5. A plane traveling north at 200 m/s turns and then travels south at 200 m/s. The change in its velocity is:
   A. zero
   B. 200 m/s north
   C. 200 m/s south
   D. 400 m/s north
   E. 400 m/s south
       ans: E

Section: 4–3; Difficulty: E

rq #1
6. Acceleration is defined as:
   A. rate of change of position with time
   B. speed divided by time
   C. rate of change of velocity with time
   D. a speeding up or slowing down
   E. change of velocity
       ans: C

Section: 4–4; Difficulty: E

7. Which of the following is NOT an example of accelerated motion?
   A. Vertical component of projectile motion
   B. Circular motion at constant speed
   C. A swinging pendulum
   D. Earth's motion about sun
   E. Horizontal component of projectile motion
       ans: E

Section: 4–4; Difficulty: E

8. Which of the following is a scalar quantity?
   A. Speed
   B. Velocity
   C. Displacement
   D. Acceleration
   E. None of these
       ans: A

Section: 4–2, 3, 4; Difficulty: E

9. Two bodies are falling with negligible air resistance, side by side, above a horizontal plane. If one of the bodies is given an additional horizontal acceleration during its descent, it:
   A. strikes the plane at the same time as the other body
   B. strikes the plane earlier than the other body
   C. has the vertical component of its velocity altered
   D. has the vertical component of its acceleration altered
   E. follows a straight line path along the resultant acceleration vector
       ans: A

Section: 4–6; Difficulty: E

13. A bullet shot horizontally from a gun:
    A. strikes the ground much later than one dropped vertically from the same point at the same instant
    B. never strikes the ground
    C. strikes the ground at approximately the same time as one dropped vertically from the same point at the same instant
    D. travels in a straight line
    E. strikes the ground much sooner than one dropped from the same point at the same instant

    ans: C
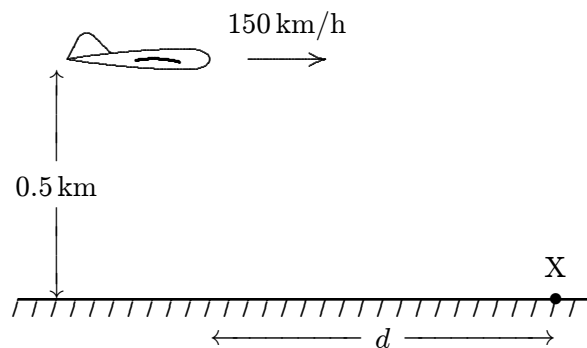
Section: 4–6; Difficulty: E

14. A bomber flying in level flight with constant velocity releases a bomb before it is over the target. Neglecting air resistance, which one of the following is NOT true?
    A. The bomber is over the target when the bomb strikes
    B. The acceleration of the bomb is constant
    C. The horizontal velocity of the plane equals the vertical velocity of the bomb when it hits the target
    D. The bomb travels in a curved path
    E. The time of flight of the bomb is independent of the horizontal speed of the plane

    ans: C

Section: 4–6; Difficulty: E

15. The airplane shown is in level flight at an altitude of 0.50 km and a speed of 150 km/h. At what distance d should it release a heavy bomb to hit the target X? Take $g = 10\,\text{m/s}^2$.

150 km/h

0.5 km

X

d

    A. 150 m
    B. 295 m
    C. 420 m
    D. 2550 m
    E. 15,000 m

    ans: C

Section: 4–6; Difficulty: M

RQ4

24. A projectile is fired from ground level over level ground with an initial velocity that has a vertical component of 20 m/s and a horizontal component of 30 m/s. Using $g = 10 \, \text{m/s}^2$, the distance from launching to landing points is:

    A. 40 m
    B. 60 m
    C. 80 m
    D. 120 m
    E. 180 m

    ans: D

    Section: 4–6; Difficulty: M

25. A stone thrown from the top of a tall building follows a path that is:

    A. circular
    B. made of two straight line segments
    C. hyperbolic
    D. parabolic
    E. a straight line

    ans: D

    Section: 4–5, 6; Difficulty: E

26. Two projectiles are in flight at the same time. The acceleration of one relative to the other:

    A. is always $9.8 \, \text{m/s}^2$
    B. can be as large as $19.8 \, \text{m/s}^2$
    C. can be horizontal
    D. is zero
    E. none of these

    ans: D
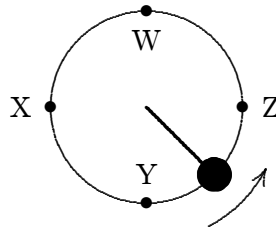
    Section: 4–5, 6; Difficulty: E

27. An airplane makes a gradual 90° turn while flying at a constant speed of 200 m/s. The process takes 20.0 seconds to complete. For this turn the magnitude of the average acceleration of the plane is:

    A. zero
    B. $40 \, \text{m/s}^2$
    C. $20 \, \text{m/s}^2$
    D. $14 \, \text{m/s}^2$
    E. $10 \, \text{m/s}^2$

    ans: D

    Section: 4–7; Difficulty: M

28. An object, tied to a string, moves in a circle at constant speed on a horizontal surface as shown. The direction of the displacement of this object, as it travels from W to X is:
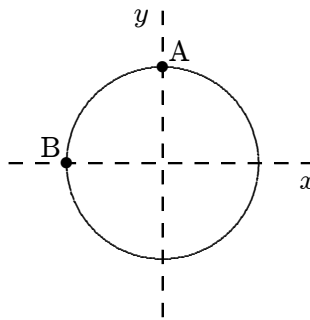

A. ←
B. ↓
C. ↑
D. ↗
E. ↙

    ans: E

Section: 4–7; Difficulty: E

29. A toy racing car moves with constant speed around the circle shown below. When it is at point A its coordinates are $x = 0$, $y = 3$ m and its velocity is $(6\,\text{m/s})\,\hat{\imath}$. When it is at point B its velocity and acceleration are:

A. $-(6\,\text{m/s})\,\hat{\jmath}$ and $(12\,\text{m/s}^2)\,\hat{\imath}$, respectively
B. $(6\,\text{m/s})\,\hat{\imath}$ and $-(12\,\text{m/s}^2)\,\hat{\imath}$, respectively
C. $(6\,\text{m/s})\,\hat{\jmath}$ and $(12\,\text{m/s}^2)\,\hat{\imath}$, respectively
D. $(6\,\text{m/s})\,\hat{\imath}$ and $(2\,\text{m/s}^2)\,\hat{\jmath}$, respectively
E. $(6\,\text{m/s})\,\hat{\jmath}$ and 0, respectively

    ans: C

Section: 4–7; Difficulty: E

34. Two objects are traveling around different circular orbits with constant speed. They both have the same acceleration but object A is traveling twice as fast as object B. The orbit radius for object A is _____ the orbit radius for object B.
   A. one-fourth
   B. one-half
   C. the same as
   D. twice
   E. four times
      ans: E

Section: 4–7; Difficulty: E

sq 7

35. A stone is tied to a 0.50-m string and whirled at a constant speed of 4.0 m/s in a vertical circle. Its acceleration at the top of the circle is:
   A. $9.8 \, \text{m/s}^2$, up
   B. $9.8 \, \text{m/s}^2$, down
   C. $8.0 \, \text{m/s}^2$, down
   D. $32 \, \text{m/s}^2$, up
   E. $32 \, \text{m/s}^2$, down
      ans: E

Section: 4–7; Difficulty: E

rq7

36. A stone is tied to a 0.50-m string and whirled at a constant speed of 4.0 m/s in a vertical circle. Its acceleration at the bottom of the circle is:
   A. $9.8 \, \text{m/s}^2$, up
   B. $9.8 \, \text{m/s}^2$, down
   C. $8.0 \, \text{m/s}^2$, up
   D. $32 \, \text{m/s}^2$, up
   E. $32 \, \text{m/s}^2$, down
      ans: D

Section: 4–7; Difficulty: E

37. A car rounds a 20-m radius curve at 10 m/s. The magnitude of its acceleration is:
   A. 0
   B. $0.20 \, \text{m/s}^2$
   C. $5.0 \, \text{m/s}^2$
   D. $40 \, \text{m/s}^2$
   E. $400 \, \text{m/s}^2$
      ans: C

Section: 4–7; Difficulty: E

`sq8`

46. A boy wishes to row across a river in the shortest possible time. He can row at $2\,\text{m/s}$ in still water and the river is flowing at $1\,\text{m/s}$. At what angle θ should he point the bow (front) of his boat?
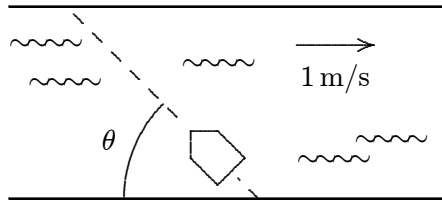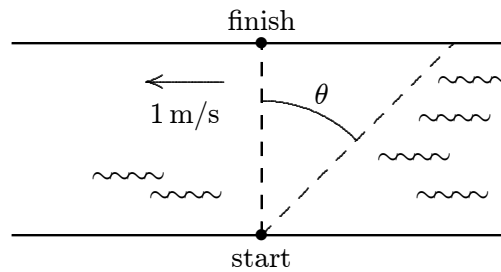

    A. 30°
    B. 45°
    C. 60°
    D. 63°
    E. 90°

    ans: E

Section: 4–9; Difficulty: M

`rq8`

47. A girl wishes to swim across a river to a point directly opposite as shown. She can swim at $2\,\text{m/s}$ in still water and the river is flowing at $1\,\text{m/s}$. At what angle θ with respect to the line joining the starting and finishing points should she swim?

    A. 30°
    B. 45°
    C. 60°
    D. 63°
    E. 90°

    ans: A

Section: 4–9; Difficulty: M