Q1.
The density of aluminum is 2700 kg/m^3. Find the mass of a uniform solid aluminum cylinder of radius 10.00 cm and height 30.48 cm.

A) 25.85 kg
B) 31.30 kg
C) 45.20 kg
D) 21.77 kg
E) 18.90 kg

Q2.
During a short interval of time the speed v (m/s) of a car is given by $v = ct^2 + bt^3$, where the time t is in seconds. The units of c and b are respectively:

A) m/s^3 ; m/s^4
B) m/s^2 ; m/s^4
C) m/s^3 ; m/s^3
D) ms^3 ; ms^4
E) ms^3 ; m/s^4

Q3.
A stone is released from rest from the top of a tower of height H meters above the ground. It takes t seconds for the stone to reach the ground. What is the height of the stone at 0.5t seconds above the ground? [Ignore air resistance]

A) 0.75H
B) 0.50H
C) 0.25H
D) The position of the stone depends on its mass
E) The position of the stone depends on its density

Q4.
An object is thrown straight downward with an initial speed of 4.0 m/s from a window which is 8.0 m above the ground. The time it takes the object to reach the ground is: [Ignore air resistance]

A) 0.93 s
B) 1.90 s
C) 0.40 s
D) 1.10 s
E) 0.77 s

Q5.
A man drives north for 35.0 minutes at 85.0 km/h and then stops for 15.0 minutes. He then continues north, traveling 130 km in 2.00 h. Find the man's average speed?

A) 63.5 km/hr
B) 35.6 km/hr
C) 85.0 km/hr
D) 15.3 km/hr
E) 45.8 km/hr

Q6.
The coordinate of a particle is given by $x(t) = 16t - 3.0t^3$, where x is in meters and t is in seconds. Find the time when the particle is momentarily at rest?

A) 1.3 s
B) 0.0 s
C) 1.5 s
D) 1.0 s
E) 2.3 s

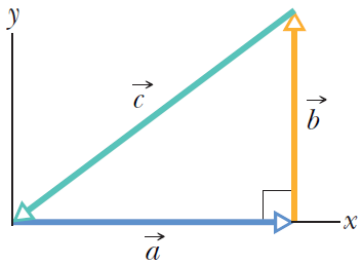
Q7.
A car travels 20.0 km due north and then 35.0 km due west. Find the car's resultant displacement relative to the starting point?

A) 40.3 km, 60.3° west of north
B) 45.3 km, 30.3° north of west
C) 65.0 km, 65° north
D) 30.5 km, 45.0° west of south
E) 65.8 km, 25.0° east

Q8.
If $\vec{A} = 2.0\hat{i} + 3.0\hat{j}$, $\vec{B} = -3.0\hat{i} + 4.0\hat{j}$ and $\vec{C} = 7.0\hat{i} + 3.0\hat{j}$, find $\vec{C} \times (2\vec{A} - \vec{B})$?

A) $-7.0\hat{k}$
B) $7.0\hat{k}$
C) $2.0\hat{i} + 1.0\hat{j}$
D) 0
E) $-6.0\hat{j}$

Q9.
In **Figure 1**, the magnitudes of vector $\vec{a} = 4.0\,\text{m}$, $\vec{b} = 3.0$ m, and $\vec{c} = 5.0\,\text{m}$. If the + z axis is out of the page, find the magnitude and direction of $\vec{c} \times \vec{b}$?



A) 12 m, along the – z axis
B) 9.0 m, along the + y axis
C) 12 m, along the –y axis
D) 12 m, along the + z axis
E) 9.0 m, along the + z axis

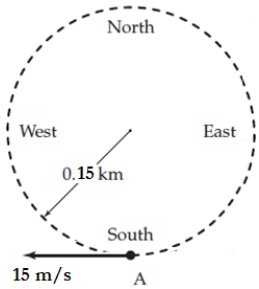
Q10.
A car travels along a highway due west with a speed of 24 m/s. Then, the car leaves the highway and continues travelling. After 4.0 s, its instantaneous velocity is 16 m/s at an angle of 45° north of west. What is the magnitude of the average acceleration of the car during the four-second interval?

A) 4.3 m/s^2
B) 2.4 m/s^2
C) 1.2 m/s^2
D) 11 m/s^2
E) 17 m/s^2

Q11.
A tennis ball is thrown from ground level with initial velocity $\vec{v}_o$ directed 30° above the horizontal. If the ball reaches the top of the trajectory after 0.30 s, what is the magnitude of the initial velocity? [Ignore air resistance]

A) 5.9 m/s
B) 9.8 m/s
C) 11.3 m/s
D) 19.6 m/s
E) 34.4 m/s

Q12.
A car travels clockwise around a flat (horizontal) circle of radius 0.15 km at a constant speed of 15 m/s. When the car is at point A as shown in the **Figure 2**, what is the car's acceleration? [Ignore air resistance]



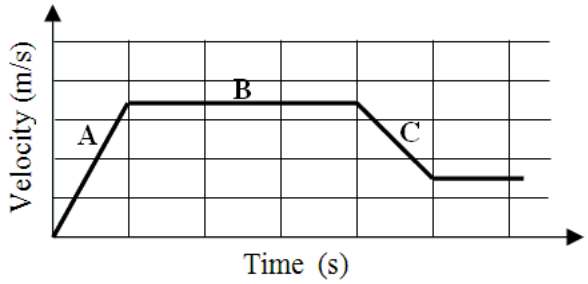
A) 1.5 m/s^2, due north
B) Zero
C) 1.5 m/s^2, due south
D) 1.6 m/s^2, due east
E) 1.6 m/s^2, due west

Q13.
A plane is headed westward at a speed of 165 m/s. A wind with a speed of 25.0 m/s is blowing southward at the same time as the plane is flying. The velocity of the plane relative to the ground is:

A) 167 m/s at an angle 8.62° south of west
B) 167 m/s at an angle 8.62° west of south
C) 167 m/s at an angle 5.31° south of east
D) 167 m/s at an angle 5.31° east of south
E) 107 m/s at an angle 7.31° south of east

Q14.

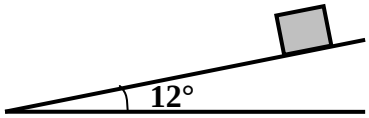
Figure 3 shows the velocity versus time curve for a car traveling along a straight line.Which of the following statements is **False**?



A) The magnitude of the net force acting during interval A is less than that during interval C
B) Net forces act on the car during intervals A and C
C) Opposing forces may be acting on the car during interval B
D) Opposing forces may be acting on the car during interval C
E) No net force acts on the car during interval B

Q15.

A box slide down a rough incline plane at a constant acceleration of 0.20 m/s^2 (see **Figure 4**). The incline plane makes an angle of 12° with the horizontal. What is coefficient of kinetic friction between the box surface and the incline surface? [Ignore air resistance]



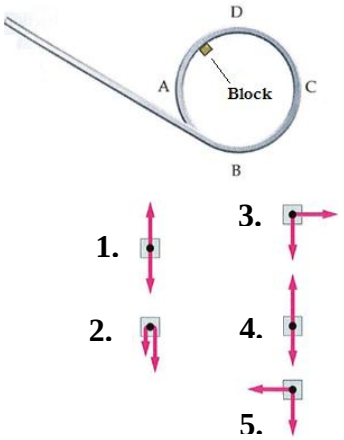
A) 0.19
B) 0.14
C) 0.11
D) 0.24
E) 0.25

Q16.

A 10 kg block is connected to a 40-kg block through a massless rope, as shown in **Figure 5**. A force of 90 N pulls the blocks to the right on a frictionless surface. What is the magnitude of the tension $\vec{T}$ in the rope that connects the two blocks?

A) 18 N
B) 11 N
C) 22 N
D) 23 N
E) 12 N

Q17.
A block is sliding on a frictionless surface along a vertical loop-the-loop as shown in **Figure 6**. The block is moving fast enough that it never loses contact with the track. Its positions at different times are marked as A, B, C and D. Out of the following five free- body diagrams, which one corresponds to block position A? [Ignore air resistance]

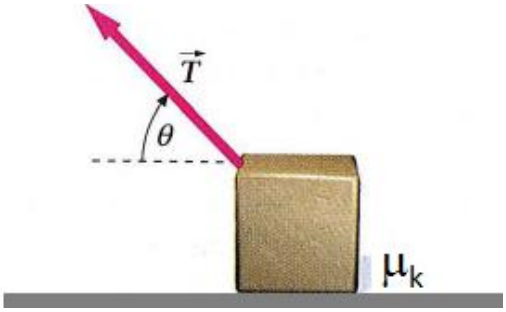


A) 3
B) 5
C) 1
D) 2
E) 4

Q18.
A 71.0 kg man stands on a bathroom scale in an elevator. What does the scale read if the elevator is moving upward with an increasing velocity and at constant acceleration of 3.00 m/s^2?

A) 909 N
A) 482 N
C) 699 N
D) 833 N
E) 999 N

Q19.
A 5.5 kg box is pulled by a string over a rough horizontal surface at a constant velocity. The string makes an angle of $\theta = 37°$ with the horizontal, as shown in **Figure 7**. If coefficient of kinetic friction between the box and the horizontal surface is 0.15, find the magnitude of tension in the string T.



A) 9.1 N
B) 4.8 N
C) 11 N
D) 16 N
E) 1.9 N

Q20.
Two blocks with masses $m_1 = 2.0$ kg and $m_2 = 6.0$ kg are in contact on a frictionless horizontal surface. The blocks are accelerated by a horizontal force *F* applied to the block m_1 as shown in **Figure 8**. Find the magnitude of the force $\vec{F}$ if the contact force between the blocks is 1.1 N.

A) 1.5 N
B) 1.1 N
C) 3.2 N
D) 2.3 N
E) 3.1 N
