NDA-CDS 1 2025

GS

LIVE

PHYSICS

FORCE & LAWS OF MOTION

MCQS

NAVJYOTI SIR

SSBCrack EXAMS

29 Jan 2025 Live Classes Schedule

9:00AM	29 JANUARY 2025 DAILY DEFENCE UPDATES	DIVYANSHU SIR
10:00AM	29 JANUARY 2025 DAILY CURRENT AFFAIRS	RUBY MA'AM

AFCAT 1 2025 LIVE CLASSES

12:30PM	REASONING - BLOOD RELATIONS	RUBY MA'AM
3:00PM	STATIC GK - GI TAGS	DIVYANSHU SIR
4:30PM	ENGLISH - ANTONYMS - CLASS 1	ANURADHA MA'AM
5:30PM	MATHS - SPEED DISTANCE TIME	NAVJYOTI SIR

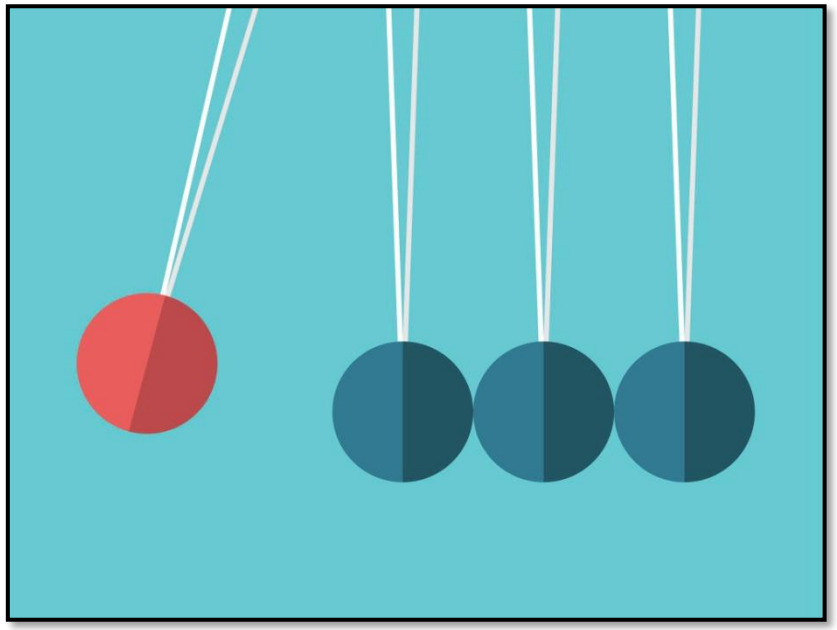
NDA 1 2025 LIVE CLASSES

10:00AM	MATHS - ANALYTICAL GEOMETRY 2D - CLASS 2	NAVJYOTI SIR
11:30AM	MODERN HISTORY - CLASS 1	RUBY MA'AM
1:00PM	PHYSICS - FORCE & LAWS OF MOTION	NAVJYOTI SIR
4:30PM	ENGLISH - ANTONYMS - CLASS 1	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	MODERN HISTORY - CLASS 1	RUBY MA'AM
1:00PM	PHYSICS - FORCE & LAWS OF MOTION	NAVJYOTI SIR
4:30PM	ENGLISH - ANTONYMS - CLASS 1	ANURADHA MA'AM
5:30PM	MATHS - SPEED DISTANCE TIME	NAVJYOTI SIR

LAWS OF MOTION - MCQs



The SI Unit Of Momentum Is

A. $kgms^{-1}$

B. $kgms^{-2}$

C. $kgm^{-1}s^{-2}$

D. None of these

momentum = Mass x velocity

= kg ms^{-1}

kg ms^{-1}

The SI Unit Of Momentum Is

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C. $kgm^{-1}s^{-2}$

D. None of these

Car A of mass 1500 kg travelling at 25 m/s collides with another car B of mass 1000 kg travelling at 15 m/s in the same direction. After collision the velocity of car A becomes 20 m/s. What is the velocity of car B after collision ?

A. 25 m/s

B. 22.5 m/s

C. 36.7 m/s

D. 16.7 m/s

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$$

$$(1500 \times 25) + (1000 \times 15) = (1500 \times 20) + (1000 \times v_2)$$

$$1500(25 + 10) = 1500 \times 20 + 1000 v_2$$

$$1000 v_2 = 1500(35 - 20)$$

$$v_2 = \frac{1500 \times 15}{1000} = \frac{225}{10} = 22.5 \text{ m/s}$$

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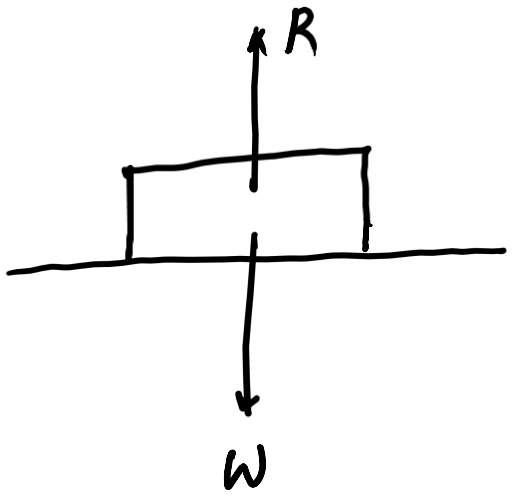
When A Body Is Stationary :

A. There Is No Force Acting On It ✗

B. The Forces Acting On It Are Not In Contact With It ✗

C. The Combination Of Forces Acting On It Balances Each Other

D. The Body Is In Vacuum



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A cricket player catches A ball of mass 10^{-1} kg moving with A velocity of 25 ms^{-1}. If the ball is caught in 0.1 s , the force of the blow exerted on the hand of the player is

A. 4 N

B. 25 N

C. 40 N

D. 250 N

Impulse = force × contact time = change in momentum

$F \times 0.1 = 10^{-1}(0) - 10^{-1}(25)$

(final) − (Initial)

$F = \frac{0 - 2.5}{0.1} = -25\ N$

magnitude = 25N

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D. 250 N

A Football And A Stone Has Same Mass,

A. Both Have Same Inertia
B. Both Have Same Momentum
C. Both Have Different Inertia
D. Both Have Different Momentum

$$\text{Inertia} \propto \text{mass}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

A Football And A Stone Has Same Mass,

A. **Both Have Same Inertia**
B. Both Have Same Momentum
C. Both Have Different Inertia
D. Both Have Different Momentum

What is responsible for the change in magnitude of speed ?

A. Momentum

B. Force

C. Speed

D. Kinetic Energy

change in speed ⇒ there is acceleration

⇓

generates force

What is responsible for the change in magnitude of speed ?

A. Momentum

B. Force

C. Speed

D. Kinetic Energy

Which one of the following has maximum inertia ?

maximum mass

(a) An atom

(b) A molecule

(c) A one-rupee coin

(d) A cricket ball ✓

Which one of the following has maximum inertia ?

(a) An atom

(b) A molecule

(c) A one-rupee coin

(d) A cricket ball

Answer: D

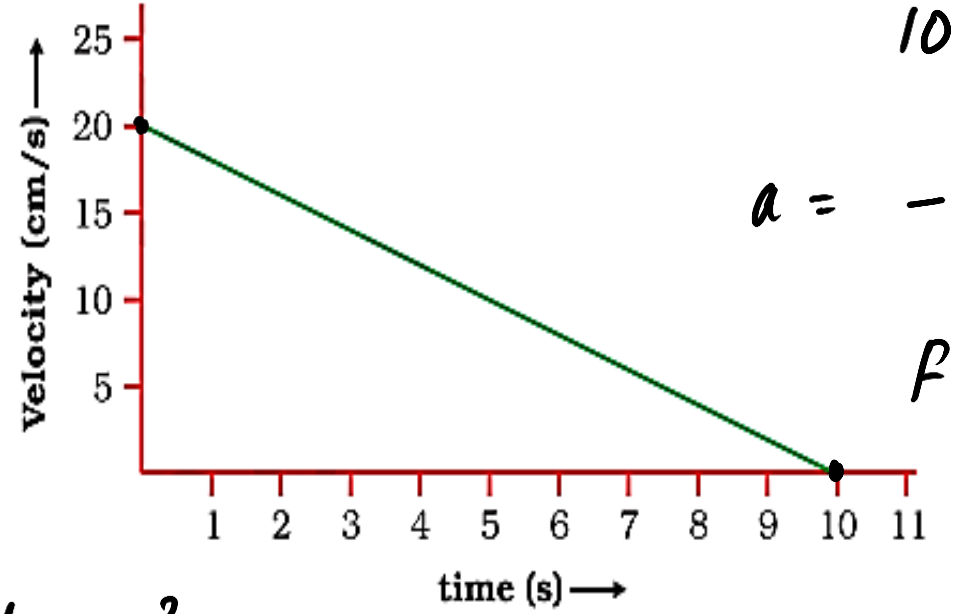
The velocity-time graph of a ball of mass 20 g moving along a straight line on a long table is shown. How much force does the table exert on the ball to bring it to rest ?

A. 0.0002 N

B. - 0.0002 N

C. 0.004 N

D. - 0.0004 N



$a = \frac{(0 - 20)}{10}$ cm/s

$a = -2\ cm/s^2 = -0.02\ m/s^2$

F = mass x acceleration

= 0.02 kg x -0.02 m/s²

= -0.0004 N

Newton → $kg\,ms^{-2}$

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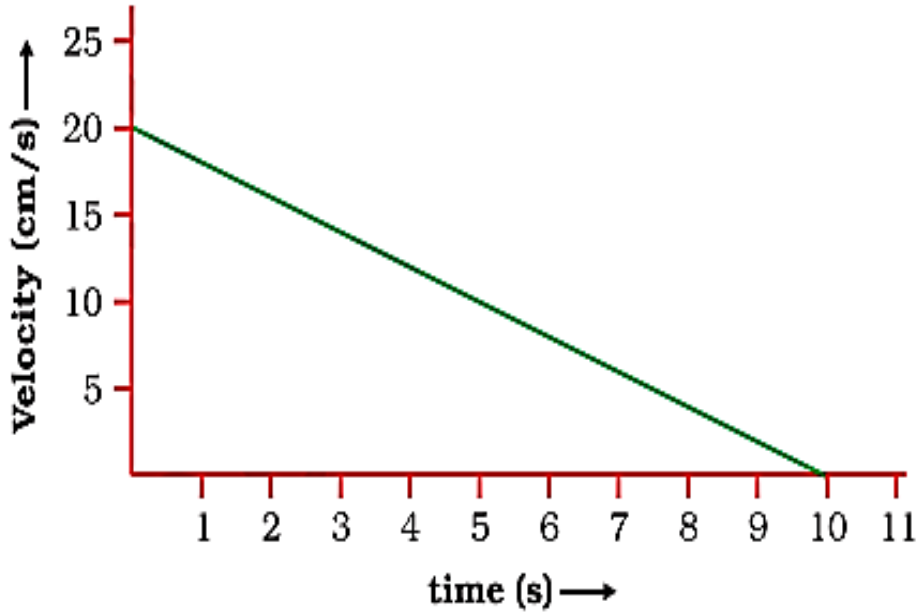

The statement "friction force is a contact force while magnetic force is a non-contact force" is

(a) always true.

(b) true only at 0°C.

(c) a false statement.

(d) either true or false depending upon the temperature of the surroundings.

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Answer: A

A bullet of mass 10 g is horizontally fired with velocity 300 m s^{-1} from a pistol of mass 1 kg. What is the recoil velocity of the pistol?

(a) 0·3 m s^{-1}

(b) 3 m s^{-1}

(c) –3 m s^{-1}

(d) –0·3 m s^{-1}

Conservation of momentum,

$$(0.01\ kg)(0) + (1\ kg)(0) = (0.01\ kg)(300) + (1kg)(v)$$

$$0 + 0 = 3 + v$$

$$v = -3\ ms^{-1}$$

opposite to direction of motion of bullet

A bullet of mass 10 g is horizontally fired with velocity 300 m s^{-1} from a pistol of mass 1 kg. What is the recoil velocity of the pistol?

(a) 0·3 m s^{-1}

(b) 3 m s^{-1}

(c) –3 m s^{-1}

(d) –0·3 m s^{-1}

Answer: C

An object of mass 2 kg is sliding with a constant velocity of 4 m/s on a frictionless horizontal table. The force required to keep the object moving with the same velocity is

A. 32 N

B. 0 N ✓

C. 2 N

D. 8 N

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With reference to the third law of motion, Action and Reaction happens at

A. Same Time

B. Different Time

C. Action happens first and then Reaction

D. Reaction happens first and then Action

With reference to the third law of motion, Action and Reaction happens at

A. **Same Time**

B. Different Time

C. Action happens first and then Reaction

D. Reaction happens first and then Action

no cause - effect kind of relationship,

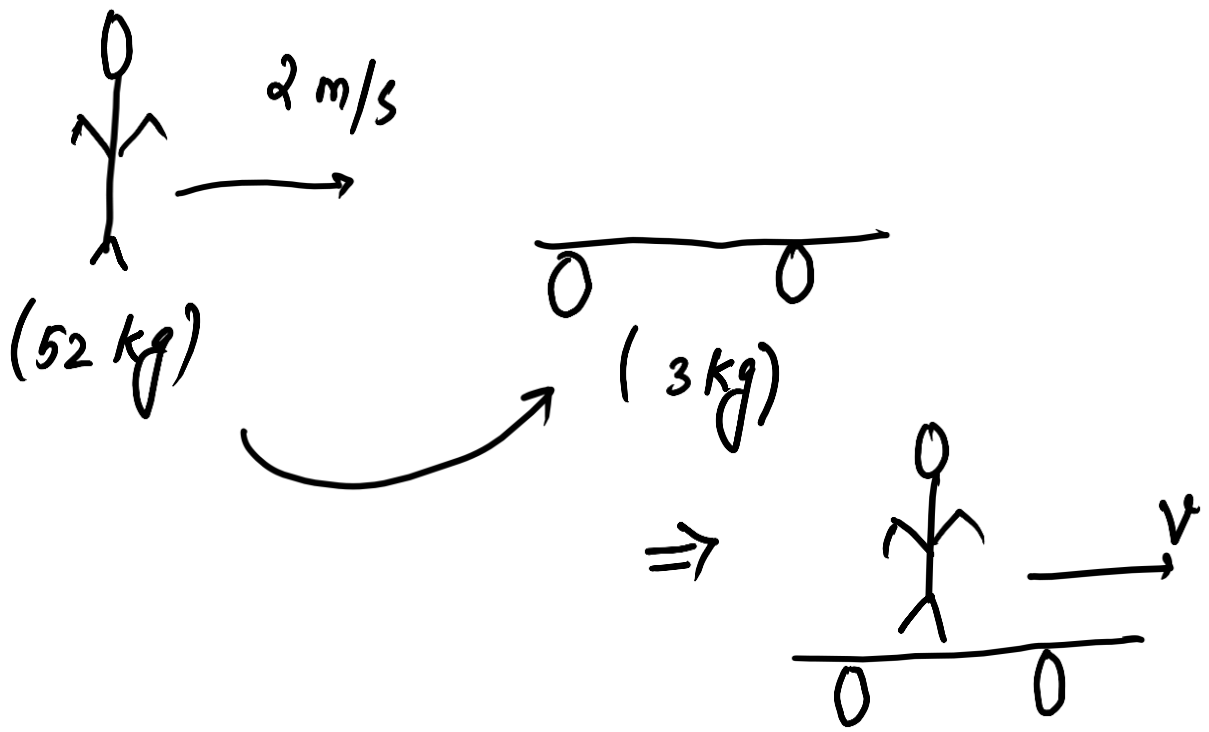
A boy of mass 52 kg jumps with a horizontal velocity of 2 m/s onto a stationary cart of mass 3 kg. The cart is fixed with frictionless wheels. Which one of the following would be the speed of the cart?

(a) 2·15 m/s

(b) 1·89 m/s

(c) 1·51 m/s

(d) 2·51 m/s



$$52(2) + 3(0) = 52v + 3v$$

$$v = \frac{52 \times 2}{55} = \frac{104}{55} \approx 1.89 \text{ m/s}$$

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(c) 1·51 m/s

(d) 2·51 m/s

Answer: B

Sand falls vertically on a conveyor belt at a rate of 0·1 kg/s. In order to keep the belt moving at a uniform speed of 2 m/s, the force required to be applied on the belt is :

(a) 0 N

(b) 0·2 N

(c) 1·0 N

(d) 2·0 N

$0.1\ kg/s \times 2\ m/s = 0.2\ kg\,ms^{-2}$

$= \underline{0.2\ N}$

Sand falls vertically on a conveyor belt at a rate of 0·1 kg/s. In order to keep the belt moving at a uniform speed of 2 m/s, the force required to be applied on the belt is :

(a) 0 N

(b) 0·2 N

(c) 1·0 N

(d) 2·0 N

Answer: B

A driver accelerates his car first at the rate of 4 m/s^2 and then at the rate of 8 m/s^2. Calculate the ratio of forces exerted by the engine.

A. 2 : 3

B. 3 : 4

C. 2 : 1

D. 1 : 2

$$\frac{F_1}{F_2} = \frac{m_1 a_1}{m_2 a_2} = \frac{m(4)}{m(8)} = \frac{4}{8} = 1:2$$

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A. 2 : 3

B. 3 : 4

C. 2 : 1

D. 1 : 2

A goalkeeper in A game of football pulls his hands backwards after holding

The ball shot at goal. This enables the goalkeeper to

A. Exert large force on the ball
B. Increase the force exerted by the ball on hands
C. Increase the rate of change of momentum
D. Decrease the rate of change of momentum ✓

Newton's 2nd law

Impulse = Force × contact time

$m(0) - m(v) = -mv$ (constant)

Force $\propto$ rate of change of momentum

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The ball shot at goal. This enables the goalkeeper to

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Type of inertia that tends to resist the change in case of an athlete often jumps before taking a long jump

A. Inertia of rest

B. Inertia of motion

C. Inertia of direction

D. Uniformly accelerated motion

Type of inertia that tends to resist the change in case of an athlete often jumps before taking a long jump

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A sedan car of mass 200 kg is moving with A certain velocity. It is brought to rest by the application of brakes , within a distance of 20 m when the average resistance being offered to it is 500 N. What was the velocity of the motor car ?

A. 40 m/s

B. 30 m/s

C. 20 m/s

D. 10 m/s

$$v^2 - u^2 = 2as$$

$$0^2 - u^2 = 2(-2.5)(20)$$

$$-u^2 = -100$$

$$u = 10\ m/s$$

$$F = ma$$

$$a = \frac{F}{m} = -\frac{500\ N}{200\ kg} = -2.5\ m/s^2$$

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A. 40 m/s

B. 30 m/s

C. 20 m/s

D. 10 m/s

In the absence of External force , the velocity

A. Remains constant

B. Vanishes

C. Changes continously

D. None of the Above

$F = 0 \Rightarrow a = 0 \Rightarrow$ v is constant

In the absence of External force , the velocity

A. **Remains constant**

B. Vanishes

C. Changes continously

D. None of the Above

PYQ – 24 - I

Which of the following forces is/are fundamental in nature ?

1. Gravitational force
2. Electromagnetic forces
3. Strong and weak nuclear forces

Select the correct answer using the code given below :

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

PYQ – 24 - I

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Select the correct answer using the code given below :

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: D

PYQ – 24 - I

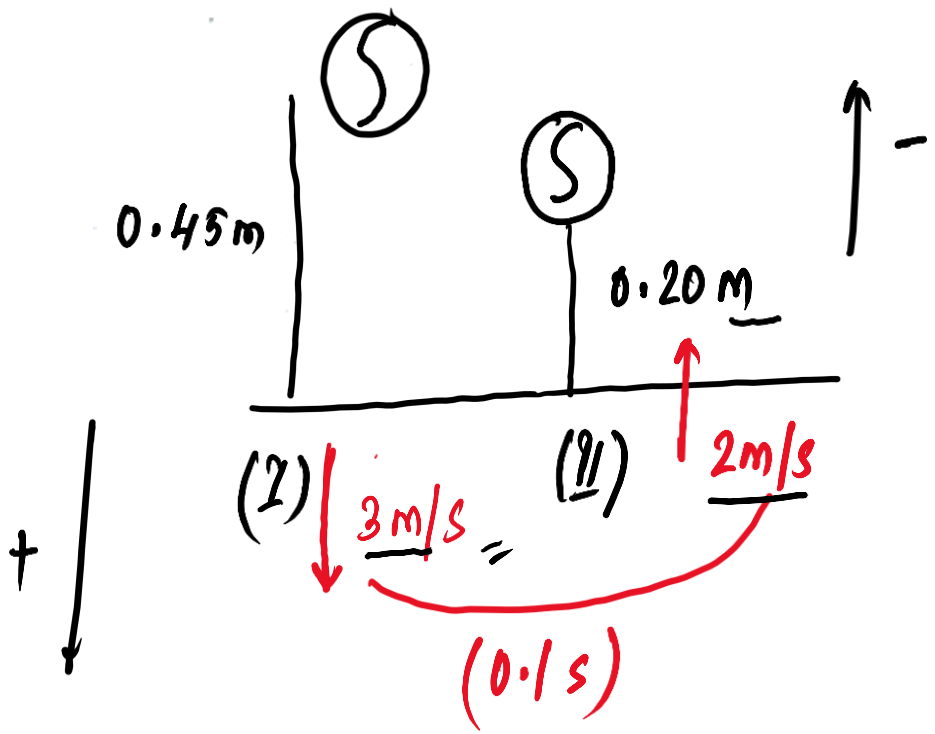
A ball of 0·1 kg mass is dropped on a hard floor from a height of 0·45 m and rises to a height of 0·20 m. If it was in touch with the floor for 0·1 s, the net force it applied on the floor while bouncing is : (take the gravitational acceleration g = 10 m s^{-2})

(a) 1·0 N

(b) 6·0 N

(c) 3·0 N

(d) 5·0 N



(I) $\Rightarrow s = 0.45\,m$; $u = 0$; $v = ?$

$v^2 - u^2 = 2as$

$v^2 - 0^2 = 2(10)(0.45)$

$v^2 = 9 \Rightarrow v = 3\ m/s$

(II) $\Rightarrow s = 0.20$; $u = ?$; $v = 0\ m/s$

$v^2 - u^2 = 2as$

$0^2 - u^2 = 2(-10)(0.20)$

$u^2 = 4 \Rightarrow u = 2\ m/s$

$$a = \frac{\text{change in velocity}}{\text{Time taken}}$$

$$= \frac{(-2) - (3)}{0.1} = \frac{-5}{0.1} = -50 \text{ m/s}^2$$

$$F = ma = (0.1)(-50 \text{ m/s}^2)$$

$$= -5 \text{ N} \Rightarrow \text{magnitude} = 5.0 \text{ N}$$

PYQ – 24 - I

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(a) 1·0 N

(b) 6·0 N

(c) 3·0 N

(d) 5·0 N

Answer: D

PYQ – 24 - I

Which one of the following about different frictional forces is correct ?

(a) Kinetic friction > Static friction > Rolling friction

(b) Static friction > Rolling friction > Kinetic friction

(c) Static friction > Kinetic friction > Rolling friction

(d) Static friction > Kinetic friction = Rolling friction

PYQ – 24 - I

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(b) Static friction > Rolling friction > Kinetic friction

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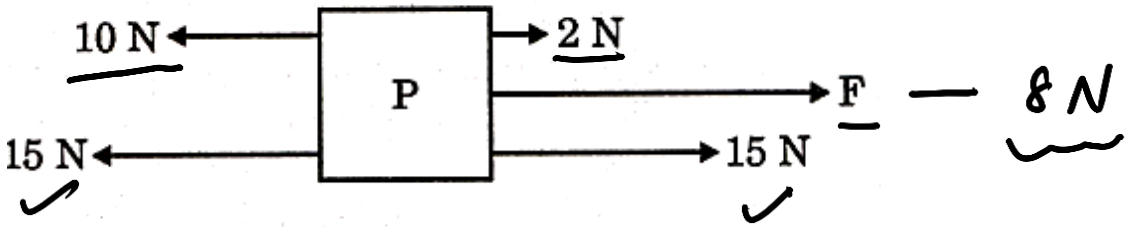
Answer: C

PYQ – 24 - I

If the block P as shown in the figure below were to be at rest, what should the magnitude of force F be ?



(a) 5 N

(b) 6 N

(c) 8 N

(d) 10 N

PYQ – 24 - I

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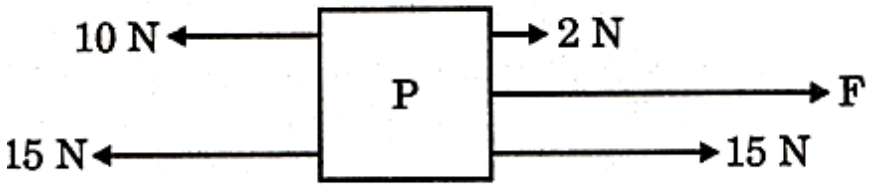

(a) 5 N

(b) 6 N

(c) 8 N

(d) 10 N

Answer: C

PYQ – 24 - II

Which of the following statements give characteristics of contact forces ?

1. It appears between an object when it is in contact with some other object ✓
2. It satisfies the third law of motion ✓
3. It may appear between a pair of solid and fluid ✓

Select the answer using the code given below :

(a) 1 and 3 only

(b) 2 and 3 only

(c) 1 and 2 only

(d) 1, 2 and 3

PYQ – 24 - II

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1. It appears between an object when it is in contact with some other object

2. It satisfies the third law of motion

3. It may appear between a pair of solid and fluid

Select the answer using the code given below :

(a) 1 and 3 only

(b) 2 and 3 only

(c) 1 and 2 only

(d) 1, 2 and 3

Answer: D

PYQ – 24 - I

A car weighs 1000 kg. It is moving with a uniform velocity of 72 km/h towards a straight road. The driver suddenly presses the brakes. The car stops in 0·2 s. The retarding force applied on the car to stop it is

(a) 100 N

(b) 1000 N

(c) 10 kN

(d) 100 kN

$$72 \times \frac{5}{18} = 20 \text{ m/s}$$

$$a = \frac{0 - 20}{0.2} = -100 \text{ m/s}^2$$

$$F = ma = 1000 \text{ kg} \times -100 \text{ m/s}^2$$

$$= 100 \text{ kN (magnitude)}$$

PYQ – 24 - I

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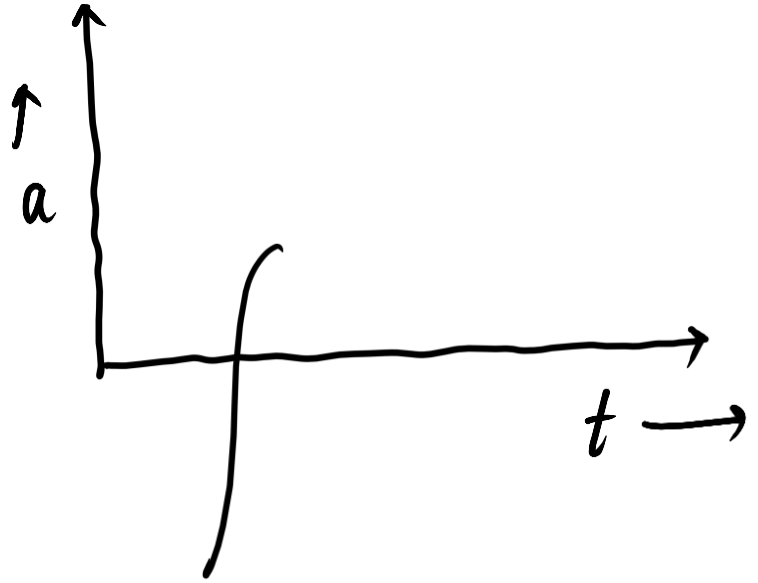
Answer: D

The area under acceleration-time graph represents

(a) velocity
(b) displacement travelled
(c) distance travelled
(d) change in velocity



Area = accln. × time

$= \frac{\text{change in velocity}}{\text{time}} \times \text{time} = \text{change in velocity}$

The area under acceleration-time graph represents

(a) velocity

(b) displacement travelled

(c) distance travelled

(d) change in velocity

Answer: D

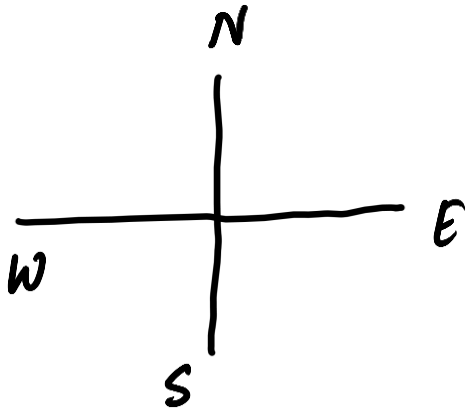
Starting from rest a vehicle accelerates at the rate of 2 m/s^2 towards east for 10 s. It then stops suddenly. It then accelerates again at a rate of $4\sqrt{2}$ m/s^2 for next 10 s towards south and then again comes to rest. The net displacement of the vehicle from the starting point is

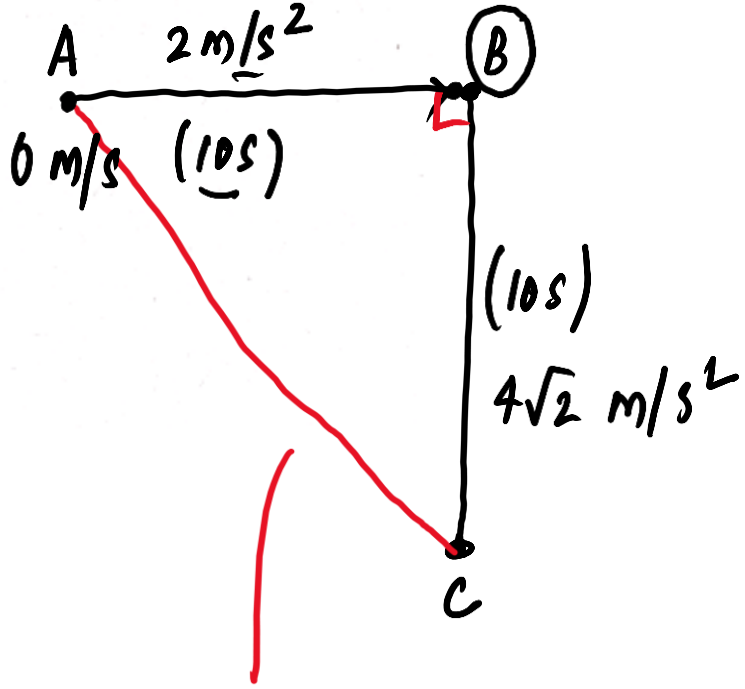
(a) 100 m

(b) 200 m

(c) 300 m

(d) 400 m





$AC^2 = AB^2 + BC^2$

Distance AB

$S = ut + \frac{1}{2}at^2$

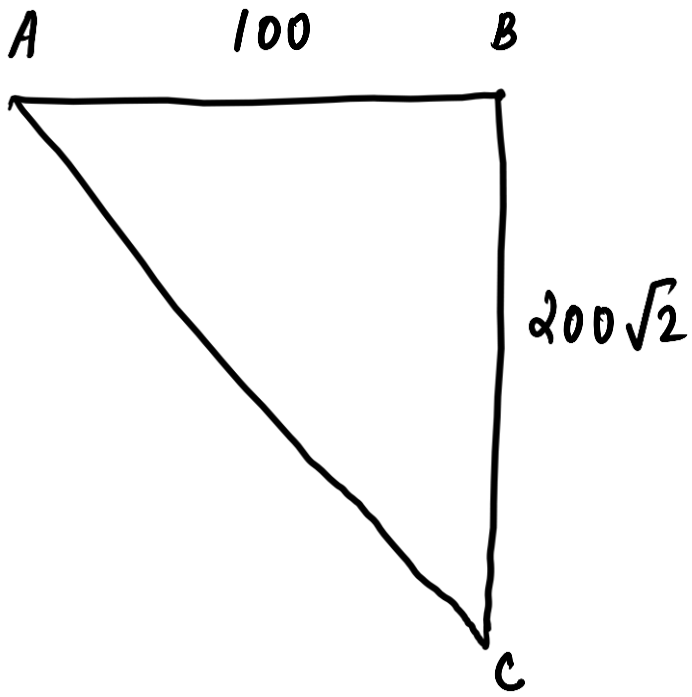
$= 0(10) + \frac{1}{2}(2)(10)^2$

$S = 100\ m$

Distance BC

$S = ut + \frac{1}{2}at^2$

$= 0(10) + \frac{1}{2}(4\sqrt{2})(10)^2 = 200\sqrt{2}\ m$



$$AC^2 = (100)^2 + (200\sqrt{2})^2$$

$$= 10000 + 40000 \times 2$$

$$= 10000 + 80000$$

$$AC^2 = 90000$$

$$AC = 300 \text{ m}$$

Starting from rest a vehicle accelerates at the rate of 2 m/s^2 towards east for 10 s. It then stops suddenly. It then accelerates again at a rate of $4\sqrt{2}\ m/s^2$ for next 10 s towards south and then again comes to rest. The net displacement of the vehicle from the starting point is

(a) 100 m

(b) 200 m

(c) 300 m

(d) 400 m

Answer: C

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PHYSICS

WORK-ENERGY-POWER

MCQS

NAVJYOTI SIR

SSBCrack EXAMS