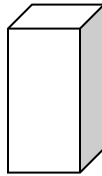


Practice problems, Physics 102 Common Exam 1, Spring 2025

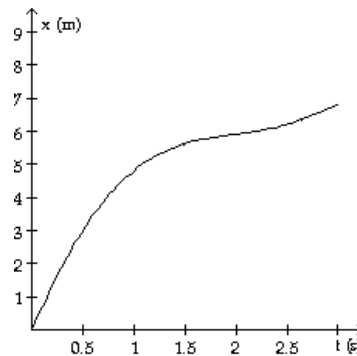
- 1) A train travels at a constant speed of 60.4 miles per hour for 101.5 minutes. What distance does the train cover?
- A) 100 miles
 - B) 102.2 miles
 - C) 102 miles**
 - D) 102.18 miles

- 2) One inch is equal to 0.0254 m. A box with the dimensions of 2.1 inch \times 3 inch \times 10 inch has a volume of:

- A) 10^6 m^3
- B) 10^{-3} m^3**
- C) 1 m^3
- D) 10^3 m^3
- E) 10^{-6} m^3



- 3) In the position vs. time graph shown, how does the instantaneous velocity at $t_1 = 0.5 \text{ s}$ compare with that at $t_2 = 1.5 \text{ s}$?
- A) They are equal.
 - B) The velocity at t_1 is smaller than that at t_2 .
 - C) The velocity at t_1 is greater than that at t_2 .**
 - D) It is impossible to tell velocities in such a graph.



- 4) An airplane starts from rest and accelerates at 10.8 m/s^2 . What is its speed at the end of a 400 m-long runway?
- A) 37.0 m/s
 - B) 93.0 m/s**
 - C) 65.7 m/s
 - D) 4320 m/s
- 5) A car is moving with a speed of 32.0 m/s. The driver sees an accident ahead and slams on the brakes, giving the car a deceleration of 3.50 m/s^2 . How far does the car travel after the driver put on the brakes before it comes to a stop?
- A) 4.57 m
 - B) 9.14 m
 - C) 112 m
 - D) 146 m**
- 6) To determine the height of a bridge above the water, a person drops a stone and measures the time it takes for it to hit the water. If the time is 2.3 s, what is the height of the bridge?
- A) 10 m
 - B) 14 m
 - C) 26 m**
 - D) 32 m
- 7) Vector \vec{A} points north and vector \vec{B} points east. If $\vec{C} = \vec{B} - \vec{A}$, then vector \vec{C} points:
- A) north of east.
 - B) south of east.**
 - C) north of west.
 - D) south of west.

8) A vector is located in the x - y plane. The x - and y -components of this vector are 4.00 m and 3.00 m, respectively. Find the angle that this vector makes with the positive y -axis.

- A) **53.1°**
- B) 36.9°
- C) 126.9°
- D) 22.4°

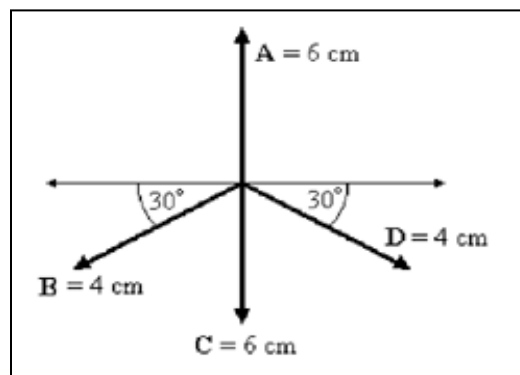
9) A displacement vector is 34.0 m in length and is directed 60.0° east of north. What are the components of this vector?

- A) Choice 1
- B) Choice 2
- C) Choice 3
- D) **Choice 4**

<u>choice</u>	<u>Northward component</u>	<u>Eastward component</u>
1	29.4 m	17.0 m
2	18.2 m	28.1 m
3	22.4 m	11.5 m
4	17.0 m	29.4 m

10) There are four vectors arranged as shown in the figure. Using the component method, find the components of the sum (resultant) of these four vectors.

<u>choice</u>	<u>x-component</u>	<u>y-component</u>
1	0 cm	6.0 cm
2	-3.5 cm	-2.0 cm
3	+3.5 cm	-2.0 cm
4	0 cm	-4.0 cm



- A) Choice 1
- B) Choice 2
- C) Choice 3
- D) **Choice 4**

11) A car is traveling with a constant speed when the driver suddenly applies the brakes, giving the car a deceleration of 3.50 m/s^2 . If the car comes to a stop in a distance of 30.0 m , what was the car's original speed?

- A) 105 m/s
- B) 210 m/s
- C) 315 m/s
- D) 10.2 m/s
- E) **14.5 m/s**

12) A track star in the broad jump goes into the jump at 12 m/s and launches himself at 20° above the horizontal. How long is he in the air before returning to Earth? ($g = 9.8 \text{ m/s}^2$)

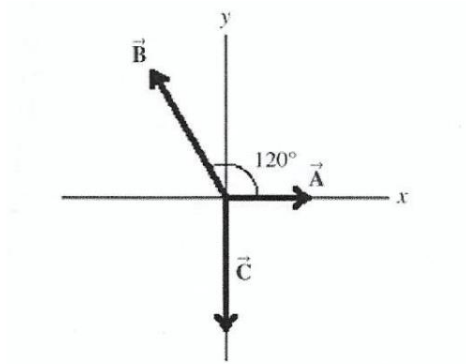
- A) 0.42 s
- B) **0.84 s**
- C) 1.25 s
- D) 1.68 s

13) A bird moves with a speed of $v = 12.0 \text{ m/s}$. The x-component of its velocity is 9.00 m/s . The angle between the direction of its motion and the x-axis must be:

- A) **41.4°**
- B) 48.2°
- C) 53.0°
- D) 58.6°
- E) 30.0°

14) Find the magnitude and direction of the sum of the three vectors, **A**, **B**, and **C**, shown in the figure. These vectors have the following magnitudes: $A = 5.0$, $B = 7.9$, and $C = 6.0$. Express the direction by specifying the angle it makes with the $+x$ -axis, with counterclockwise angles taken to be positive.

- A) Magnitude 0.38, Angle -38.7
- B) Magnitude 1.49, Angle 218.7
- C) Magnitude 1.34, Angle 38.7**
- D) Magnitude 1.34, Angle 218.7



- 15) A large cannon is fired from ground level over level ground at an angle of 30° above the horizontal. The muzzle speed is 10 m/s . Neglecting air resistance,
- (a) How long does it take until the projectile hits the ground? **Ans. 1 s**
 - (b) Find the maximum height. **Ans. 1.3 m**

- 16) A race car starting from rest accelerates at a constant rate of 5.0 m/s^2 .
- a) What is the velocity of the car after it has traveled 30.5 m? **Ans. 18 m/s**
 - b) How much time does it take to reach that distance? **Ans. 3.5 s**

17) A car slows down from $+31 \text{ m/s}$ to $+15 \text{ m/s}$ in a distance of 54 m along a straight road. What was its acceleration, assuming constant? **Ans. -6.8 m/s^2**

- 18) Vector \vec{A} points north and vector \vec{B} points east. If $\vec{C} = \vec{B} - \vec{A}$, then vector \vec{C} points:
- A) north of west.
 - B) south of west.
 - C) north of east.
 - D) south of east**