Review: Projectiles and Relative Motion

1. What other launch angle will give the same range as a 35° launch with the same launch speed?

2. A projectile is launched upward at an angle. At the highest point of the projectile's trajectory, how has its vertical velocity component changed?

3. At the highest point of the projectile's trajectory, how has its horizontal velocity component changed?

4. A projectile is launched at 25 m/s at an angle of 20°. Find the horizontal (x) and vertical (y) components of the velocity.

5. What would be the projectile's velocity (in previous question) at the top of its path?

6. If one ball is thrown horizontally and another is dropped from the same height at the same time, which will hit the ground first?

7. Which launch angle gives the greatest range?

8. Does the horizontal motion of the projectile depend on the vertical motion? Explain.

9. A train is passing through a station at 5 m/s to the north (relative to the earth) when a passenger walks towards the south at 2 m/s (relative to the train).

    a. To a stationary observer on the station platform, what is the velocity of the passenger?

    b. A second train on an adjacent track passes by at a velocity of 8 m/s south (relative to the earth). What is the velocity of the walking passenger on the first train as seen by an observer in the second train?

10. A cannon is fired at 35 m/s at a 22° angle. Find the range and the maximum height of the trajectory.

11. A boat that travels 6.0 m/s in still water is crossing a river that flows at 2.5 m/s.

    a. If it heads out perpendicular to the bank, what will its velocity be relative to an observer on the bank? (magnitude and direction)

    b. If the river is 120 m wide, how long will the crossing take?

    c. What heading would it need in order to go straight across the river?

    d. What would its speed be on that heading?

12. What information is needed to describe a scalar quantity?

13. What information is needed to describe a vector quantity?

14. Define resultant and component.

15. Find the x and y components of a vector with a magnitude of 36 and a direction of 73°.

16. A 5-unit vector and a 7-unit vector act simultaneously on an object. What is the maximum possible magnitude of the resultant? What is the minimum possible resultant?

17. How can vectors be added graphically?

18. If a 9 N force in the + y direction and a 12 N force in the + x direction act at the same time, what is the direction and magnitude of the resultant?

19. Find the vector sum of a 25 unit vector at 37° and a 16 unit vector at 12° using the component method.

20. Express the sin, cos and tan of θ using the drawing as labeled.