Q1.
The position y of a particle moving along the *y* axis depends on the time *t* according to the equation $y = At - Bt^2$. The dimensions of the quantities *A* and *B* are respectively:

A) L/T, L/T^2
B) L^2/T, L/T^2
C) L/T, L^2/T
D) L^3/T, T^2/L
E) Both are dimensionless

Q2.
The position of an object is given as a function of time by $x = 4.0t^2 - 3.0t^3$, where *x* is in meters and *t* is in seconds. Its average acceleration during the interval from *t* = 1.0 s to *t* = 2.0 s is:

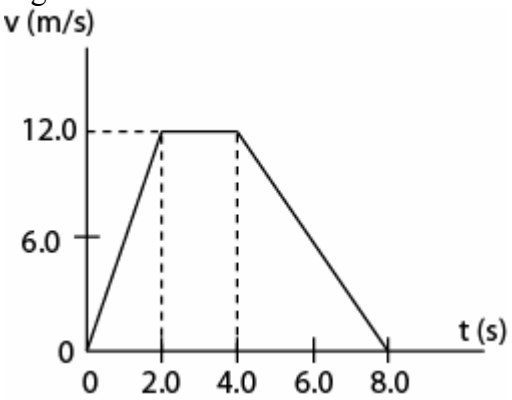
A) -19 m/s^2
B) -9.5 m/s^2
C) 9.5 m/s^2
D) 19 m/s^2
E) zero

Q3.
A car starts from rest and undergoes a constant acceleration. It travels 5.0 m in the time interval from t = 0 to t = 1.0 s. Find the displacement of the car during the time interval from t = 1.0 s to t = 2.0 s.

A) 15 m
B) 5.0 m
C) 10 m
D) 25 m
E) 30 m

Q4.
Fig. 1 represents the velocity of a car (v) moving on a straight line as a function of time (t). Find the acceleration of the car at 6.0 s.

Fig#



A) -3.0 m/s^2
B) 3.0 m/s^2

C) -6.0 m/s^2
D) 6.0 m/s^2
E) 0.0 m/s^2

Q5.
Vectors $\vec{a}$, $\vec{b}$, and $\vec{c}$ are related through equations $\vec{a}+\vec{b}=\vec{c}$ and $\vec{a}-\vec{b}=5.0\,\vec{c}$.
If $\vec{c}=3.0\,\hat{i}+4.0\,\hat{j}$, what is the magnitude of vector $\vec{a}$?

A) 15
B) 5.0
C) 25
D) 10
E) 2.6

Q6.
Three vectors $\vec{F}$, $\vec{v}$ and $\vec{B}$ are related through $\vec{F}=5.0\left(\vec{v}\times\vec{B}\right)$. If vector $\vec{v}=3.0\,\hat{i}-5.0\,\hat{j}$ and $\vec{B}=-2.0\,\hat{k}$, then vector $\vec{F}$ is:

A) $50\,\hat{i}+30\,\hat{j}$
B) $30\,\hat{i}+50\,\hat{j}$
C) $60\,\hat{i}-30\,\hat{j}$
D) $50\,\hat{i}+60\,\hat{k}$
E) $50\,\hat{i}-30\,\hat{j}$

Q7.
A vector $\vec{A}$ of magnitude 20 is added to a vector $\vec{B}$ of magnitude 25. The magnitude of the vector $\vec{A}+\vec{B}$ can be:

A) 12
B) zero
C) 3
D) 47
E) 50

Q8.
Vectors $\vec{F}$ and $\vec{G}$ are defined as $\vec{F}=3.0\,\hat{i}+4.0\,\hat{j}$, and $\vec{G}=-\hat{i}+\hat{j}$. Find the component (projection) of vector $\vec{G}$ along the direction of vector $\vec{F}$.

A) 0.20
B) 5.0
C) 1.4
D) 6.1
E) 2.0

Q9.

A projectile is fired over a flat horizontal land. It takes 10 s to reach its range of 100 m. What is the speed of the projectile at the highest point of its trajectory?

A) 10 m/s.
B) 100 m/s
C) It cannot be found from the information given
D) 9.8 m/s
E) 0

Q10.
A particle is moving counterclockwise in *x*-*y* plane in a uniform circular motion. The circle is centered at the origin and has a radius of 2.0 m. When the velocity of the particle is $\left(4.0\,\hat{i}\right)$ m/s , then its acceleration is :

A) $\left(+8.0\,\hat{j}\right) m/s^2$
B) $\left(-8.0\,\hat{j}\right) m/s^2$
C) $\left(-8.0\,\hat{i}\right) m/s^2$
D) $\left(+8.0\,\hat{i}\right) m/s^2$
E) $\left(8.0\,\hat{i}+8.0\,\hat{j}\right) m/s^2$

Q11.
A river is flowing 0.20 m/s east. A boat in this river has a speed of 0.40 m/s directed 60° south of east relative to the earth. Find the velocity of the boat relative to the river.

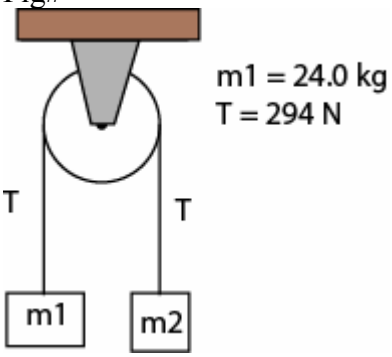
A) 0.35 m/s, south
B) 0.35 m/s, 60^o south of east
C) 0.40 m/s, 52^o south of west
D) 0.40 m/s, 38^o south of east
E) 0.11 m/s, 10^o south of west

Q12.
A particle has its position vector defined by $\vec{r}=\left[\left(2.0t-t^2\right)i+\left(3.0t-1.5t^2\right)j\right]$ m . At what time is its speed equal to zero?

A) 1.0 s
B) 4.0 s
C) Its speed will never become zero
D) 0.25 s
E) 0

Q13.
Two blocks of mass m_1= 24.0 kg and m_2, respectively, are connected by a light string that passes over a massless pulley as shown in Fig. 2. If the tension in the string is T = 294 N. Find the value of m_2. (Ignore friction)

Fig#



A) 40.0 kg
B) 48.0 kg
C) 24.0 kg
D) 16.0 kg
E) 30.0 kg

Q14.
Two horizontal forces of equal magnitudes are acting on a box sliding on a smooth horizontal table. The direction of one force is the north direction; the other is in the west direction. What is the direction of the acceleration of the box?

A) 45° west of north
B) 20° east of north
C) 60° north of east
D) 45° south of east
E) 10° west of south

Q15.
A constant horizontal force of 36 N is acting on a block of mass 4.0 kg, another block of mass 2.0 kg sits on the 4.0 kg block. The 4.0 kg block moves on a frictionless horizontal floor. Find the magnitude of the frictional force maintaining the 2.0 kg block in its position above the 4.0 kg block during the motion.

A) 12 N
B) 15 N
C) 18 N
D) 16 N
E) 36 N

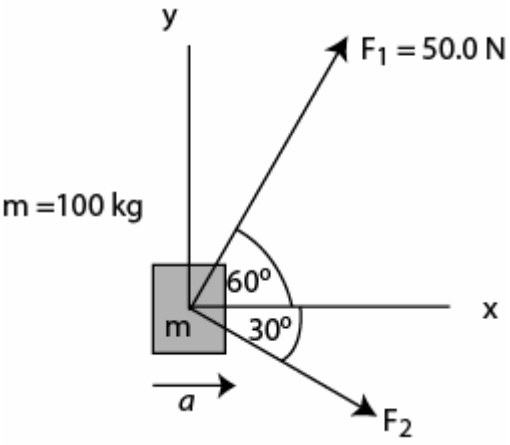
Q16.
A 5.0 kg block is lowered with a downward acceleration of 2.8m/s^2 by means of a rope. The force of the block on the rope is:

A) 35 N, down
B) 14 N, up
C) 14 N, down
D) 35 N, up
E) 49 N, up

Q17.

Two students are dragging a box (m=100 kg) across a horizontal frozen lake. The first student pulls with force F_1=50.0 N, while the second pulls with force F_2. The box is moving in the x-direction with acceleration a (see Fig. 3). Assuming that friction is negligible, what is F_2?

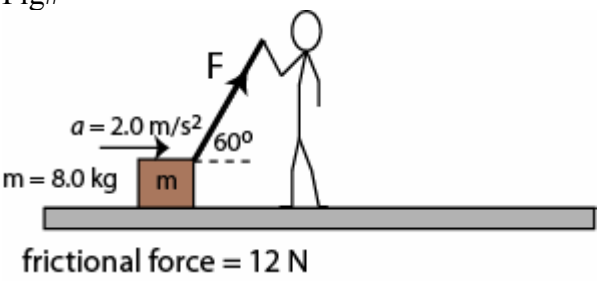
Fig#



A) 86.6 N
B) 50.0 N
C) 100 N
D) 43.3 N
E) 173 N

Q18.
In Fig. 4, a boy is dragging a box (mass =8.0 kg) attached to a string. The box is moving horizontally with an acceleration a = 2.0 m/s^2. If the frictional force is 12 N, calculate the applied force F at an angle θ=60°.

Fig#



A) 56 N.
B) 16 N
C) 28 N
D) 4.0 N.
E) 32 N

Q19.
At what angle should the circular roadway of 50 m radius, be banked to allow cars to round the curve without slipping at 12 m/s? (Ignore friction)

A) 16°
B) 0°
C) 23°

D) 35°
E) 73°

Q20.
A 1000 kg airplane moves in straight horizontal flight at constant speed. The force of air resistance is 1800 N. The net force on the plane is:

A) zero
B) 11800 N
C) 1800 N
D) 9800 N
E) none of these
