Closed book. No work needs to be shown for multiple-choice questions.

1. A train moves forward at a constant speed of 15.0 m/s for 10.0 min, and then accelerates at a constant rate for 8.00 min, eventually reaching a final forward speed of 25.0 m/s. Which one of the following choices best describes how far the train traveled during this entire 18.0 min process?

a. 2.70×10^{4} m.
b. 1.86×10^{4} m.
c. 1.62×10^{4} m.
d. 9.60×10^{3} m.
e. 9.00×10^{3} m.

2. A ball is thrown vertically upward and reaches a maximum height of 20.0 m. What is the total time the ball is in the air? Assume the ball was released from ground level.

a. 1.01 s.
b. 2.02 s.
c. 3.03 s.
d. 4.04 s.
e. 6.06 s.

3. A cheetah can run at approximately 120 km/hr and a gazelle at 96.0 km/hr. If both animals are running at full speed, with the gazelle 84.0 m ahead, how long before the cheetah catches its prey?

a. 12.6 s.
b. 25.2 s.
c. 6.3 s.
d. 10.7 s.
e. 19.4 s.

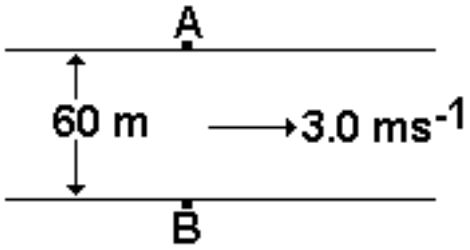
4. A high fountain of water is in the center of a circular pool of water. You walk the circumference of the pool and measure it to be 150 meters. You then stand at the edge of the pool and use a protractor to gauge the angle of elevation of the top of the fountain. It is 55°. How high is the fountain (think about the square triangle that you have to draw) ?

a. 17 m
b. 20 m
c. 23 m
d. 29 m
e. 34 m

5. A radar speed trap measures the instantaneous velocity of an approaching car. The reading is correct only when the car is moving directly toward the speed trap. The radar device is however used at a slight angle Θ to the oncoming car, as shown in the diagram on the right. If a car is measured to have a velocity of 112 km/h and the angle Θ is 14°, what is the true velocity of the car along the direction of travel?

a. 27 km/h
b. 119 km/h
c. 109 km/h
d. 112 km/h
e. 115 km/h

6. A boat must cross a river from a point A on one bank to the point B on the other bank. The river flows at 3.0 $m.s^{-1}$. The boat has the power to move at 7.6 m/s in still water. The width of the river is 60 m. What is the speed of the boat from A to B (treat each velocity as a vector)?



a. 7.0 m/s
b. 6.5 m/s
c. 6.8 m/s
d. 7.6 m/s
e. 7.3 m/s

7. An automobile driver puts on the brakes and uniformly decelerates from 30.0 m/s to zero in 10.0 s. What distance does the car travel in those 10.0 s?

a. 150 m.
b. 392 m.
c. 336 m.
d. 244 m.
e. 196 m.

8. John throws a rock down with speed 14.0 m/s from the top of a 30.0 m tower. If air resistance is negligible, what is the rock's speed just as it hits the ground?

a. 12.0 m/s
b. 19.8 m/s
c. 28.0 m/s
d. 350 m/s
e. 784 m/s

Equations and constants:

$$\begin{Bmatrix} x = r\cos\theta \\ y = r\sin\theta \end{Bmatrix};\quad \begin{Bmatrix} r = \sqrt{x^2 + y^2} \\ \theta = \tan^{-1}\left(\frac{y}{x}\right) \end{Bmatrix};\quad \begin{Bmatrix} v = v_o + at \\ \Delta x = \frac{1}{2}(v_o + v)t \\ \Delta x = v_o t + \frac{1}{2}at^2 \\ v^2 = v_o^2 + 2a\Delta x \end{Bmatrix};\quad \begin{Bmatrix} \Delta x = x_f - x_i \\ \\ speed_{avg} = \frac{d}{\Delta t} \end{Bmatrix};\quad \begin{Bmatrix} a_{avg} = \frac{\Delta v}{\Delta t} \\ \\ v_{avg} = \frac{\Delta x}{\Delta t} \end{Bmatrix};$$

$$\begin{Bmatrix} a = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t} \\ \\ v = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} \end{Bmatrix};\quad \begin{Bmatrix} \text{Circum}_{Circle} = 2\pi r \\ Area_{Circle} = \pi r^2 \end{Bmatrix};\quad \begin{Bmatrix} Perimeter_{\text{Rectangle}} = 2 \times length + 2 \times width \\ Area_{\text{Rectangle}} = length \times width \end{Bmatrix};$$

$g = 9.80\ \text{m/s}^2$; 100 cm = 1 m; 1,000 m = 1 km; 60 s = 1 min; 60 min = 1 hr; 2.54 cm = 1 in;

12 in = 1 ft; 5,280 ft = 1 mi; 1,609 m = 1 mi; 0.3048 m = 1 ft.