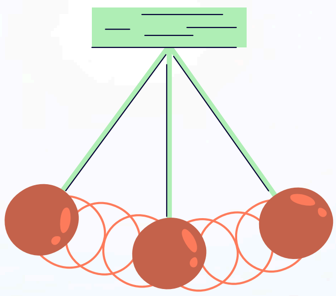
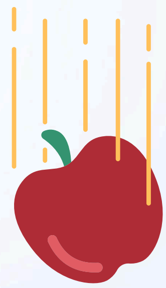
QUESTIONS

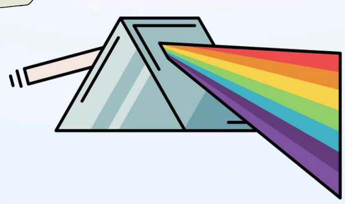
EmSAT PHYSICS

Reach Your Potential

$E_K = \frac{1}{2}mv^2$







عندك سؤال وحابب إجابة؟ فريقنا بساعدك عالمجموعة

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Fundamentals of Physics:

Scalar and vector quantities:

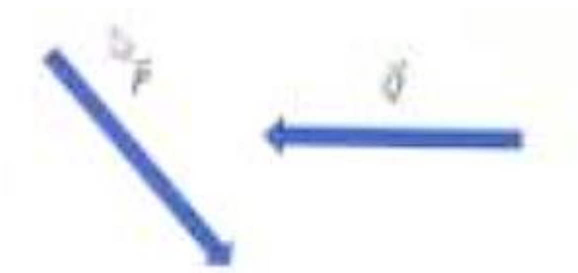
Which quantity is a vector?

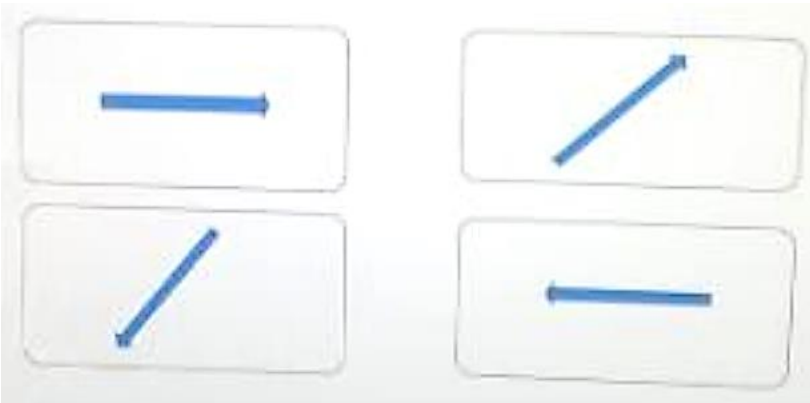
Power	B	Weight	A
Speed	D	*Kinetic Energy*	C

Which one of the following is not a vector quantity?

Momentum	B	mass	A
Acceleration	D	*Velocity*	C

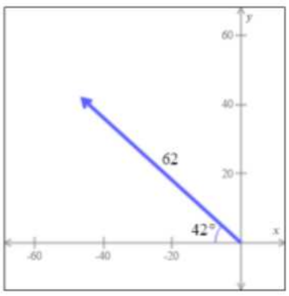
If there is two vectors P and Q as shown below, which of the following represent $P + Q$?





What are the x and y components of the vector given below?

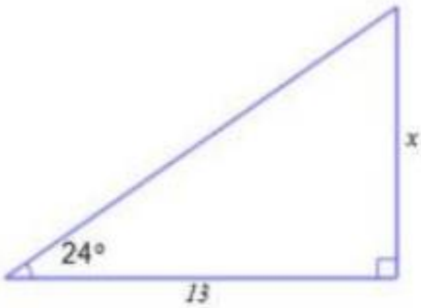
Round your answers to the nearest hundredth.



$x =$

$y =$

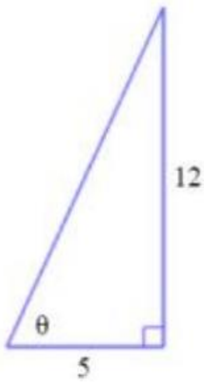
- Solve for x.



Round your answer to the nearest tenth.

x =

- Find $\sin\theta$ where θ is the angle shown.

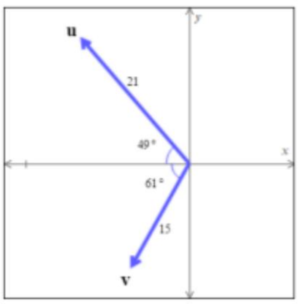


sin(θ) = /

- The vectors u and v are shown below.

Find u_v.

Round your answer to the nearest hundredth,



u_v =

- Which of the following represents the velocity of a moving object?

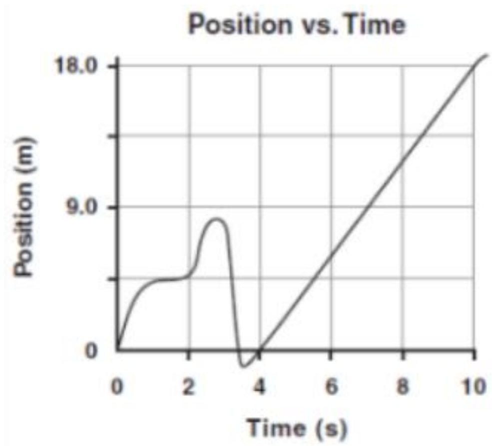
40 m/s north	B	40 m North	A
40	D	*4 m/s*	C

Mechanics:

Linear Motion:

One Dimensional Motion:

- The graph below shows how the position of an object changes over time.

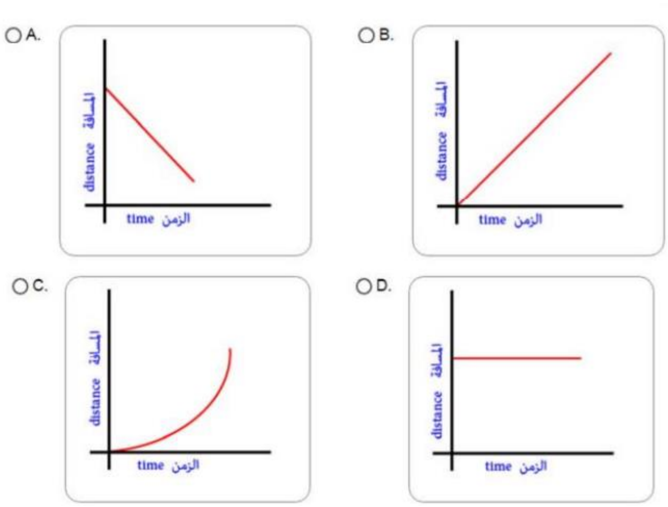


What is the speed of the object during time interval from 4 seconds to 10 seconds.

$3m/s$	B	$16\ m/s$	A
$8m/s$	D	$2m/s$	C

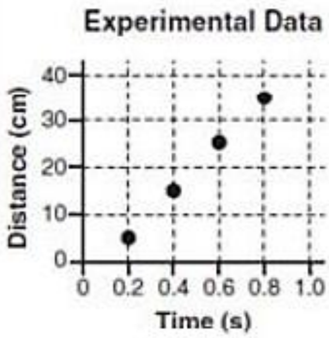
- A car is moving away from a motion detector with a constant speed.

Which graph best represents the motion of the car?



Data from an experiment are presented below

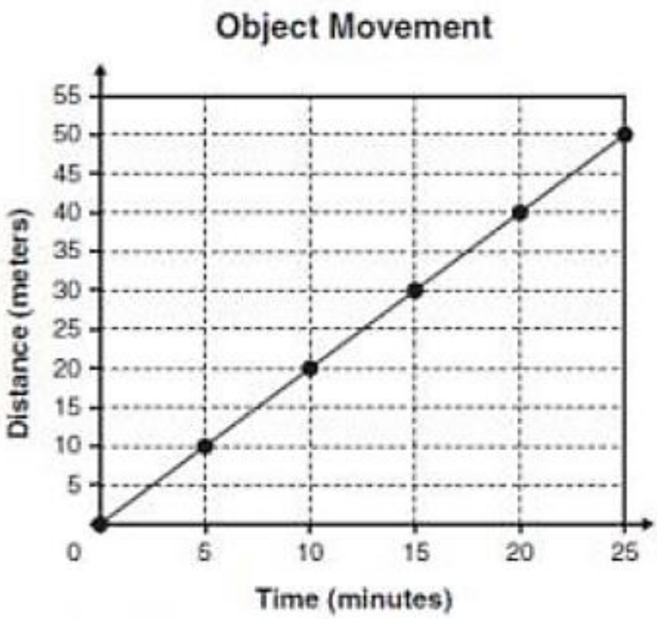
بيانات تجريبية Experimental Data	
المسافة (سم) Distance	الوقت (الثواني) Time
5 cm	0.2 s
15 cm	0.4 s
25 cm	0.6 s
35 cm	0.8 s



The slope of the graph represents what characteristic of an object?

Speed	B	Inertia I	A
Displacement	D	*Force*	C

- The graph below shows the movement of an object at several points in time.



What is the average speed of the object?

$\frac{50\ meter}{minute}$	B	$\frac{0.5\ meter}{minute}$	A
$\frac{25\ meter}{minute}$	D	$\frac{2meter}{minute}$	C

- How much time is required for a bicycle to travel a distance of $100m$ at an average speed $2m/s$.

$50s$	B	$0.02s$	A
$100s$	D	$200s$	C

- Salma is propelled on a skateboard moving on a horizontal road in such a way that her position is always given by $x = 5t^2 + 2t$. At moment t she jumps, keeping the horizontal propulsion, and the maximum height she cn achieve is $0.5m$. What is Salma's acceleration at the highest point?

Note: ignore friction.

$a = 14\ m/s^2$ *above the horizontal*	B	$a = 4.5m/s^2$ *above the horizontal*	A
$a = 10\ m/s^2$ *East*	D	$a = 14\ m/s^2$ *below the horizontal*	C

- The velocity vector of a particle is given by:

$$v = (4t^3)i + (6.5)j$$

Where v is in m/s and t is in s.

What is the instantaneous acceleration vector at $t = 2.5s$?

$75\ i\ m/s^2$	B	$27\ i\ m/s^2$	A
$69\ i\ m/s^2$	D	$41\ i\ m/s^2$	C

A river has a steady speed of 0.500 m/s. A man swims in a river a distance of 1000 m and swims back to the starting point. If he swims at a speed of 1.20 m/s in still water, how long does the entire trip take?

$23.8\ min$	B	$10\ min$	A
$33.6\ min$	D	$28.0\ min$	C

- Which of the following work on changing the acceleration direction in 2D motion?

If the velocity vector change in Magnitude or Direction.	B	If the velocity vector changed in one direction	A
If the velocity vector change in Magnitude or Direction.	D	*If the velocity changed in Magnitude only.*	C

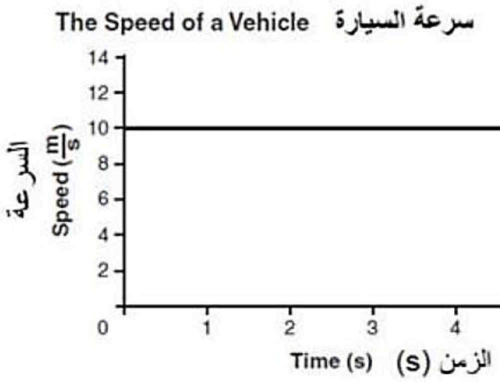
- A formula one car accelerates from rest and reaches a speed of $28m/\ s$ in $2.5s$ What is the value of it's average acceleration?

$25.5\ m/s^2$	B	$3.4\ m/s^2$	A
$40.0\ m/s^2$	D	$11.1\ m/s^2$	C

- A car increases it's speed from $11.7\ m/s$ to $13.8\ m/s$ in $3.5\ s$. What is the average acceleration of the car during this interval?

Average acceleration in (m/s^2) = $\boxed{}$

The graph below shows the speed of a vehicle over time:



- How far did the vehicle travel during the first two seconds?

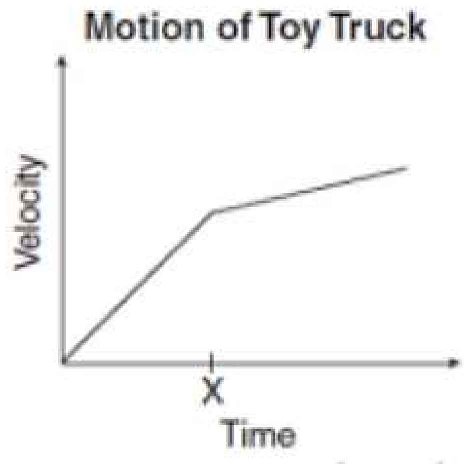
$20m$	B	$0.2m$	A
$10m$	D	$5m$	C

- An athlete can run 9 kilometer's in 1 hour.

If the athlete runs at that same average speed for 30 minutes. How far will the athlete travel?

$4.5km$	B	$3.3km$	A
$18km$	D	$9km$	C

- A student applied a constant force to a toy truck. A graph of the truck's movement is shown below.



Which of the following could best explain the change in velocity at time x?

The truck's momentum became greater than it's inertia.	B	The truck began traveling up slightly sloped surface,	A
The truck went from rolling on a rough surface to rolling on a polished surface.	D	The truck went from moving in a straight line path to moving in a curved path.	C

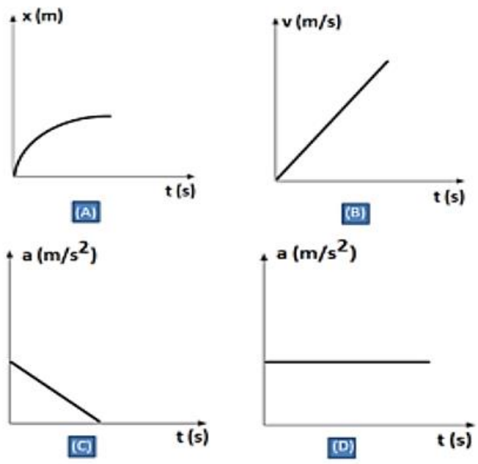
- To create real-time graphs of an object's displacement versus time and velocity versus time, a student would need to use a:

Motion sensor	B	Force probe	A
Potential difference probe.	D	Low – g accelerometer	C

- The position of an object as it moves along the $y-axis$ is given by $y = 15e^{-2t}$, Where y is in meters and t is in seconds. What is the acceleration of the object at $t = 1.0s$?

$5.5m/s^2$	B	$60m/s^2$	A
$35m/s^2$	D	$8.1m/s^2$	C

- Which of the following combination of graphs best describes a motion with constant acceleration of an object?



(C) and (D)	B	(B) and (D)	A
(A) and (B)	D	(A) and (C)	C

- A formula one car accelerates from rest and reaches a speed of $28m/s$ in $2.5s$. what is the value of it's average acceleration?

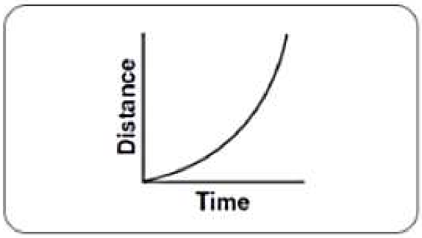
$25.5\ m/s^2$	B	$40.0\ m/s^2$	A
$8.4\ m/s^2$	D	$11.1\ m/s^2$	C

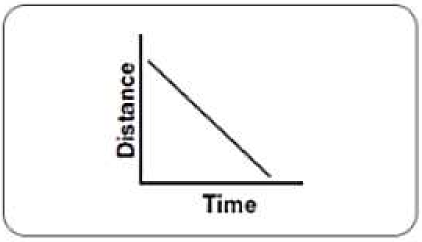
- A racing car travels around a 2 km circular track at a constant speed of $40m/s$. Which of the following are the values for the displacement and average velocity after ten complete laps?

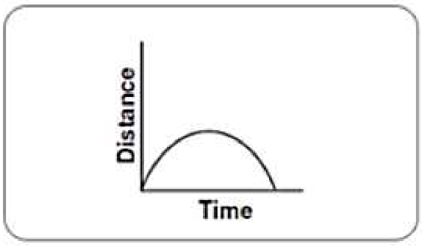
Displacement = 0 And average velocity = 0m/s	B	Displacement = 0 And average velocity = 40m/s	A
Displacement = 20 km And average velocity = 40m/s	D	Displacement = 2km And average velocity = 40m/s	C

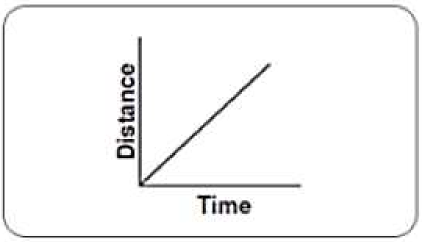
- A cart travels with a constant nonzero acceleration along a straight line.

Which graph best represents the relationship between distance the cart travel and time of travel?

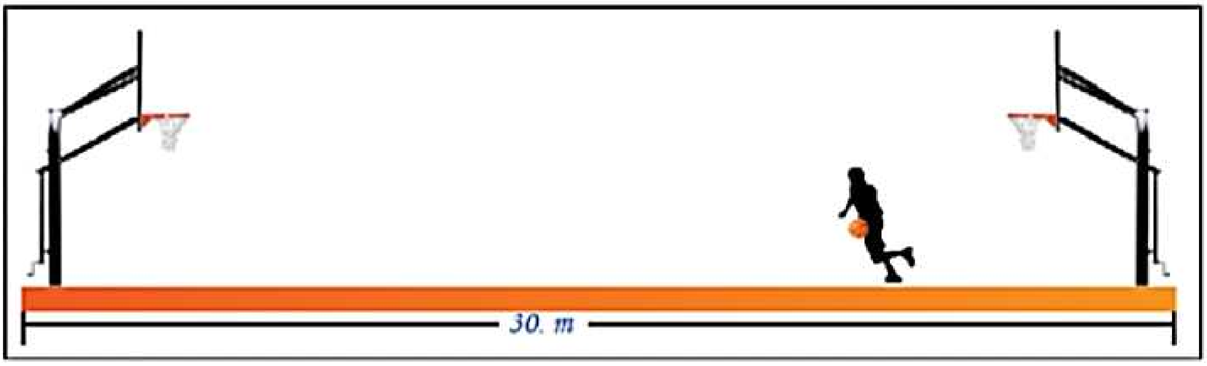
○ 

○ 

○ 

○ 

- A player runs the length of the $30.0m$ court and back. The player does this three times in $60s$.



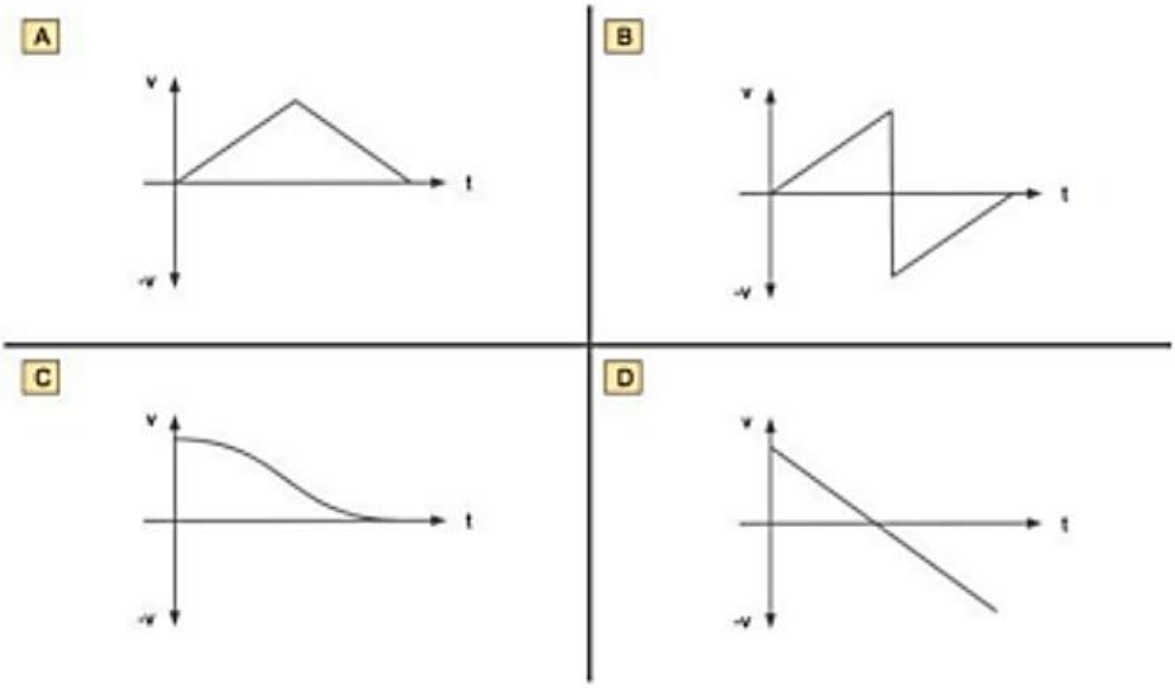
What is the magnitude of the player's total displacement after $60s$?

Magnitude (m) = ☐

- The position of a particle is given by $x = 24t - 2.09t^3$, Where x is in meters t is in seconds. What is the magnitude of the acceleration of the particle when it's velocity is zero?

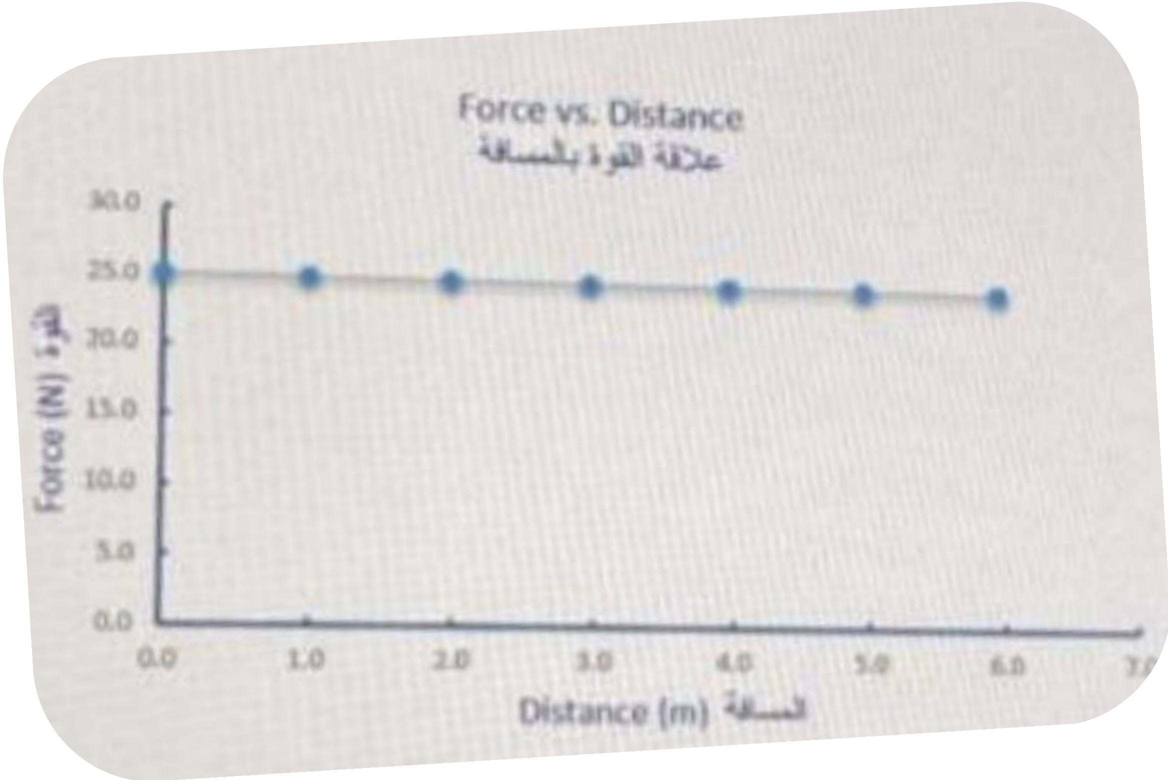
$48\ m/s$	B	$24\ m/s$	A
$0\ m/s$	D	$12\ m/s$	C

- A ball is thrown vertically up in the air and then caught again. Which velocity- time graph for the ball is correct?



A	B	**D**	A
C	D	**B**	C

- A boy pushes a cart at constant speed along a level sidewalk. The graph below represents the relationship between the horizontal force exerted by the boy and the distance the cart moves. What Is the total work done by the boy in pushing the wagon a distance off $3.0m$?



Total Work (J) = $\boxed{}$

- The velocity vector of a particle is given by:

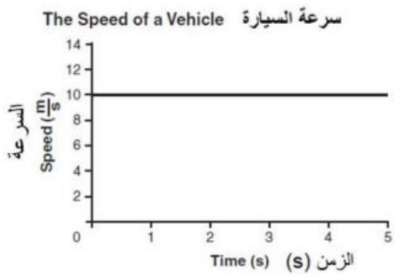
$$v = (4t^3)i + (6.5)j$$

Where v is in m/s and t is in s

What is the instantaneous acceleration vector at $t = 2.5\ s$?

$75i\ m/s^2$	B	$27i\ m/s^2$	A
$69\ i\ m/s^2$	D	$41i\ m/s^2$	C

- The graph below shows the speed of a particle vehicle over time.

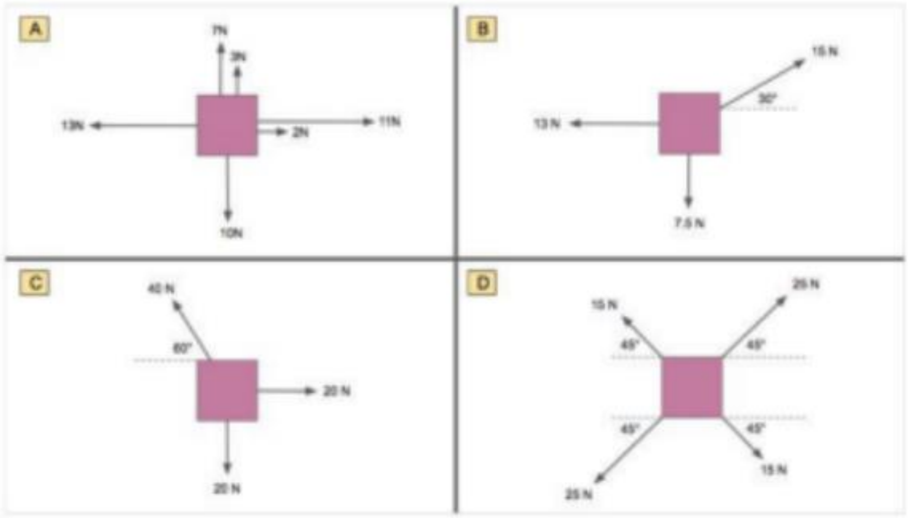


How far did the vehicle travel during first two seconds?

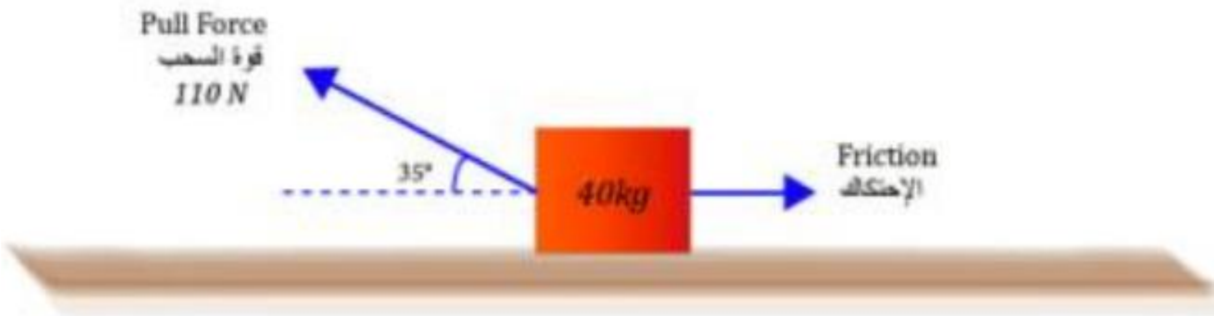
$20m$	B	$0.2m$	A
$10m$	D	$5m$	C

Force and Newton's Laws:

- In which of the four situations are the forces on the object not balanced?



A	B	**C**	A
D	D	**B**	C



- The figure shows a wooden box that is being pulled along a horizontal plane.

  According to the figure, what Is the horizontal acceleration of the box to the left?

  Provided that the coefficient of kinetic friction wood on wood is 0.2s.

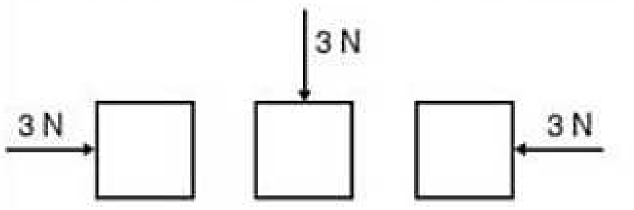
  Round your answer to the nearest hundredth.

Horizontal acceleration (m/s^2) = ☐

- Six kJ of work are used to lift an object to a height of $100m$ What is the object's mass? (Assuming $g = 10\ m/s^2$)

$600kg$	B	$600g$	A
$60kg$	D	$6kg$	C

- A force is acting on each of the objects below:



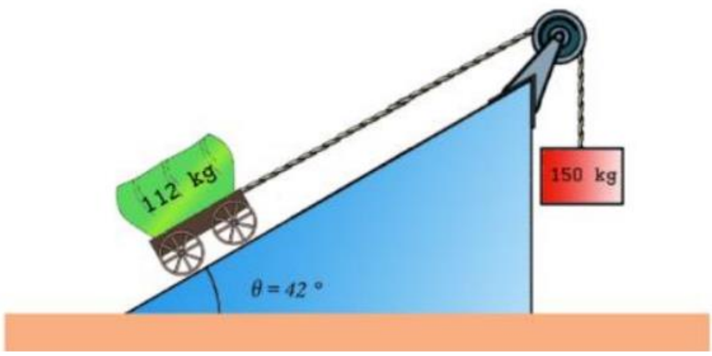
What can be concluded about these forces?

They are the same because they have the same magnitude.	B	**They are the same because they point toward the objects.**	A
They are different because they have different directions.	D	**They are different because they have different sources.**	C

- The diagram below shows a force magnitude F applied to a mass at angle θ
Relative to the horizontal frictionless surface, What is the effect of increasing the angle θ pn the horizontal acceleration of the mass?

Decreases	B	**Remains the same**	A
None of the above.	D	**Increases.**	C

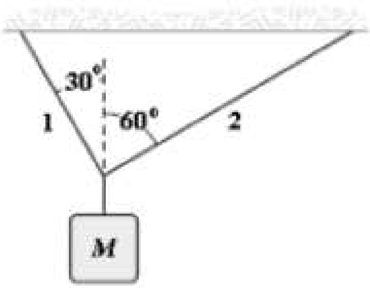
- A $112\ kg$ wooden cart on a frictionless inclined plane of angle $42°$ is connected by a robe over a frictionless pulley to a $112kg$ block hanging vertically as shown in the figure below.
Neglect the mass of the rope and the pulley.



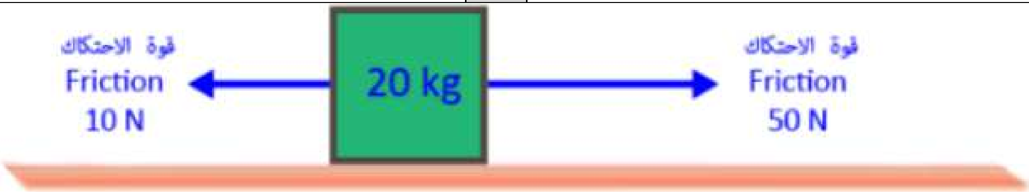
What is the downhill acceleration of the wooden box?
Round your answer to the nearest hundredth.

Acceleration (m/s^2) = $\boxed{}$

- If $M = 9kg$. What is the tension in string 1?

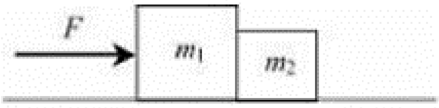


$44N$	B	$76N$	A
$29N$	D	$34N$	C



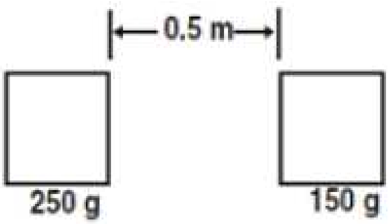
- The figure shows a block that is being pulled along the floor. According to the figure, what is the acceleration of the block?

$2\frac{m}{s^2}$	B	$6\frac{m}{s^2}$	A
$4\frac{m}{s^2}$	D	$3\frac{m}{s^2}$	C



- A force $F = 12$ newtons, Pushes two masses $m_1 = 3kg$ and $m_2 = 1$ kilogram, horizontally along a frictionless surface, as shown in the diagram above.
Determine the acceleration of m_2:

Acceleration (m/s^2) = $\boxed{}$



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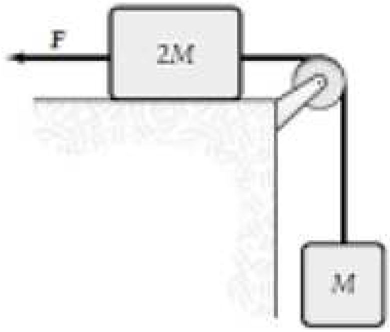
- What event will produce the greatest increase in the gravitational force between the two masses?

Doubling the large mass.	B	**Reducing the small mass by half.**	A
Reducing the distance between the masses by half.	D	**Doubling the distance between the masses.**	C

- A soccer player kicks a 05-kilogram stationary ball with a force Of 50 newtons Is the force on the players foot?

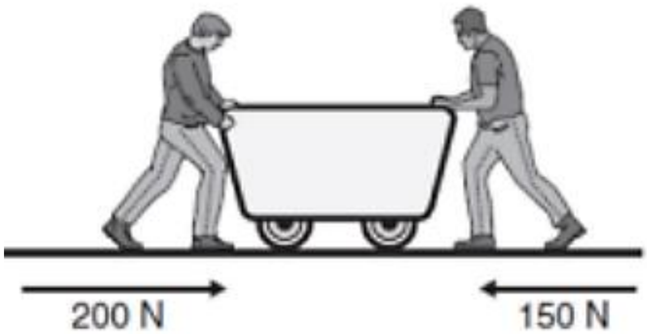
$25N$	B	$100N$	A
$50N$	D	$0N$	C

- Consider the following figure, if the applied force is $60N$ and the lower mass is $1.0kg$ What is the tension in the string? (frictionless surface)



$36N$	B	$26N$	A
$28N$	D	$15N$	C

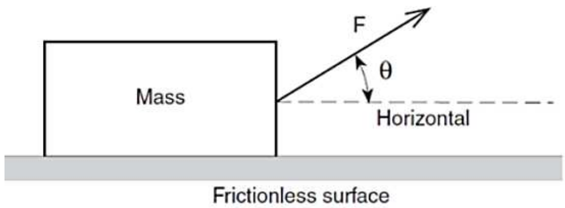
- Two students are pushing a cart, as shown below.



The cart will move as if it were acted on by a single force with a magnitude of:

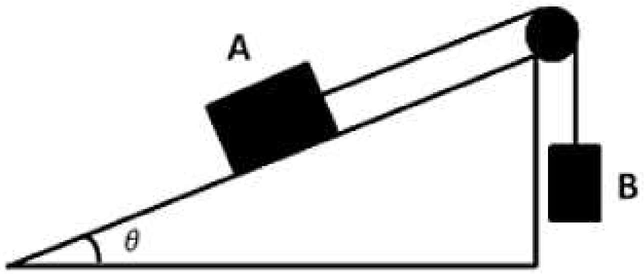
$50N$	B	$350N$	A
$150N$	D	$200N$	C

- The diagram below shows a force of a magnitude F applied to a mass at angle θ relative to a horizontal frictionless surface.
  As angle θ is increased the horizontal acceleration of the mass_______.



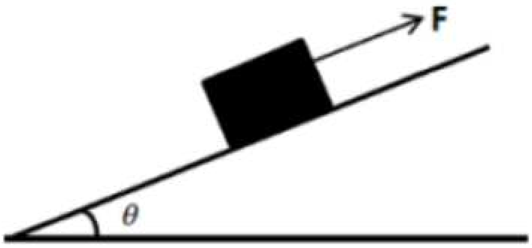
Increases.	B	**Decrease s**	A
		Remains the same.	C

- Two block A (mass = $10kg$) and B (mass = $8.0\ kg$) are attached to each other through a massless. Frictionless pulley as shown in the figure. The coefficient of kinetic friction between block A and the inclined surface is 0.20. What is the acceleration of block B if the angle of the inclined surface is $30°$?



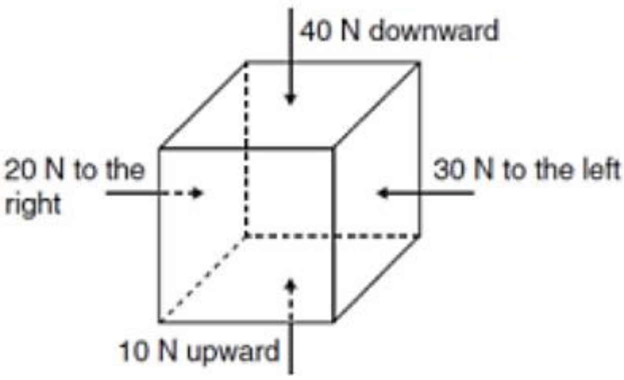
$\mathbf{2.6\ m/s^2}$ **Up**	B	$\mathbf{0.69 m/s^2}$ **Down**	A
$\mathbf{0\ m/s^2}$	D	$\mathbf{2.6\ m/s^2}$ **Down**	C

- The figure shows a $20N$ block on a frictionless inclined surface. The block is at rest due to the applied fore F. If $\theta = 37°$, What is the magnitude of the applied force?



$\mathbf{16N}$	B	$\mathbf{12N}$	A
$\mathbf{9.8N}$	D	$\mathbf{20N}$	C

- Four forces are acting on a box, as shown below.



The box will increase in speed___________.

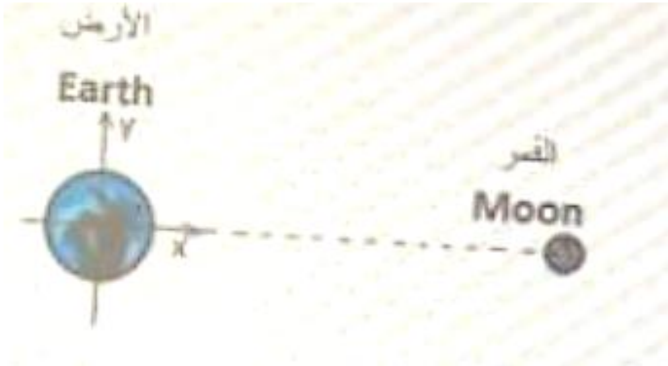
Downward and to the left.	B	**Upward and to the lift.**	A
Upward and to the right.	D	**Downward and to the right..**	C

- The force of an object, with a certain mass accelerating at a certain rate, can be determined using the equation below.
  Which object would have the greatest force?

$$Force = mass \times acceleration$$

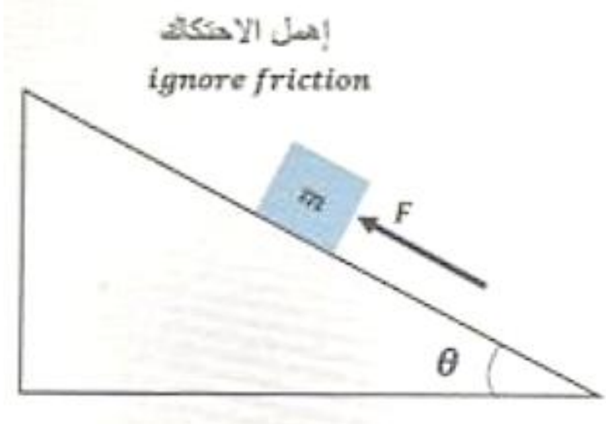
A $2kg$ object accelerating at 30 m/s^2	B	**A $5kg$ object accelerating at $20m/s^2$**	A
A $5kg$ object accelerating at $10m/s^2$	D	**A $20kg$ object accelerating at $4m/s^2$**	C

- Find the center of the mass (X_{cm}) of the moon and the earth given that the earth mass and the moon are $5.97 \times 10^{24}kg$, $7.36 \times 10^{27}kg$ respectively and that the moon orbits the Earth at a distance of $384000km$.
  Note: Round the answer to a whole number.



$\boldsymbol{4676km}$	B	$\boldsymbol{4500km}$	A
$\boldsymbol{4650km}$	D	$\boldsymbol{4555km}$	C

- A block of mass $m = 2.8kg$ is moving up along an inclined surface under the influence of the force F as shown in the figure if the force $F = 21.7N$, and the angle inclination $\theta = 37°$, What is the magnitude of the block acceleration?



$\boldsymbol{2.05\ m/s^2}$	B	$\boldsymbol{1.85\ m/s^2}$	A
$\boldsymbol{4.1\ m/s^2}$	D	$\boldsymbol{0.076\ m/s^2}$	C

- A $2000kg$ car moving with a speed of $100km/hr$ stops in $10m$ as a result of applying brakes. What is the magnitude of the average force applied by the brakes?

$\boldsymbol{1.0 \times 10^{12}N}$	B	$\boldsymbol{7.7 \times 10^{4}N}$	A
$\boldsymbol{7.7 \times 10^{-2}N}$	D	$\boldsymbol{1.0 \times 10^{6}N}$	C

- When a child plays on a swing. They will follow a circular path. Take T to be the combined tension in the ropes and m to be the mass of child and swing. As they pass through the lowest point above the ground. What is the centripetal exerted on the child and swing?

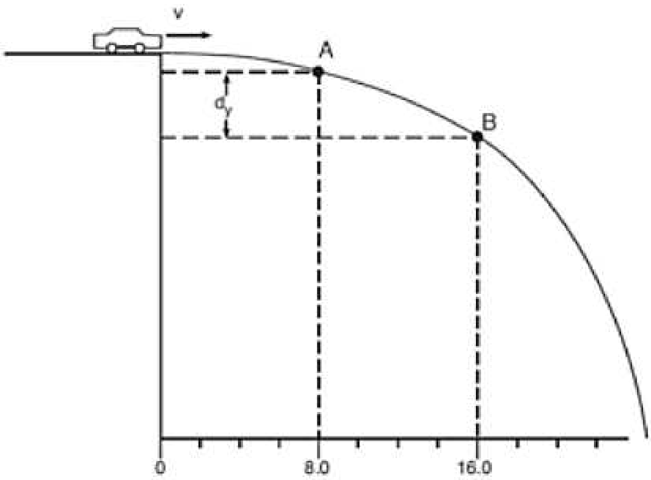
T/mg	B	$T * mg$	A
$T - mg$	D	$T + mg$	C

- The coefficient of static friction between a car tires and a level road is 0.80 if the car Is to be stopped in a maximum time of $3.0\ s$. It's speed can exceed.

$2.6\ m/s$	B	$7.8 m/s$	A
$23.5\ m/s$	D	$2.4\ m/s$	C

Projectile Motion:

- The path of stunt car driven horizontally off a cliff is represented by the diagram below. After leaving the cliff, the car falls freely to a point A in 0.50 second and to point B in $1.00\ second$.



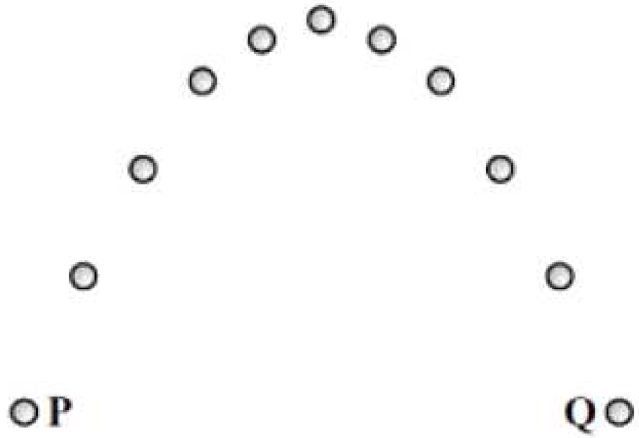
What is the magnitude of the horizontal component of the velocity of the car at point B? (Neglect Friction)
Round your answer to the nearest whole number.

Magnitude (m/s) = $\boxed{}$

- A tennis ball is thrown vertically upwards and then allowed to fall down and hit the floor. Which of the following quantities is never zero when the ball is in the air?s

Acceleration	B	**Displacements**	A
Velocity.	D	**Momentum.**	C

- A ball is thrown upward at an angle from position Ps. The diagram below shows the position of the ball at equal times intervals as it moves from position P to position Q.



e

Which of the following causes the change in the ball's velocity as the ball travels from position P to position Q?

Increase in it's momentum.	B	**Initial Acceleration upward.**	A
Decrease in it's inertia.	D	**Downward force of gravity.s**	C

Circular Motion:

- A wheel with $10\ cm$ radius rotates at a speed of $10.0\ rad/s$ about an axle that goes through it's center. The wheel is then showed down at constant rate. If the wheel comes to rest after $50.0s$. What is the tangential acceleration of a point on the rim of the wheel?

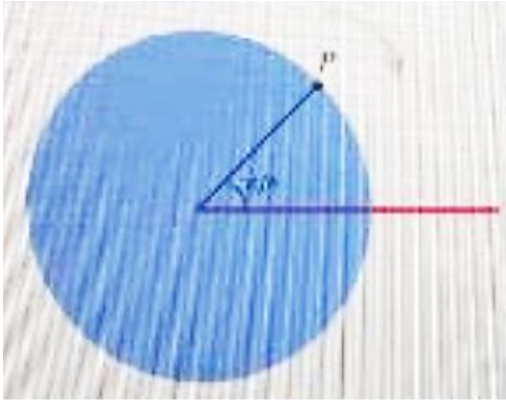
$\mathbf{0.0200\ m/s^2}$	B	$\mathbf{1.0\ m/s^2}$	A
$\mathbf{2.00\ m/s^2}$	D	$\mathbf{0.200\ m/s^2}$	C

- A communication satellite is in a circular oribt around Earth.

If the speed of the satellite is constant, the force acting on the satellite.

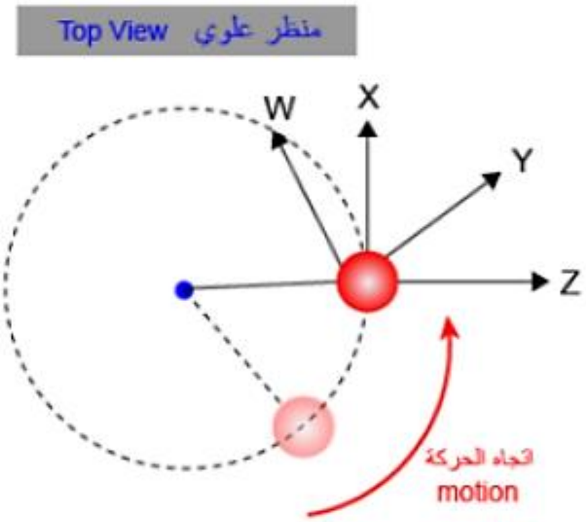
Is decreasing.	B	**Is zero.**	A
Points toward the center of Earth at all times.	D	**Points in the direction that the satellite is moving.**	C

- The disc shown in the figure has a radius of $10.0cm$ it's center is pivoted to wall. The red line is marked on the disc. The black line makes angle of $\pi/4$ with red line. When the is rotates in the clockwise direction the angle between the black and red line decreases to $2.00s$. What I the average angular velocity of the disc during two second?



$\mathbf{0.785}\, \boldsymbol{rad/s}$	B	$\mathbf{-0.0393}\, \boldsymbol{rad/s}$	A
$\mathbf{0.785}\boldsymbol{s}\, \boldsymbol{rad/s}$	D	$\mathbf{0.0393}\, \boldsymbol{rad/s}$	C

- A ball on a rope swing around a vertical pole.



In which direction will the ball fly if released at the location shown?

$\boldsymbol{X}$	B	$\boldsymbol{Y}$	A
$\boldsymbol{W}$	D	$\boldsymbol{Z}$	C

- A $0.35\ kg$ glass marble attached to a robe and swings in a vertical Circle of radius $1.22m$.
The speed of the marble as it passes it's highest point is $9.5m/s$.
What is the tension in the rope at the highest point in the marble's motion.
Round your answer to the nearest tenth.

Tension in the rope (Ns) = ☐

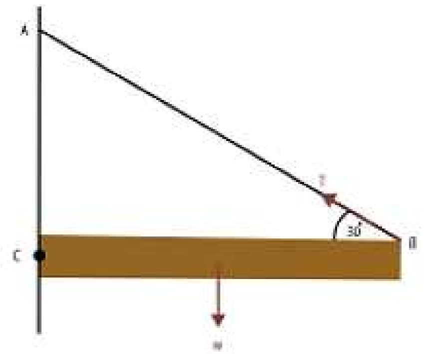
- A $0.18kg$ Stone is attached to a cord and whirled in a horizontal circle of radius $0.5m$ such that It completes 32 revolution per minute. The magnitude of tension force in the cord is:

$\mathbf{4.0N}$	B	$\mathbf{1.0N}$	A
$\mathbf{1.2\ N}$	D	$\mathbf{5.6\ N}$	C

- A $2.0 \times 10^3\ kg$ car travels at a constant speed of $12.0\ m/s$ around a circular curve radius $30.0m$. What is the magnitude of the centripetal acceleration of the car as it goes around the curve?

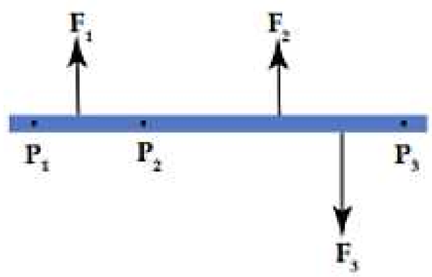
$\mathbf{800\ m/s^2}$	B	$\mathbf{0.40\ m/s^2}$	A
$\mathbf{4.8s\ m/s^2}$	D	$\mathbf{9600\ m/s^2}$	C

- A shelf consists of a uniform wooden beam attached to the wall by a hinge at point C. It is suspended by a single steel wire attached to the wall at point A and to the shelf at point B. If the weight of the beam is W and the tension in the steel wire is T. What is the relationship between W and T if the angle of the steel wire with the horizontal is 30 degrees?



$\boldsymbol{W = T}$	B	$\boldsymbol{W = 1.73T}$	A
$\boldsymbol{W = 0.5T}$	D	$\boldsymbol{W = 2T}$	C

- The figure below shows a beam with three forces acting on it. The figure also shows three points marked on the beam. Which of the following forces creates a negative torque?



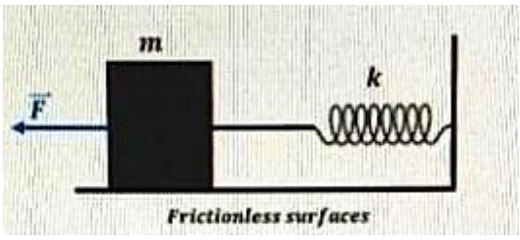
F_3 about P_3	B	**F_1 about P_1**	A
F_2 about P_1	D	**F_2 about P_3**	C

- The diagram below represents a person using a lever.
  The person applies force to the lever to change the rock's_________.

Size	B	**Flexibility**	A
Position	D	**Weight**	C

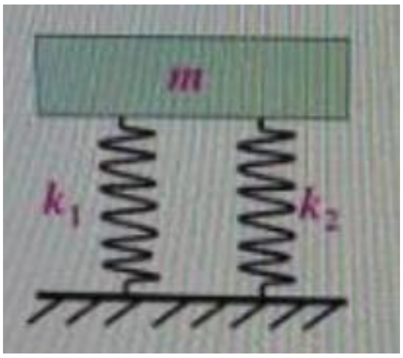
Simple Harmonic Motion:

- A box ($m = 2.5kg$) is attached to a spring ($k = 432\ N/m$) through a rope as shown. The box is initially at rest and the spring is unstretched. A constant force is then applied on the box. When the box is $0.15m$ away from it's initial position, it has a speed of $0.97m/s$.
  How much work was done by the spring?



$\mathbf{4.86J}$	B	$\mathbf{1.17J}$	A
$\mathbf{-4.86J}$	D	$\mathbf{-1.17J}$	C

- What is the frequency of the following simple harmonic motion (SHM)?



$\frac{1}{2\pi}\sqrt{\frac{k_1 \times k_2}{m}}$	B	$\frac{1}{2\pi}\sqrt{\frac{k_1 \div k_2}{m}}$	A
$\frac{1}{2\pi}\sqrt{\frac{k_1 - k_2}{m}}$	D	$\frac{1}{2\pi}\sqrt{\frac{k_1 + k_2}{m}}$	C

- Which physical quantity does the period of a simple pendulum depend on?

It's maximum velocity	B	**It's total energy**	A
It's mass	D	**It's length**	C

- A spring scale is pulled downward and reading are recorded.

جدول البيانات
Data Table

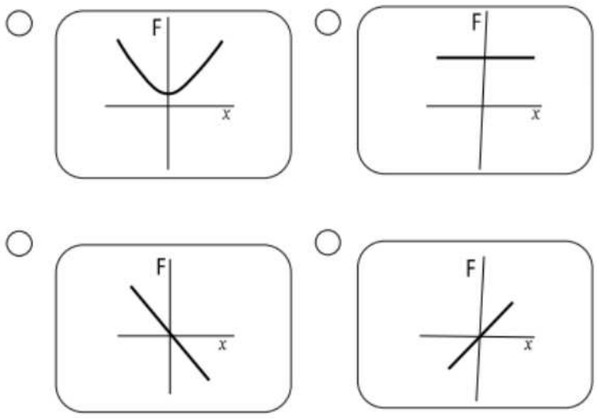
مسافة السحب Distance Pulled	قراءة الميزان الزنبركي Spring Scale Reading
1.0 cm	4 N
1.5 cm	6 N
2.0 cm	8 N
2.5 cm	10 N

$\mathbf{15N}$	B	$\mathbf{13N}$	A
$\mathbf{14N}$	D	$\mathbf{12N}$	C

- A $50g$ block is attached to a horizontal spring with a spring constant of $k = 3600N/m$. The spring is compressed by $5cm$, as shown in the figure.
  When the spring is released will the block be able to cross the top of the hill with a height of $h = 10m$?

The block will cross the hill.	B	**The block will bounce back before reaching the top of the hill.**	A
The block will settle at the top of the hill.	D	**The block will stop immediately after crossing the hill**	C

- Which of the following restoring forces may lead to simple harmonic motion?



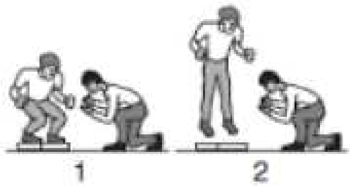
- Two equal masses, each of mass m are attached to the ends of a horizontal spring with a spring constant k. If the spring is compressed by a distance d, what is the speed of either of the two masses when the spring is released?

$\boldsymbol{v = \sqrt{\frac{m}{2km}}d}$	B	$\boldsymbol{v = \sqrt{\frac{m}{2k}}d^{-1}}$	A
$\boldsymbol{v = \frac{m}{2k}d^{-2}}$	D	$\boldsymbol{v = \frac{m}{2k}d^{2}}$	C

- A ping ball undergoing a simple harmonic motion over a hard floor take $0.19s$ to travel from the ground to it's highest point. The distance between these points is $87cm$.
  Calculate the frequency of this harmonic motion.
  Round your answer to nearest tenth.

$\boldsymbol{16.5Hz}$	B	$\boldsymbol{5.3Hz}$	A
$\boldsymbol{10.5Hz}$	D	$\boldsymbol{2.6Hz}$	C

- A student in a lab experiment jumps upward off a common bathroom scale as the lab partner record the scale reading.



What does the lab partner observe during the instant the student pushes off?

The scale reading will decrease momentarily then will increase as the student is moving upward from the scale.	B	**The scale reading will increase during the entire time the student I in contact with the scale.**	A
The scale reading will remain unchanged during the entire time the student is in contact with the scale.	D	**The scale reading will increase momentarily then will decrease as the student is moving upward from the scale.**	C

- A vertical spring was elongated by $2.0\ cm$ when a $5.0g$ mass was attached to it. What is the natural frequency of the spring?

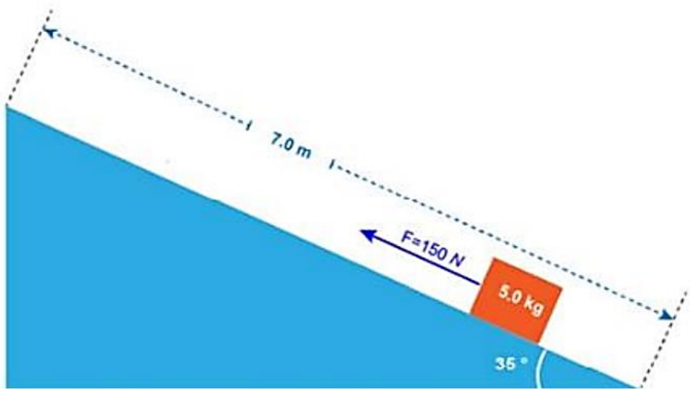
$\mathbf{2.2\ s^{-1}}$	B	$\mathbf{3.5\ s^{-1}}$	A
$\mathbf{22.1 s^{-1}}$	D	$\mathbf{0.4\ s^{-1}}$	C

Energy and work:

- How much work is required to raise a $200kg$ steel beam to a height of $10m$ on a bridge being built?

$\mathbf{2kJ}$	B	$\mathbf{98kJ}$	A
$\mathbf{19.6kJ}$	D	$\mathbf{10kJ}$	C

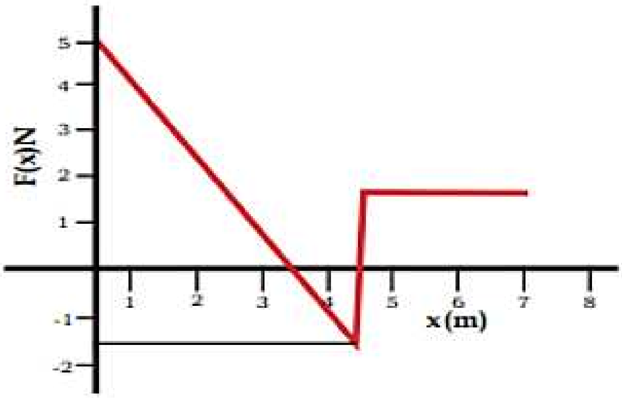
- A $5.0\ kg$ wooden box is pulled by a force of $150N$. The box moves a long an inclined rough surface for $7m$ long shown below.



Calculate the change in the kinetic energy of the block

Change in the kinetic energy (J) = $\boxed{}$

- The figure shown indicates a varying force F(x) acting on an object along the x-axis. What is the work done on the object by the force when the displacement is 7 m?

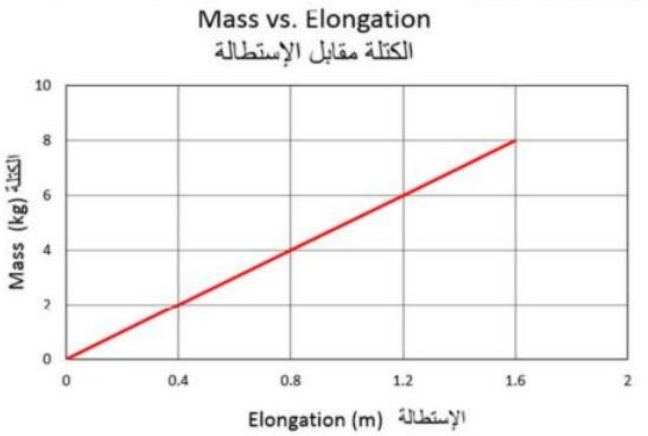


$13J$	B	$14.5J$	A
$13.8J$	D	$21.8J$	C

- The only force acting on a $1.8kg$ box moving along the $x - axis$ is given by $F_2 = (4.0x)N$ where x is in m.
  What is the total kinetic energy of the box from $x = 1m$ to $x = 5.0m$?

$10.0J$	B	$-48.0J$	A
$-10.0J$	D	$48.0J$	C

- Various elongations are produced when different objects are attached to a spring.
  The graph below represents the relationship between the object mass and the elongation of the spring.



What is the energy stored in the spring when the elongation is $1.15m$? Round your answer to the nearest tenth.

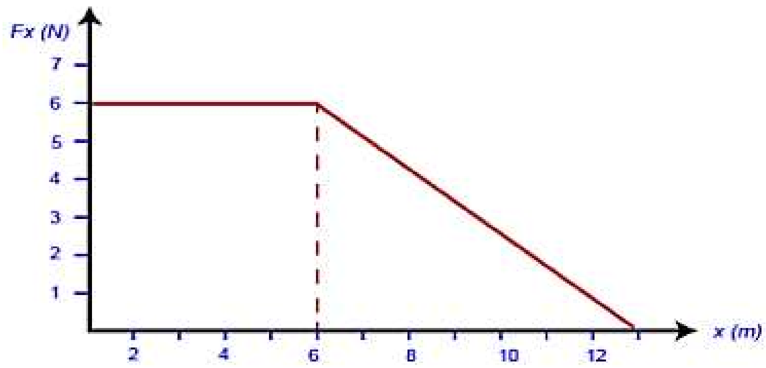
Stored energy (J) = ☐

Power:

A $5.8 \times 10^4 W$ elevator motor can lift a total weight of $2.1 \times 10^4 N$ with a maximum constant speed of________,

$\mathbf{0.36\ m/s}$	B	$\mathbf{0.28\ m/s}$	A
$\mathbf{3.6\ m/s}$	D	$\mathbf{2.8\ m/s}$	C

- A force is acting on an object as shown in the figure below.



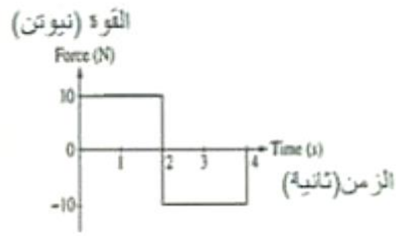
How much power is delivered by the acting force over the first $6s$ period?

$\mathbf{6.0\ Watt}$	B	$\mathbf{9.5\ Watt}$	A
$\mathbf{5.7\ Watt}$	D	$\mathbf{6.0\ Watt}$	C

- A 200 W small engine operates for a total of 1.50 $hours$. What is the maximum work it can do on an object?

$\mathbf{1250kJ}$	B	$\mathbf{686.0kJ}$	A
$\mathbf{1080kJ}$	D	$\mathbf{300kJ}$	C

- The below graph shows applied force on an of mass (m) as a function of time What is the total change in the object's momentum?



$\mathbf{10\ kg\ m/s}$	B	$\mathbf{20\ kg\ m/s}$	A
$\mathbf{1080kJ}$	D	$\mathbf{0\ kg\ m/s}$	C

- A boat weighing $9.0 \times 10^2 N$ requires a horizontal force of $7.3 \times 10^2 N$ to move it across the water at $3.1 \times 10^1 m/s$.
  The boat's engine must provide energy at a rate of __________.

$\mathbf{2.0 \times 10^3 W}$	B	$\mathbf{2.8 \times 10^3 W}$	A
$\mathbf{6.6 \times 10^5 W}$	D	$\mathbf{2.3 \times 10^4 W}$	C

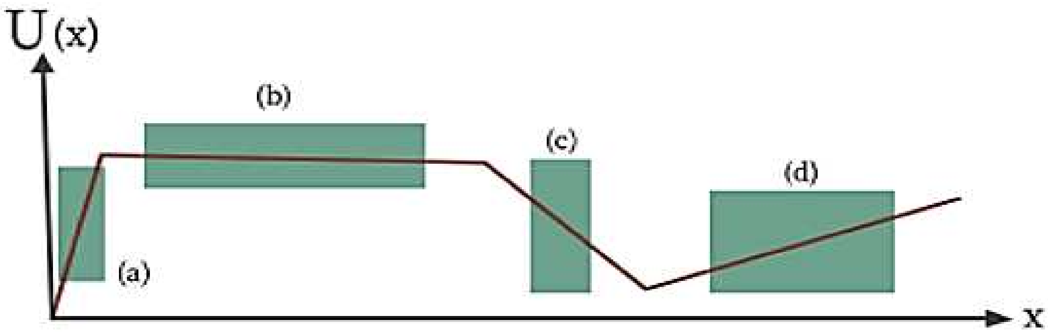
- A small steel ball is dropped from a height of $1.0m$ onto a perfectly horizontal steel floor. If the change in the kinetic energy during collision is 5.0%. find the maximum height the ball reaches after the Collison.

$\mathbf{103\ Cm}$	B	$\mathbf{95\ Cm}$	A
$\mathbf{105\ Cm}$	D	$\mathbf{100\ Cm}$	C

- A $5\ kg$ mass is lifted from ground to a height of $10m$. The gravitational potential energy of the mass is increased by approximately_______.

$\mathbf{250\ J}$	B	$\mathbf{50J}$	A
$\mathbf{500\ J}$	D	$\mathbf{0.5\ J}$	C

- In which region, in the following potential energy $U(x)$ as a function of position (x). is the magnitude of the conservative force the greatest?



(d)	B	**(a)**	A
(b)	D	**(c)**	C

Linear Momentum:

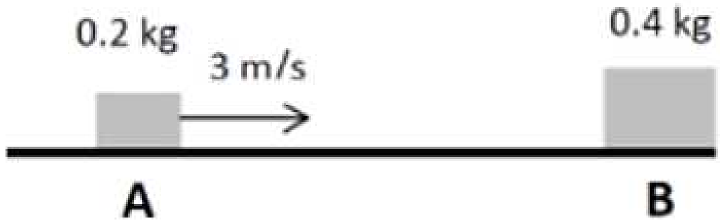
1. In a collision of two masses m and 2m, the momentum of the 2m-mass increased by 3 kg m/s. What is the change in the momentum of the m-mass?

$6kg\ m/s$	B	$-6\ kg\ m/s$	A
$-3\ kg\ m/s$	D	$3\ kg\ m/s$	C

2. A 2 kg mass moving with speed of 3 m/s to the right collides with a 7 kg mass that is moving to the left with a speed of 2 m/s. After collision, the 2 kg mass was moving with a speed of 2 m/s to the left. What is the change in the momentum of the 7 kg mass?

$4kg\ m/s$	B	$-4\ kg\ m/s$	A
$-10\ kg\ m/s$	D	$-10\ kg\ m/s$	C

- The two blocks shown in the figure (B is at rest) stick together after the collision. Their final speed is:



$4.5\ m/s$	B	$1.0 m/s$	A
$2.3\ kg\ m/s$	D	$2.0\ m/s$	C

- A $15000\ kg$ truck moving with a speed of $9\ m/s$ is about to collide with a stationary loaded truck with a total mass of $45000\ kg$ as shown in the figure below.
  After the collision both of the trucks move together.
  Calculate the kinetic energy of the combined trucks just after the collision (neglect friction).

$6.75 \times 10^4 J$	B	$3.04 \times 10^5 J$	A
$5.93 \times 10^5 J$	D	$1.52 \times 10^5 J$	C

- A blue lab cart is traveling west on a track when it collides with and sticks to a red lab cart traveling east.
  The magnitude of the momentum of the blue cart before Collison is $3.0\ kg.m/s$.
  The magnitude of the total momentum of the two carts after the Collison is ______.

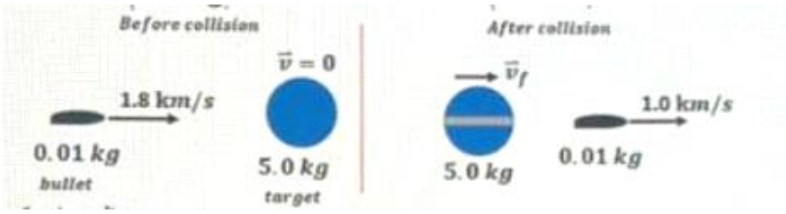
$1.0\ kg\ m/s$	B	$5.0\ kg\ m/s$	A
$2.0\ kg\ m/s$	D	$3.0\ kg\ m/s$	C

- The diagram shows a $2\ kg$ box colliding with and sticking to a second box.

What is the mass of the second box?

$6\ kg$	B	$4\ kg$	A
$8\ kg$	D	$9\ kg$	C

- A fast moving bullet hit a stationary heavy target and passes through it. What is the kinetic energy of the target right after the collision?

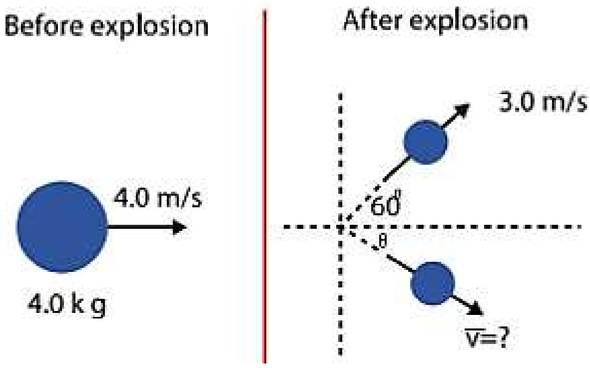


$9.4\,J$	B	$5.3J$	A
$8.0\,J$	D	$6.4\,J$	C

- A 70 kg skier leaves a ski jump at a velocity of 14 m/s.
  What is the skier's momentum at that instant?

$9800\,N\,S$	B	$50\,N\,S$	A
$980\,N\,S$	D	$5\,N\,S$	C

- The object shown on the left side of the figure is moving on a frictionless surface and suddenly undergoes an explosion resulting in two equal masses. With the information provided, what is the magnitude of the unknown velocity?



$6.1\,m/s$	B	$7.9\,m/s$	A
$6.7\,m/s$	D	$7.0\,m/s$	C

- A $2kg$ mass moving with a speed of $3m/s$ to the right collides with a 7kg mass that is moving to the left with a speed of 2 m/s. After the collision, The 2 kg mass was moving to the left with a speed of 2 m/s. What is the change in the momentum of the $7kg$ mass?

$10\,kg\,m/s$	B	$4\,kg\,m/s$	A
$-10\,kg\,m/s$	D	$-4\,kg\,m/s$	C

- What is the correct statement that applies to any collision process?

Energy is conserved only if momentum is conserved.	B	**Energy is always conserved**	A
Momentum is always conserved.	D	**Both energy and momentum are always conserved.**	C

Fluid Mechanics:

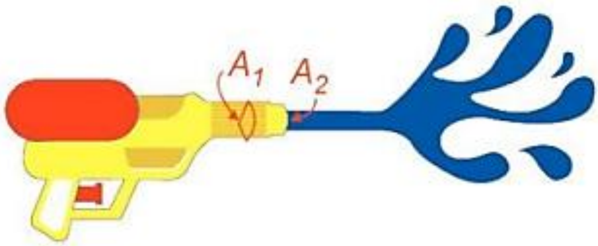
- In a car lift used in a car wash station, compressed air exerts a force on a small piston that has a circular cross section of radius 6.00 cm. This pressure is transmitted by a liquid to a piston that has a radius of 16.0 cm. What force must the compressed air exert to lift a car weighing 14,500 N?

$5.44 \times 10^3 N$	B	$3.26 \times 10^3 N$	A
$2.04 \times 10^3 N$	D	$4.64 \times 10^3 N$	C

- A water piston has two sides , side a which has a square cross section of L = 0.25m, and side b of a circular cross section of radius r = 0.5 m.

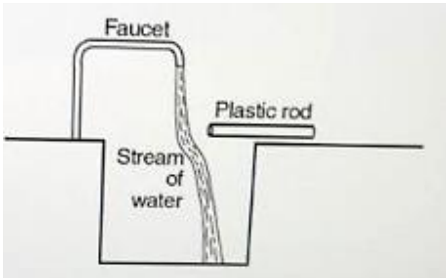
$80\ kg$	B	$17\ kg$	A
$272\ kg$	D	$142\ kg$	C

- A water gun shooter at a speed of 20 m/s through the opening of the gun, if the cross-sectional area of the gun opening is $A_2 = 8 \times 10^{-5} m^2$, While the area of the gun tube $A_1 = 4 \times 10^{-4}$ as shown in the illustration bellow, what is the pressure that was applied to the trigger?



$2.93 \times 10^5\ Pa$	B	$3.01 \times 10^5\ Pa$	A
$8000\ Pa$	D	$1.92 \times 10^5\ Pa$	C

- A dry plastic rod is rubbed with a wool cloth and held near a thin stream of water from a faucet. The path of the stream of water is changed, as represented in the diagram above. Which force causes the path of the stream of water to change due to plastic rod?



Gravitational.	B	**Electrostatic.**	A
Magnetic.	D	**Nuclear.**	C