PHYSICS

BOOKS - MTG IIT JEE FOUNDATION

FOOTSTEPS TOWARDS CBSE BOARD

Section A

1. At what place on the Earth's surface is the weight of the body maximum ?

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2. A student pushes against a wall a force of 200 N. How much work does he do in 10 minutes ?

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3. Do action-reaction forces produce the same magnitude of acceleration?

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4. A plastic ball and a clay ball of equal masses, travelling in the same direction with equal speeds, strike against a vertical wall. From which ball does the wall receive a greater amount of momentum?

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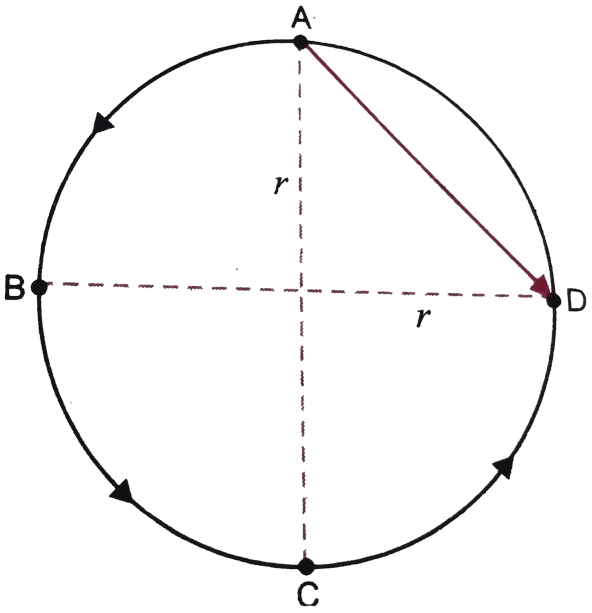
5. A particle moves over three quarters of a circle of radius r. What is the magnitude of its

displacement ?



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6. State Kepler's 3rd law of planetary motion.

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7. Newton's law of gravitation is also called inverse - square law. Why ?

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8. The kinetic energy of an object is K. If its velocity is doubled, then its kinetic energy will becomes nk. What is the value of n ?

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9. What kind of energy transformation takes place in a mixie ad grinder ?

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10. Calculate the work done by a weight of 1 kg mass when it moves up through 1 m

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11. What is the quantity which is measured by the area occupied below the velocity-time graph.

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12. What is the value of 1 kilowatt power in terms of horse power ?

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13. Why is Newton's first law of motion also called law of inertia?

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14. Under what conditions does an object moves with a uniform velocity ?

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15. A father has mass 60 kg and the mass of his on is 30 kg . What is the ratio of inertia of the father to the inertia of his son ?

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16. Why is G called the universal gravitational constant ?

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17. Earth revolves around the Sun in a circular orbit with a uniform speed. Is this motion uniform or accelerated ?

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18. (a) What remains constant in uniform circular motion ?

(b) What changes continuously in uniform circular motion ?

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19. What changes continuously in uniform circular motion ?

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20. Assertion: A spring has potential energy , both when it is compressed or stretched.

Reason: In compressing or stretching, work is done on the spring against the restoring force.

A. Both A and are true and R is correct explanation of the assertion

B. Both A and R are true but R is not the correct explanation of the assertion

C. A is true, but R is false .

D. A is false, but R is true

Answer: A

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21. Assertion : The speedometer of a car measures the instantaneous speed of the car

Reason : Average speed is equal to the total distance covered by an object divided by the total time taken

A. Both A and are true and R is correct explanation of the assertion

B. Both A and R are true but R is not the correct explanation of the assertion

C. A is true, but R is false .

D. A is false, but R is true

Answer: B

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22. Assertion : An object may have acceleration even if it is moving with uniform velocity

Reason : An object may be moving with uniform velocity but it may be changing its direction of motion

A. Both A and are true and R is correct explanation of the assertion

B. Both A and R are true but R is not the correct explanation of the assertion

C. A is true, but R is false .

D. A is false, but R is true

Answer: A

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23. Assertion : When the orbital radius of a planet is made 4 times, its time period increases by 8 times

Reason : Greater the height above the Earth's surface, greater is the time period of revolution

A. Both A and are true and R is correct explanation of the assertion

B. Both A and R are true but R is not the correct explanation of the assertion

C. A is true, but R is false .

D. A is false, but R is true

Answer: B

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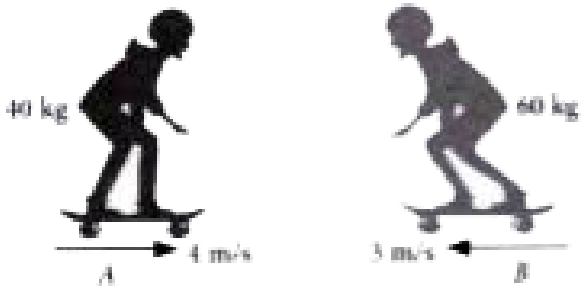
24. Two skaters A and B are moving in opposite directions such as they collide head - on and immediately become entangled. Skater A has a mass of 40 kg and is moving with a velocity 4 m/s eastwards while the other skater B has a

mass of 60 kg and is moving with a velocity 3 m/ westwards. Assume that hte frictional force acting between the skaters and the ground is negligible



The magnitude of total momentum of the two skaters before collision is

A. $40kgms^{-1}$

B. $20kgms^{-1}$

C. $10kgms^{-1}$

D. $60kgms^{-1}$

Answer: B

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25. Two skaters A and B are moving in opposite directions such as they collide head - on and immediately become entangled. Skater A has a mass of 40 kg and is moving with a velocity 4 m/s eastwards while the other skater B has a mass of 60 kg and is moving with a velocity 3

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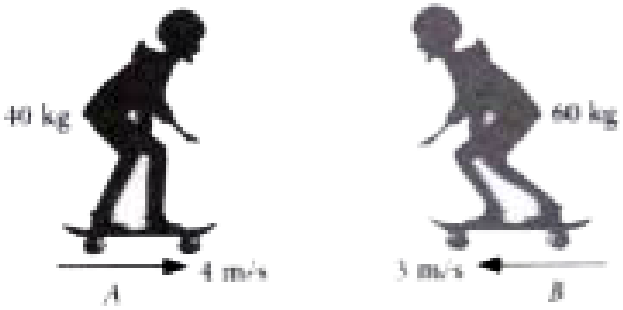

The total momentum of the two entangled skaters after collision will be

(v) is the velocity of the entangled skaters after collision)

A. $10vkgms^{-1}$

B. $100vkgms^{-1}$

C. $40vkgms^{-1}$

D. $20vkgms^{-1}$

Answer: B

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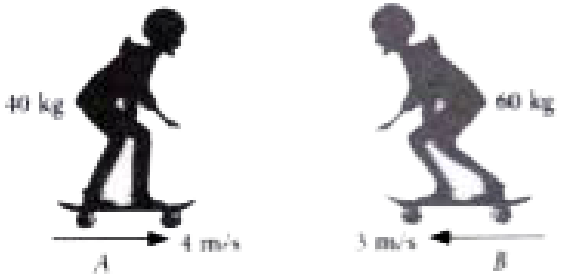
26. Two skaters A and B are moving in opposite directions such as they collide head - on and immediately become entangled. Skater A has a mass of 40 kg and is moving with a velocity 4 m/s eastwards while the other skater B has a

mass of 60 kg and is moving with a velocity 3 m/ westwards. Assume that hte frictional force acting between the skaters and the ground is negligible



The velocity with which the two entangled skaters will move after collision is

A. $0.\ 2ms^{-1}$

B. $0.\ 1ms^{-1}$

C. $2ms^{-1}$

D. $1ms^{-1}$

Answer: A

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27. Two skaters A and B are moving in opposite directions such as they collide head - on and immediately become entangled. Skater A has a mass of 40 kg and is moving with a velocity 4 m/s eastwards while the other skater B has a mass of 60 kg and is moving with a velocity 3

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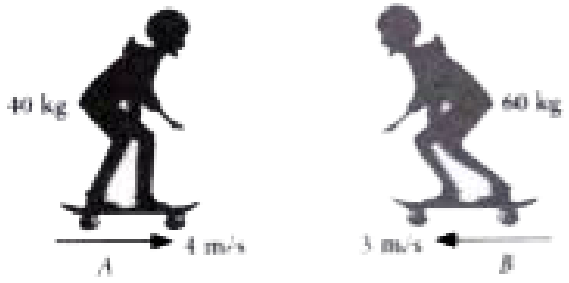
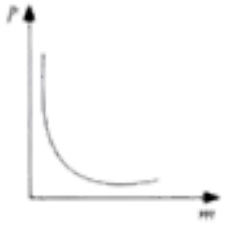


Which one of the following graphs depict linear momenta of bodies having equal velociyt proportional to their mass ?

A.



B. 

C. 

D. 

Answer: C

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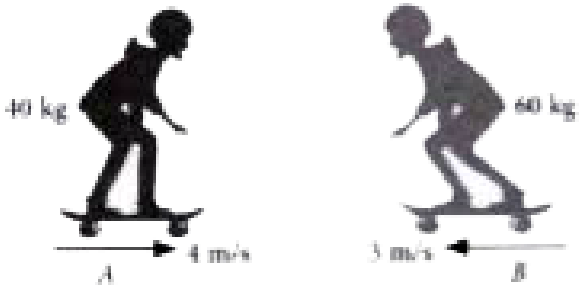
28. Two skaters A and B are moving in opposite directions such as they collide head - on and immediately become entangled. Skater A has a mass of 40 kg and is moving with a velocity 4 m/s eastwards while the other skater B has a mass of 60 kg and is moving with a velocity 3 m/ westwards. Assume that hte frictional force acting between the skaters and the ground is negligible



The percentage change is momentum of a body when both its mass and velocity are double, will be

A. $100\ \%$

B. $200\ \%$

C. $50\ \%$

D. $300\ \%$

Answer: D

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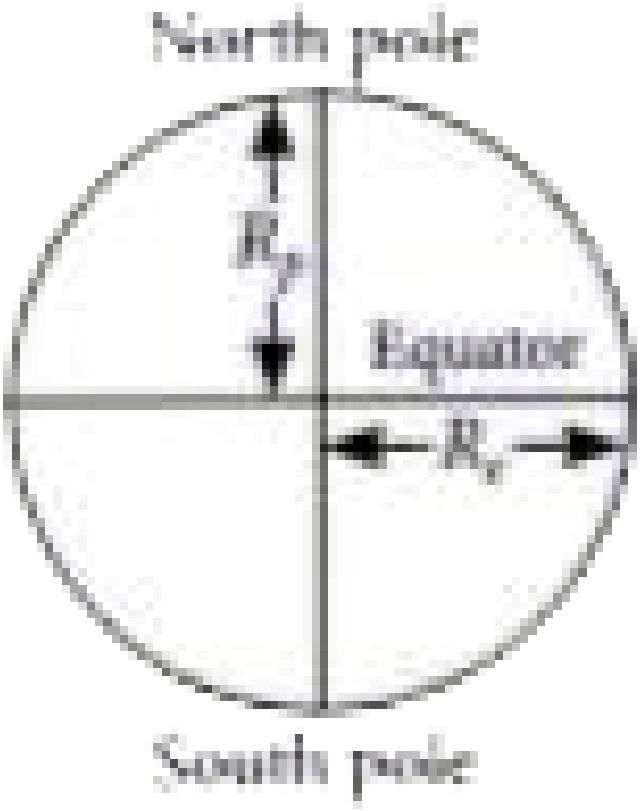
29. The Earth is not a perfect sphere. Due to the flattening of Earth at the poles, the radius of Earth is minimum at the poles and hence the value of g is maximum at the poles. One the other hand, the radius of the Earth is maximum at the equator of the Earth. As the mass and radius of moon are smaller than that of the Earth, so the value of g on moon is $1.63 m/s^2$. As we go up from the surface of the Earth, the distance from the centre of the Earth increases and hence the value of g decreases. The value of g decreases as we go

down inside the Earth and it become zero at the centre of the Earth .



What is the value of acceleration due to gravity on the surface of Earth ?

A. 10. $5m^2s^{-1}$

B. 9. $8ms^{-2}$

C. 9. $8m^2s^{-1}$

D. 2. $5ms^{-1}$

Answer: B

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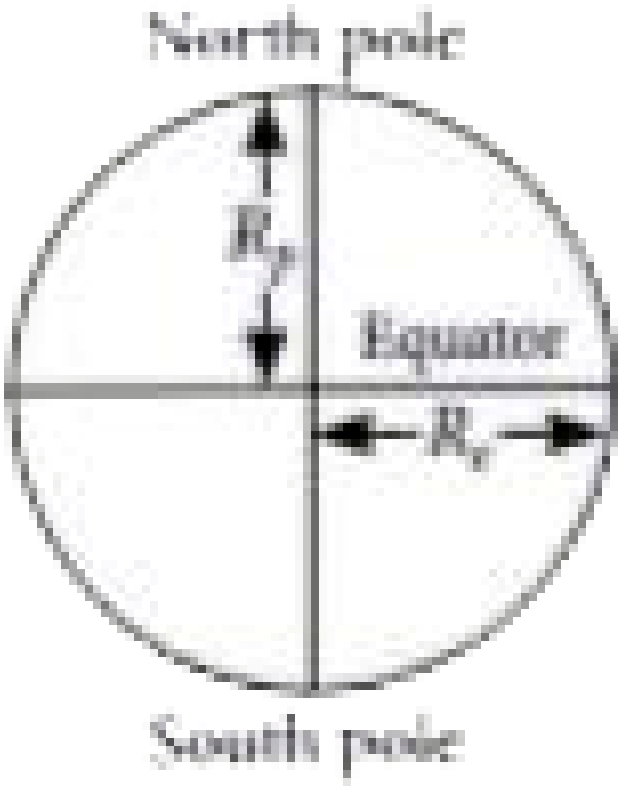

If a person with a spring balance and a body hanging from it goes up and up in an aeroplane, then the reading of the weight of the body as indicated by the spring balance will be

A. increases

B. decreases

C. remain same

D. first increases and then decreases

Answer: B

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31. The Earth is not a perfect sphere. Due to the flattening of Earth at the poles, the radius of Earth is minimum at the poles and hence

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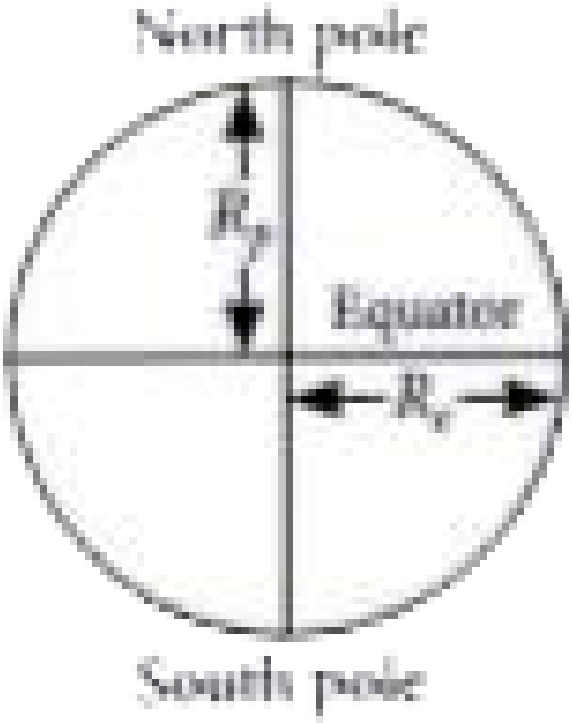

What will be the unit of $\frac{G}{g}$?

A. m^2kg^2

B. $m^{-1}kg^2$

C. m^2kg^{-1}

D. $m^{-2}kg$

Answer: C

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32. The Earth is not a perfect sphere. Due to the flattening of Earth at the poles, the radius of Earth is minimum at the poles and hence the value of g is maximum at the poles. One the other hand, the radius of the Earth is maximum at the equator of the Earth. As the

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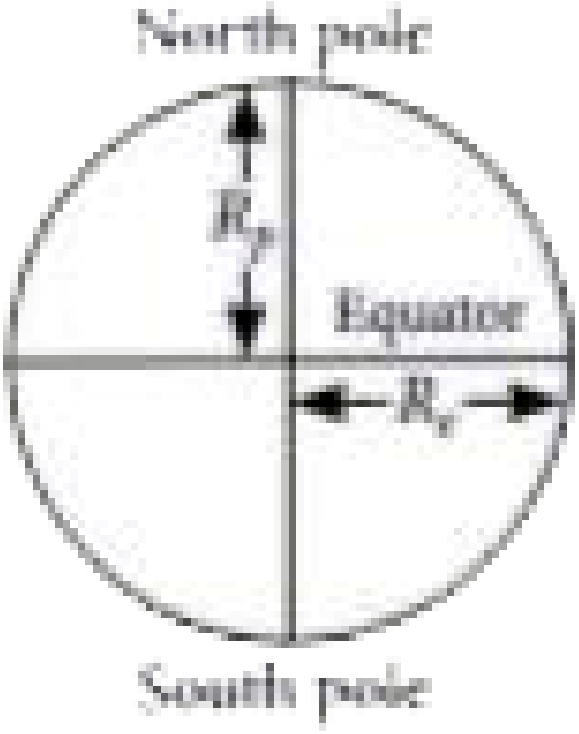

If the radius of the Earth were to shrink by 1% and its mass remaining the same, the acceleration due to gravity on the Earth's surface would

A. decreases

B. increases

C. remain unchanged

D. will decrease by 9.8%

Answer: D

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33. The Earth is not a perfect sphere. Due to the flattening of Earth at the poles, the radius of Earth is minimum at the poles and hence the value of g is maximum at the poles. One

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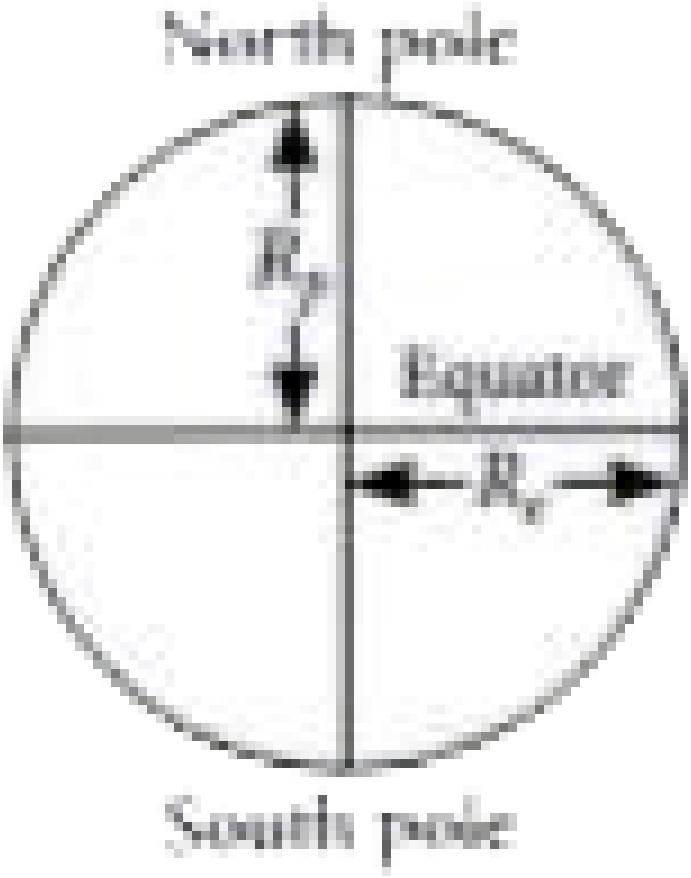

The ratio of acceleration due to gravity ont he

Moon and that on the Earth is

A. $1:2$

B. $1:6$

C. $2:1$

D. $6:1$

Answer: B

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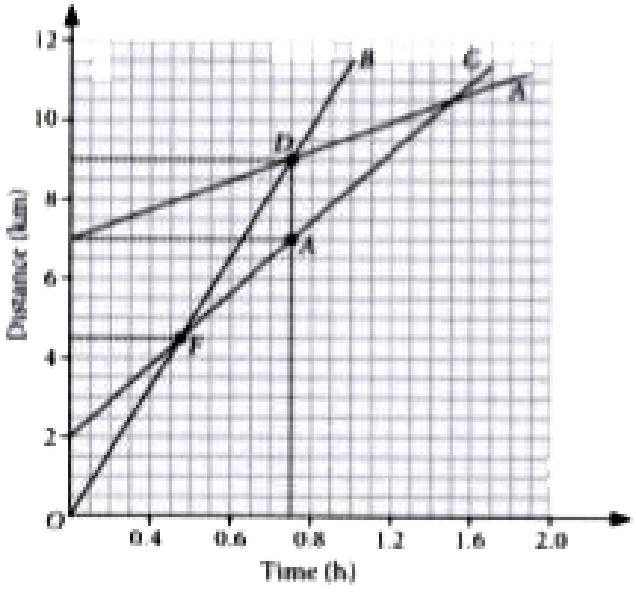
34. Given figure shows the distance - time graph of three object A, B and C as time is taken on x- axis and distance is taken on y - axis . The slope of the distance - time graph of an object represents its speed .

The magnitude of displacement equal to the distance travelled by the object , then we can use the term uniform velocity in place of uniform speed



Choose the correct statement

A. A is travelling the fastest

B. B is travelling the slowest

C. C is travelling the fastest

D. A is travelling the slowest

Answer: D

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35. Given figure shows the distance - time graph of three object A, B and C as time is taken on x- axis and distance is taken on y - axis . The slope of the distance - time graph of

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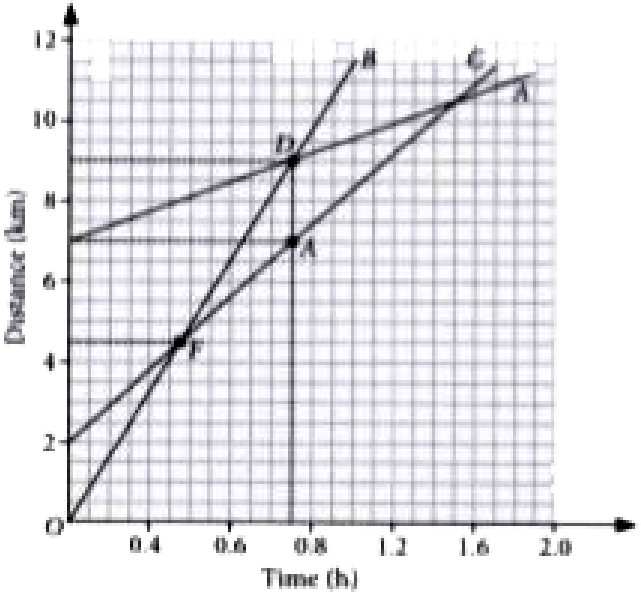
The magnitude of displacement equal to the distance travelled by the object , then we can use the term uniform velocity in place of uniform speed



Which pair out of the three objects A, B and C travelled equal distance at any point ?

A. A and B

B. A and C

C. B and C

D. none of these

Answer: D

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36. Given figure shows the distance - time graph of three object A, B and C as time is taken on x- axis and distance is taken on y -

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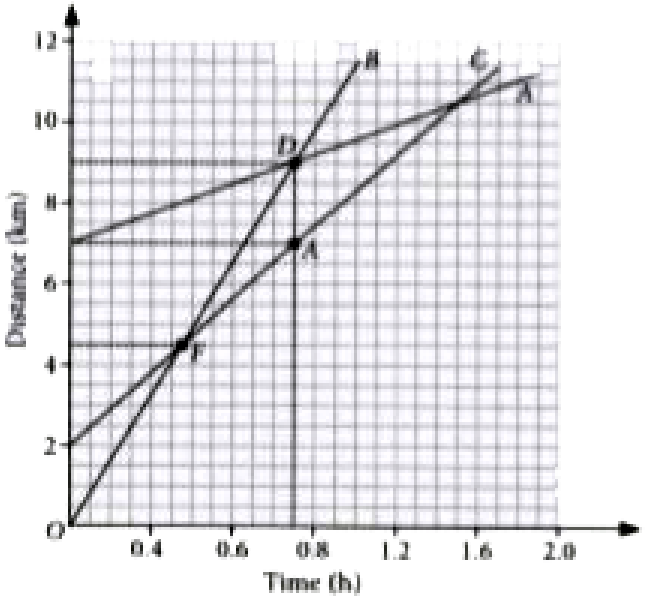
The magnitude of displacement equal to the distance travelled by the object , then we can use the term uniform velocity in place of uniform speed



When B passes a distnace travelled by C is

A. 4 km

B. 7 km

C. 10 km

D. 5 km

Answer: B

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37. Given figure shows the distance - time graph of three object A, B and C as time is taken on x- axis and distance is taken on y -

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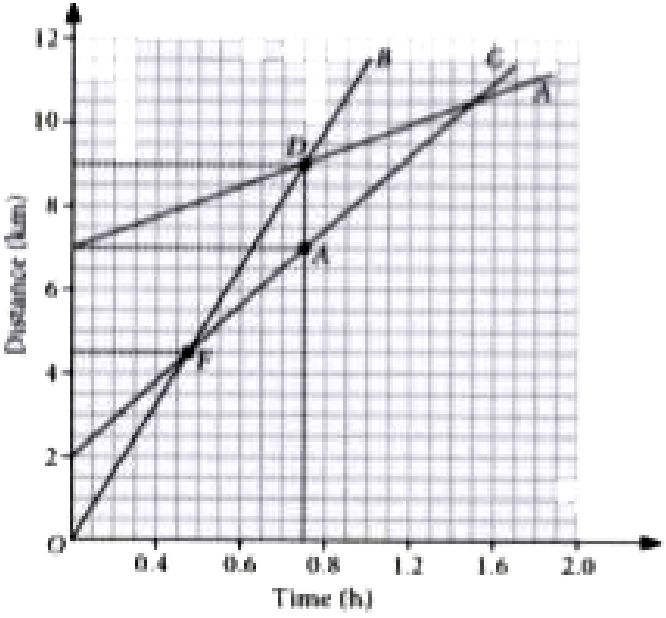
The magnitude of displacement equal to the distance travelled by the object , then we can use the term uniform velocity in place of uniform speed



Find the time when C meets A

A. 1 . 6 h

B. 1 . 5 h

C. 1 . 4 h

D. 1 . 2 h

Answer: B

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38. Given figure shows the distance - time graph of three object A, B and C as time is taken on x- axis and distance is taken on y -

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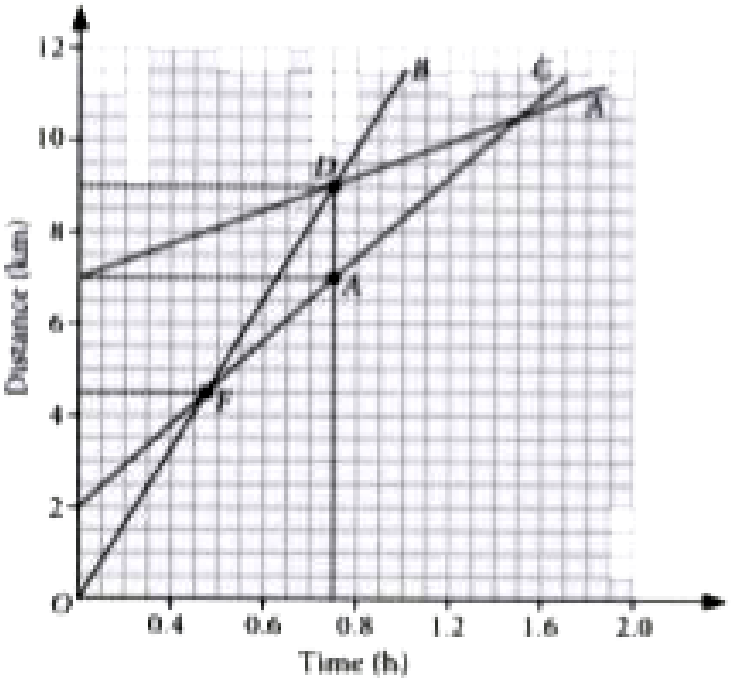
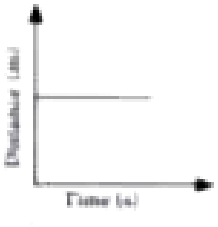
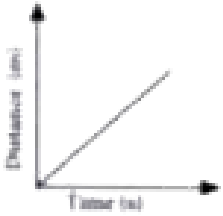
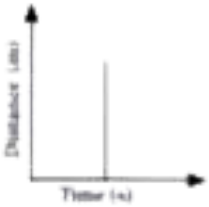
The magnitude of displacement equal to the distance travelled by the object , then we can use the term uniform velocity in place of uniform speed

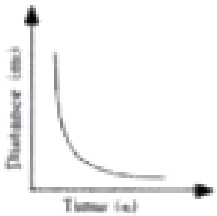


Choose the correct distance - time graph for an object moving with uniform velocity

A. 

B. 

C. 

D. 

Answer: B

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39. When a body is moving uniformly along a straight line and there is no force of friction, acceleration/retardation of the body. According to Newton's second law of motion, the magnitude of force acting on a body is the product of mass and acceleration of the body

The distance - time table of an object in motion is given below

Time(s)	Distance (m)
2	8
4	64
6	216
8	512
10	1000

Choose the correct order of the corresponding velocities of the object (in ms^{-1}) in different time intervals .

A. 16, 64, 76, 148, 244

B. 4, 28, 76, 148, 244

C. 244, 148, 76, 28, 4

D. 64, 16, 76, 148, 244

Answer: B

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40. When a body is moving uniformly along a straight line and there is no force of friction, acceleration/retardation of the body. According to Newton's second law of motion, the magnitude of force acting on a body is the product of mass and acceleration of the body

The distance - time table of an object in motion is given below

Time(s)	Distance (m)
2	8
4	64
6	216
8	512
10	1000

In the given table, acceleration of the object is

A. increasing

B. decreasing

C. constant

D. none of these

Answer: A

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41. When a body is moving uniformly along a straight line and there is no force of friction, acceleration/retardation of the body. According to Newton's second law of motion, the magnitude of force acting on a body is the product of mass and acceleration of the body

The distance - time table of an object in motion is given below

Time(s)	Distance (m)
2	8
4	64
6	216
8	512
10	1000

The force acting on the object

A. increases

B. decreases

C. remains unchanged

D. none of these

Answer: A

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42. When a body is moving uniformly along a straight line and there is no force of friction, acceleration/retardation of the body.

According to Newton's second law of motion, the magnitude of force acting on a body is the product of mass and acceleration of the body

The distance - time table of an object in motion is given below

Time(s)	Distance (m)
2	8
4	64
6	216
8	512
10	1000

Which among the Newton's laws of motion can be used to calculate the force acting on the object in motion ?

A. First law

B. Second law

C. Third law

D. none of these

Answer: B

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43. When a body is moving uniformly along a straight line and there is no force of friction, acceleration/retardation of the body. According to Newton's second law of motion,

the magnitude of force acting on a body is the product of mass and acceleration of the body

The distance - time table of an object in motion is given below

Time(s)	Distance (m)
2	8
4	64
6	216
8	512
10	1000

A passenger in a moving train tosses a coin which falls behind him. This shows that the motion of train is

A. accelerated

B. uniform

C. retarded

D. along circular track

Answer: A

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Section B

1. The data regarding the motion of two different objects A and B are given in the table

Time	Distance travelled by A (in m)	Distance travelled by B (in m)
9 : 30 AM	5	2
9 : 35 AM	10	10
9 : 40 AM	15	19
9 : 45 AM	20	25
9 : 50 AM	25	25

Examine the given data carefully and state whether the motion of objects is uniform or non - uniform

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2. A hammer of mass $500g$, moving at $50m/s$, strikes a nail. The nail stops the hammer in a

very short time of $0.01s$. What is the force of the nail on the hammer?

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3. How will the equations of motion for an object moving with a uniform velocity change ?

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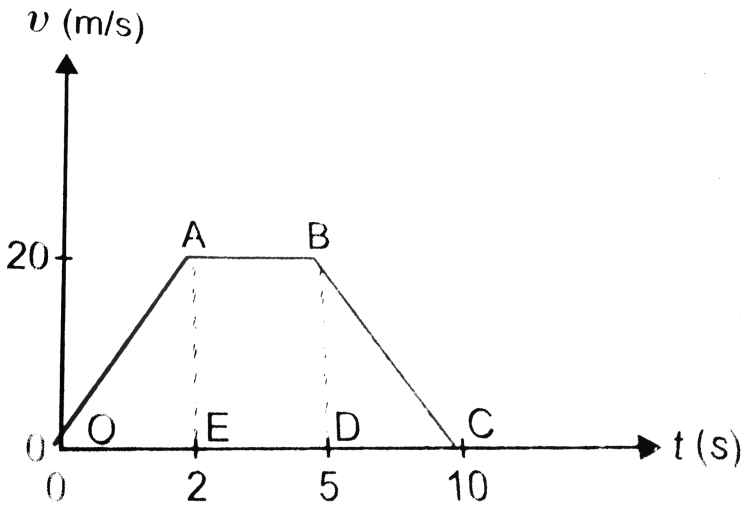
4. The velocity (u)-time (t) graph of an object moving along a straight line is as shown is Fig. 2 (b) . 30. Calculate the distance covered by object between $(i) t = 0 \rightarrow t = 5s$ (ii) $t = 0 \rightarrow t = 10s$.



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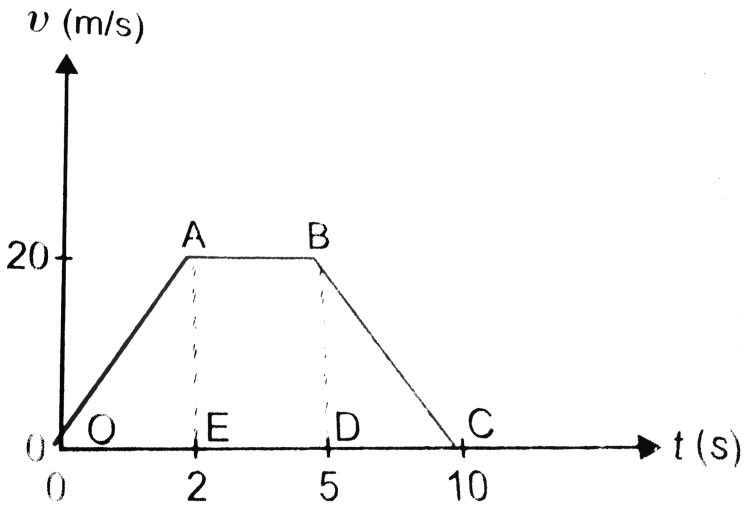

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6. If a fly collides with the windshield of a fast - moving bus, which one will experiences an impact force with a larger magnitude ?

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7. (a) State and explain the law of conservation of energy with an example ?

(b) Explain how, the total energy a swinging pendulum at any instant of time remains

conserved. Illustrate your answer with the help of a labelled diagram.

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8. Write the transformation of energy in the given cases

Winds moving

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9. Write the transformation of energy in the given cases

An athlete running

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10. Write the transformation of energy in the given cases

A coconut falling

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11. Write the transformation of energy in the given cases

playing of guitar

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12. What should be the power of an engine required to lift 90 metric tonnes of coal per hour from a mine whose depth is 200m?

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Section C

1. The acceleration of a freely falling body does not depend on the mass of the body . Show this by deriving an expression for the same

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2. Give statement of Newton's second law of motion. Deduce a mathematical formulation for it .

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3. An object of mass 200 kg is accelerated uniformly from a velocity of $4ms^{-1}to8ms^{-1}$ in 10 s . Find the magnitude of the force exerted on the object

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4. Define force . Given its unit

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5. What are different types of forces?

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6. What is uniform circular motion ? Show that it is an accelerated motion inspite of being uniform.

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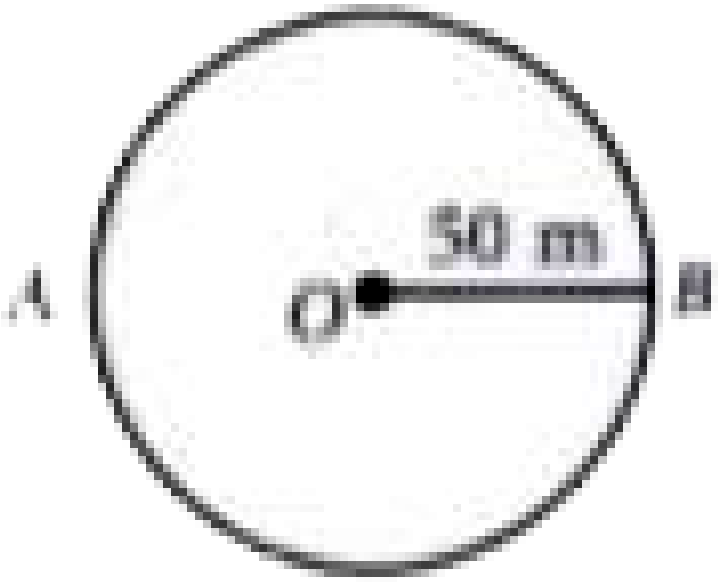
7. An athlete runs on a circular track, whose radius is 50 m with a constant speed. It takes 50 seconds to reach point B from starting point A . Find



the distance covered

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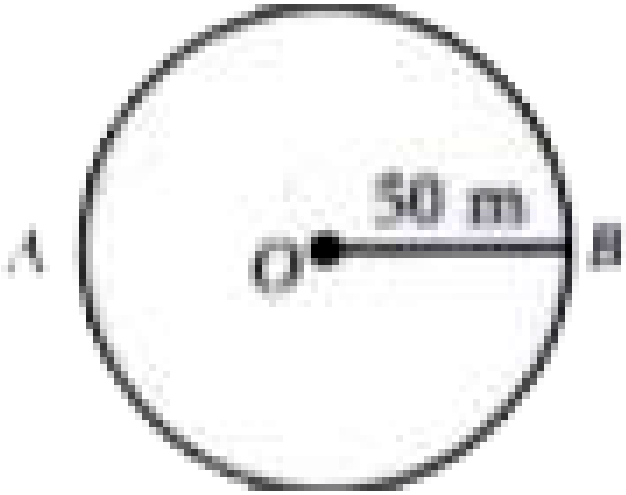
8. An athlete runs on a circular track, whose radius is 50 m with a constant speed. It takes 50 seconds to reach point B from starting point A . Find



the displacement

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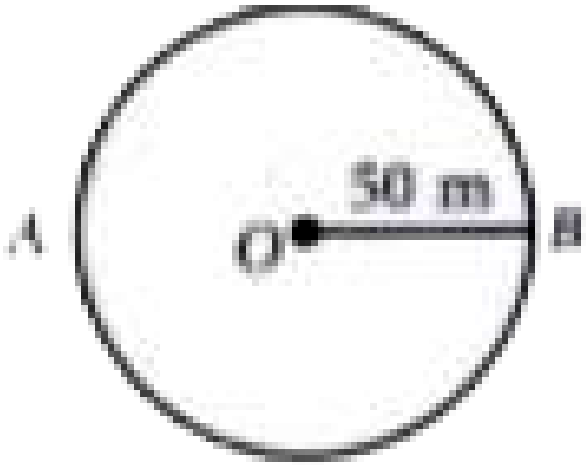
9. An athlete runs on a circular track, whose radius is 50 m with a constant speed. It takes 50 seconds to reach point B from starting point A . Find



the speed

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10. According to the third law of motion when we push an object the object pushes back on us with an equal and opposite force. If the object is a massive truck parked along the roadside, it will probable not move . A student justifies this by answering that the two opposite and equal forces cancel each other. Comment on this logic and explain why the truck does not move

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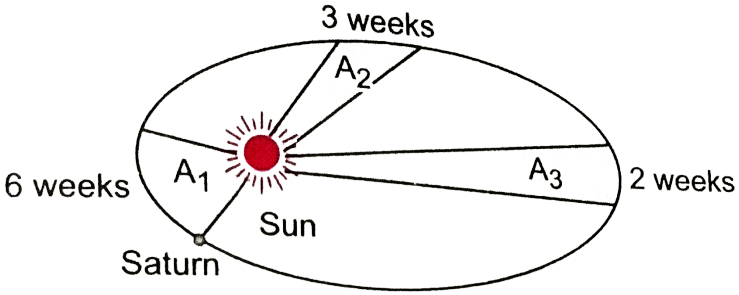
11. The line that joins the saturn to the sun sweeps area A_1, A_2 and A_3 in time intervals of 6 weeks, 3 weeks and 2 weeks respectively as shows in the Fig. What is the correct relation between A_1, A_2 and A_3?



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12. The time period of a planet of a star is 8 hours . What will be the time period if the separation between the planet and the star is increased to 9 times the previous value ?

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13. Define potential energy. Derive an expression for the potential energy of a body of mass m, at a height h above the surface of the Earth.

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14. In the following situations identify the agent exerting the force and the object on which it acts. State the effect of the force in each case.

Squeezing a piece of lemon between the fingers to extract its juice.

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15. In the following situations identify the agent exerting the force and the object on

which it acts. State the effect of force in each case

Taking out paste from a toothpaste tube.

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16. In the following situations identify the agent exerting the force and the object on which it acts. State the effect of the force in each case

A load suspended from spring while its other end is on a hook fixed to a wall

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Section D

1. A body A of mass 3 . 0 kg and a body B of mass 10 kg are dropped simultaneously from a height of 14 . 9 m Calculate

their momenta

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2. A body A of mass 3 . 0 kg and a body B of mass 10 kg are dropped simultaneously from a height of 14 . 9 m Calculate

their potential energies, and

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3. A body A of mass 3 . 0 kg and a body B of mass 10 kg are dropped simultaneously from a height of 14 . 9 m Calculate

their kinetic energies when they are 10 m above the ground

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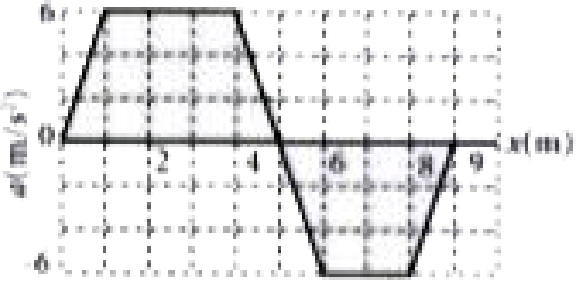
4. Figure gives the acceleration of a 2 . 0 kg body as it moves from rest along x - axis while a variable force acts on it from x = 0 m to x = 9 m . Find the work done by the force of the body when it reaches

x = 4 m and



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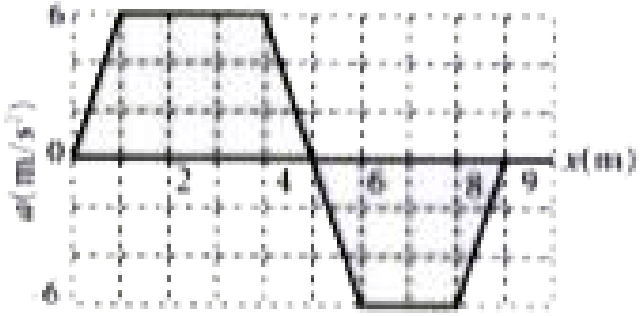
5. Figure gives the acceleration of a 2 . 0 kg body as it moves from rest along x - axis while a variable force acts on it from x = 0 m to x = 9 m . Find the work done by the force of the body when it reaches

x = 7 m



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6. An object has a uniformly acclerated motion. The object always slows down before the time, when its velcity becomes zero. Establish this statement graphiclly when (i) both initial veocity (u) and acceleration (a) are positive(iii)

(u) is positive and (a) is begative and (iv) both

(u) and (a) are negativ e.

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7. An object has uniformly accelerated motion . The object always slows down before the time, when its velocity becomes zero. Prove this statement graphically, when

u is negative and a is positive

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8. An object has uniformly accelerated motion . The object always slows down before the time, when its velocity becomes zero. Prove this statement graphically, when

u is positive and a negative and

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9. An object has a uniformly acclerated motion. The object always slows down before the time, when its velcity becomes zero. Establish this statement graphiclly when (i) both initial

veocity (u) and acceleration (a) are positive(iii) (u) is positive and (a) is begative and (iv) both (u) and (a) are negativ e.

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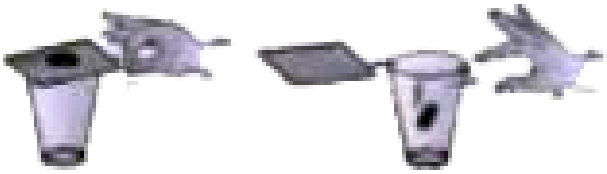
10. In the figure shown, a light one rupee coin is placed on the card and the card is flicked with a push

What do you observe in this case and explain

your observation ?



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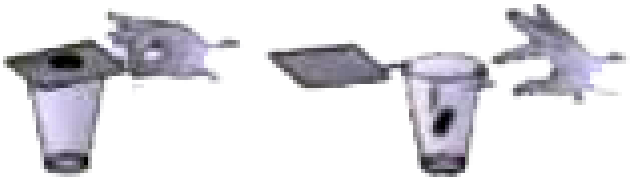
11. In the figure shown, a light one rupee coin is placed on the card and the card is flicked with a push

State the law involved in this case



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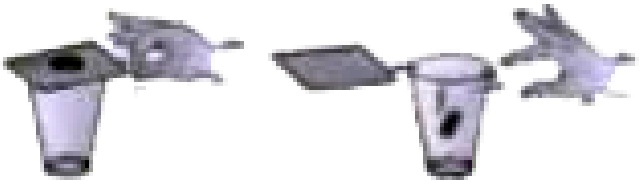
12. In the figure shown, a light one rupee coin is placed on the card and the card is flicked with a push

What will be your observation if the given coin is replaced by a heavy five rupee coin . Justify your answer



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13. "First law of motion can be mathematically stated from the mathematical formulation of second law of motion ." Justify this statement

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14. How much momentum will a dumb-bell of mass $10kg$ transfer to the floor if it falls a height of $80cm$? Take its downward acceleration to be $10m/s^2$.

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