11 and 12 revision 2

Short Answer

1. The equation $d = \sqrt{\Delta x^2 + \Delta y^2}$ is valid only if Δx and Δy are magnitudes of vectors that have what orientation with respect to each other?

2. A baby toddles 3 m west and 2 m south. If $\theta = \tan^{-1}\left(\frac{2}{3}\right)$, the baby's resultant displacement will be oriented counterclockwise at angle θ from which axis? Assume east and north lie along the +*x*-axis and +*y*-axis, respectively.

3. Breaking a vector into two components is given what term?

4. The component A_x of a vector **A** lies along what axis?

5. If the magnitude of a vector component equals the magnitude of the vector, then what is the magnitude of the other vector component?

6. What is the term for the curved, parabolic path that an object follows when thrown, launched, or otherwise projected near the surface of the Earth?

Problem

7. A cave explorer travels 2.0 m eastward, then 2.4 m northward, and finally 18.0 m westward. Use the graphical method to find the magnitude of the net displacement.

8. An airplane flying at 180 km/h due west moves into a region where the wind is blowing at 60 km/h due east. If the plane's original vector velocity is $\mathbf{v}_{\mathbf{plane}}$, what is the expression for the plane's resulting velocity in terms of $\mathbf{v}_{\mathbf{plane}}$?

9. A quarterback takes the ball from the line of scrimmage and runs backward for 1.9×10^1 m. He then runs sideways, parallel to the line of scrimmage, for 17 m. Next, he throws the ball forward 7.8×10^1 m, perpendicular to the line of scrimmage. The receiver is tackled immediately. How far is the football displaced from its original position?

10. A hiker walks 3.3 km at an angle of 45.0° north of west. Then the hiker walks 3.4 km south. What is the magnitude of the hiker's total displacement?

11. A stone is thrown at an angle of 30.0° above the horizontal from the top edge of a cliff with an initial speed of 15 m/s. A stopwatch measures the stone's trajectory time from the top of the cliff to the bottom at 6.30 s. What is the height of the cliff? (Assume no air resistance and that $a_y = -g = -9.81$ m/s^2.)

12. A stagehand starts sliding a large piece of stage scenery originally at rest by pulling it horizontally with a force of 177 N. What is the coefficient of static friction between the stage floor and the 230 N piece of scenery?

13. A waitperson pushes the bottom of a glass tumbler full of water across a tabletop at constant speed. The tumbler and its contents have a mass of 0.86 kg, and the coefficient of kinetic friction for the surfaces in contact is 0.46. What force does the waitperson exert on the glass? $g = 9.81 \text{ m/s}^2$)

14. A 43.0 N crate starting at rest slides down a rough 7.6 m long ramp inclined at 30° with the horizontal. The force of friction between the crate and ramp is 5.0 N. Using the work-kinetic energy theorem, find the velocity of the crate at the bottom of the incline.

15. A pole vaulter clears 6.41 m. With what velocity does the vaulter strike the mat in the landing area? (Assume no air resistance and that $g = 9.81 \text{ m/s}^2$.)

16. Use the impulse-momentum theorem to find the diver's momentum after falling for 1.29 s.

17. The diver strikes the water at a speed of 13.9 m/s, then slows to a stop underwater in 0.65 s. What force does