

PHYS101-052
MAJOR 1 EXAM

6. If $\vec{A} = \hat{i} + \hat{j}$ and $\vec{B} = \hat{i} - \hat{j}$ then:
- A) A and B must be parallel and in the same direction
 - B) A and B must be parallel and in opposite directions
 - C) magnitude of A is not the same as magnitude of B
 - D) the angle between A and B must be 60°
 - E) the angle between A and B must be 90°
7. Let $\vec{A} = 2.0\hat{i} - 3.0\hat{k}$ and $\vec{B} = 2.0\hat{i} + \hat{k}$. The vector $\vec{D} = (\vec{A} - \vec{B}) \times \vec{A}$ is:
- A) $2.0\hat{i} - 3.0\hat{k}$
 - B) $4.0\hat{i} - 2.0\hat{k}$
 - C) $-12\hat{i}$
 - D) $\hat{j} + \hat{k}$
 - E) $-8.0\hat{j}$
8. In Fig 1, $\vec{A} = (12\text{m}, 60^\circ)$ and $\vec{B} = (8\text{m}, 300^\circ)$. The x component of $(\vec{A} - \vec{B})$ is:
- A) 8 m
 - B) 10 m
 - C) 2 m
 - D) 14 m
 - E) 15 m

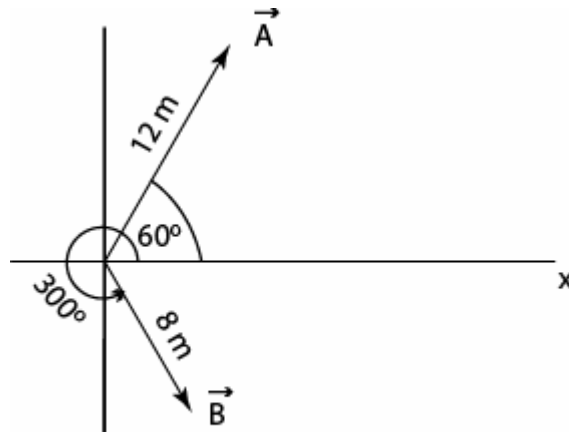


Figure 1

9. The plane shown in Fig 2, is in a level flight at a height of 490 m and a speed of 50 m/s when a package was released. The horizontal distance between the release point and the point where the package strikes the ground is:
- A) 150 m
 B) 300 m
 C) 980 m
 D) 500 m
 E) 100 m

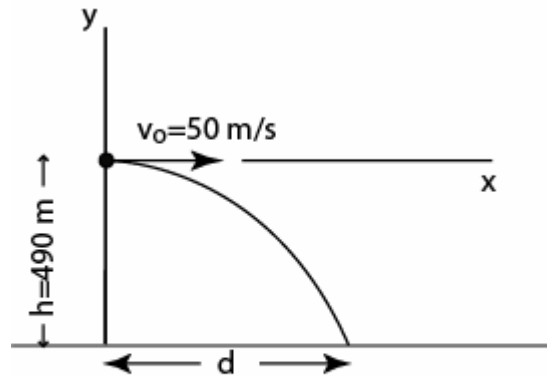


Figure 2

10. An object moves with a constant acceleration $\vec{a} = -8.0\hat{i} + 7.0\hat{j} \text{ m/s}^2$. At $t=0$ the velocity \vec{v}_0 is $40\hat{i} \text{ m/s}$. The velocity at time $t = 5.0 \text{ s}$ is:
- A) $-40\hat{i} + 35\hat{j} \text{ m/s}$
 B) $-40\hat{i} - 35\hat{j} \text{ m/s}$
 C) $35\hat{j} \text{ m/s}$
 D) $40\hat{i} - 35\hat{j} \text{ m/s}$
 E) $40\hat{i} + 35\hat{j} \text{ m/s}$
11. An object is moving on a circular path of radius 3.0 meters at a constant speed. The time required for one revolution is 4.7 s. The acceleration of the object is:
- A) 0.216 m/s^2
 B) 5.36 m/s^2
 C) 0.756 m/s^2
 D) 1.36 m/s^2
 E) zero
12. Fig 3 shows a boat is sailing at 12 km/h 30° W of N relative to a river that is flowing East (E) at 6.0 km/h relative to ground. As observed from the ground, the boat is sailing:
- A) due N
 B) 30° E of N
 C) 30° W of N
 D) 45° E of N
 E) due W

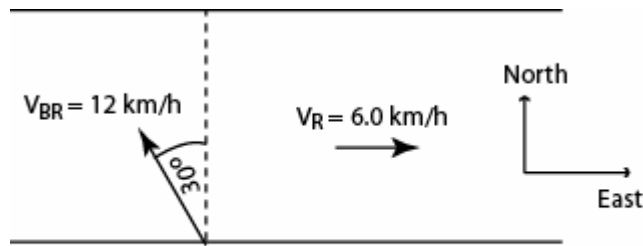


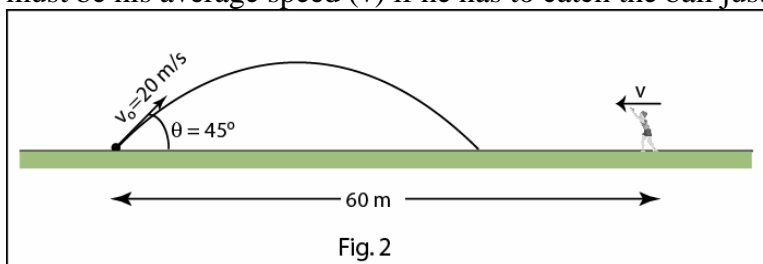
Figure 3

PHYS101-051
MAJOR 1 EXAM

6. Three vectors \vec{A} , \vec{B} , and \vec{C} are such that: $\vec{C} = \vec{A} + \vec{B}$, $\vec{B} = 5\hat{i}$ and $\vec{C} = 5\hat{j}$. Find the angle between \vec{A} and \vec{B} .
- A) 135°
 B) 120°
 C) 270°
 D) 150°
 E) 45°
7. A man walks 4.65 km West, then 12.7 km in the direction 30° West of North and finally 11.0 km due East. The man is now at
- A) 15.6 km in the direction 45° West of North
 B) 12.7 km due West
 C) 4.65 km due South
 D) 11.0 km due North
 E) back to where he started
8. If vector \vec{A} has the magnitude of 3.0 m and makes an angle 30° with the +x-axis, then the vector $\vec{B} = -2\vec{A}$ is:
- A) $\vec{B} = 5.2\hat{i} - 3.0\hat{j}$ (m)
 B) $\vec{B} = 5.2\hat{i} + 3.0\hat{j}$ (m)
 C) $\vec{B} = -5.2\hat{i} + 3.0\hat{j}$ (m)
 D) $\vec{B} = -5.2\hat{i} - 3.0\hat{j}$ (m)
 E) $\vec{B} = -3.0\hat{i} - 5.2\hat{j}$ (m)

9. A ball is thrown with a velocity $\vec{v}_0 = 3.0\hat{i} + 5.0\hat{j}$ (m/s) from the ground. Its velocity just before it strikes the ground is:
- A) $\vec{v} = 3.0\hat{i} - 5.0\hat{j}$ (m/s)
 B) $\vec{v} = 3.0\hat{i} + 5.0\hat{j}$ (m/s)
 C) $\vec{v} = 3.0\hat{i}$ (m/s)
 D) $\vec{v} = 5.0\hat{j}$ (m/s)
 E) $\vec{v} = -5.0\hat{j}$ (m/s)

10. A ball is kicked from the ground with an initial speed of 20 m/s at an angle of 45° . A player 60 m away starts running to catch the ball at that instant (see Fig 2). What must be his average speed (v) if he has to catch the ball just before it hits the ground?



- A) 15 m/s
 B) 10 m/s
 C) 20 m/s
 D) 2.0 m/s
 E) 6.6 m/s
11. The position of a particle as a function of time is given by $\vec{r} = 3.0t\hat{i} + 2.0t^2\hat{j}$. Find the angle between the velocity and acceleration of the particle at $t = 5.0$ s.
- A) 90°
 B) 0°
 C) 8.5°
 D) 45°
 E) 78°
12. Car A is moving towards East with speed 15.0 m/s and car B is moving towards West with speed 25.0 m/s, both relative to the ground. Find the velocity of car B relative to car A.
- A) 5.00 m/s towards North
 B) 5.00 m/s towards West
 C) 40.0 m/s towards West
 D) 40.0 m/s towards East
 E) 40.0 m/s towards South