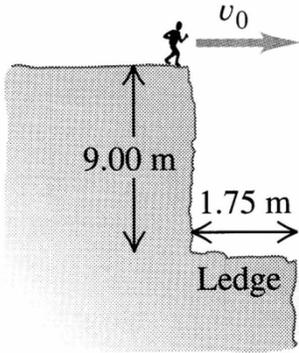
14. A tennis serve is hit horizontally with a velocity of v_A .
- Calculate the time the ball takes to get to B? [0.535 s]
 - Calculate v_A . [12 m/s]
 - Calculate how far from the net (s) will it land? [1.7 m]



15. A motorcycle leaves the ramp at an angle of 30° as shown. It is in the air for 1.5 seconds.
- What was its velocity when it left the ramp? [13 m/s]
 - How far away will it land (R)? [17 m]

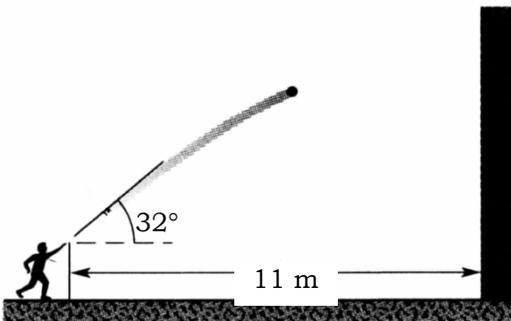


16. Indiana Jones is running from his enemies. How fast (v_0) is he running if he lands at the edge of the ledge as shown:

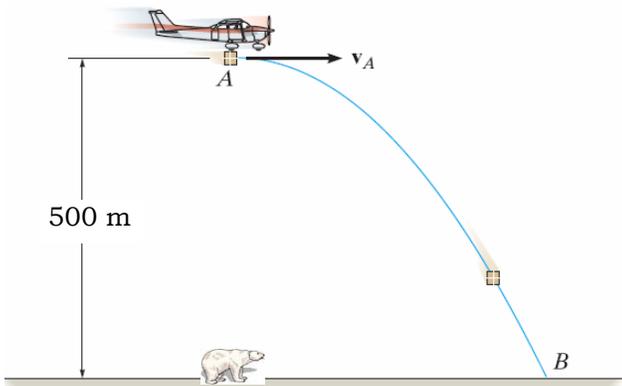


[1.29 m/s]

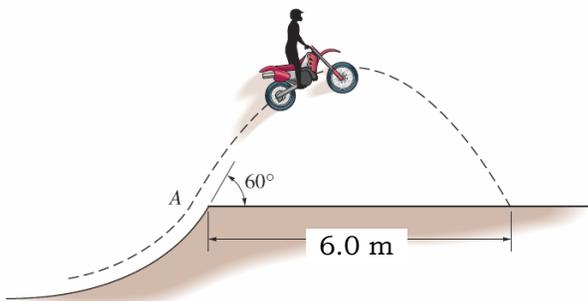
17. A ball is thrown at 25 m/s as shown below. The wall is 11 m from the person.
- How long will it take for the ball to reach the wall? [0.52 s]
 - How high up the wall will it hit? [5.6 m]



18. An airplane is traveling at $v_A = 67 \text{ m/s}$ at an altitude of 500 m . It drops a box of supplies when it is directly over a polar bear.
- A. How long will the box be in the air? [10.1 s]
 - B. How far from the polar bear will it land? [677 m]
 - C. What will be the velocity of the box when it strikes the ground? [120 m/s]

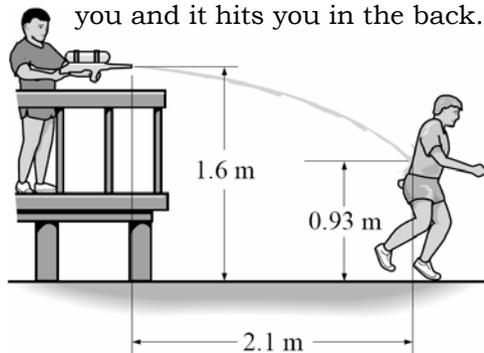


19. Determine the velocity of the dirt bike as it left the ground.



[8.2 m/s]

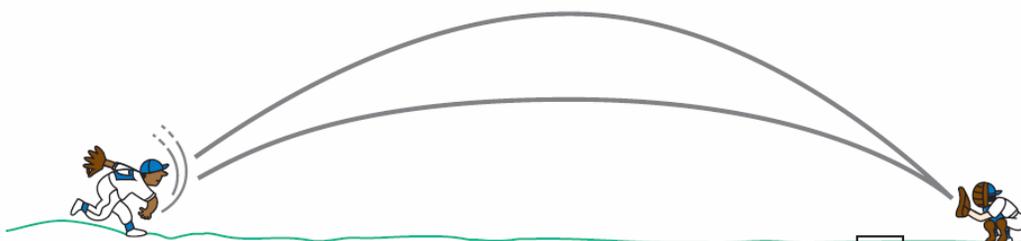
20. Your friend is standing on a deck as shown. He shoots water out of his super soaker horizontally at you and it hits you in the back...What was the velocity of that water when it left the gun?



[5.7 m/s]

21. The pitcher throws a ball to the catcher who is 18 m away. The ball's velocity is 20 m/s when it leaves his hand.

- A. What are the two possible angles that he can throw it at?
- B. What is the time in air for each angle?



A. [13.1° and 76.9°]
B. [0.925 s and 3.98 s]