



لجنة اسألني عن الهندسة تقدم لكم

حلول اسئلة سنوات فيزياء 1.1



ASKMEABOUTENG



اسألني عن الهندسة

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Two identical balls collide head- on .The initial velocity of one is (4 m/s) east, while that of the other is (6 m/s) west , if the collision is elastic ,then the final * :velocity of each ball after collision is (2 نقطة)

$v_{1f} = 4, east, v_{2f} = 6, west$

$v_{1f} = 5, west, v_{2f} = 8, east$

$v_{1f} = 8, east, v_{2f} = 5, west$

$v_{1f} = 6, west, v_{2f} = 4, east$

A particle moving initially with momentum $(7.00 \mathbf{i} - 2.00 \mathbf{j})$ kg m/s is acted on by a force given by

$$\mathbf{F} = (6.00 t \mathbf{i} - 2.00 \mathbf{j}) \text{ N},$$

where t is in seconds. The momentum (in kg m/s) of the particle after 3 s is:

Select one:

- $27.0 \mathbf{i} - 8.0 \mathbf{j}$
- $25.0 \mathbf{i} - 8.0 \mathbf{j}$
- $34.0 \mathbf{i} - 8.0 \mathbf{j}$
- $18.0 \mathbf{i} - 6.0 \mathbf{j}$
- $-11.0 \mathbf{i} + 4.0 \mathbf{j}$

CH 8

$$1) V_{A1} + V_{B1} = V_{A2} + V_{B2}$$

$$V_{B2} - V_{A2} = V_{A1} - V_{B1}$$

$$4 - 6 = V_{A2} + V_{B2} \dots \textcircled{1}$$

$$V_{B2} - V_{A2} = 4 + 6 \dots \textcircled{2}$$

$$\underline{V_{A2} = 6 \text{ west}}$$

$$\underline{V_{B2} = 4 \text{ east}}$$

$$2) dp = F dt$$

$$\int_{P_1}^{P_2} dp = \int_0^3 F dt$$

$$P_2 - P_1 = \left. \frac{6t^2}{2} \hat{i} - 2t \hat{j} \right|_0^3, \quad P_1 = 7\hat{i} - 2\hat{j}$$

$$P_2 = 27\hat{i} - 6\hat{j} + 7\hat{i} - 2\hat{j}$$

$$\underline{P_2 = 34\hat{i} - 8\hat{j}}$$

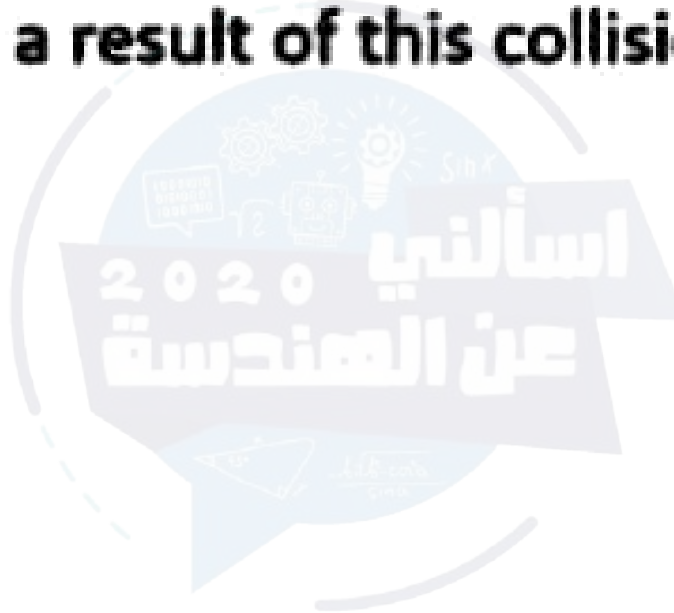
$$3) \cancel{V_{B2} - V_{A2} = V_{A1} - V_{B1}}$$

$$\cancel{V_{B2} + 2V = V}$$

$$\cancel{V_{B2} = -V}$$

A 2.0-kg ball moving at 6.0 m/s makes a one-dimensional elastic collision with a 4.0-kg ball moving at 6.0 m/s in the *opposite* direction. Calculate the magnitude of the change in momentum (in kg.m/s) of the 4.0-kg ball as a result of this collision:

- (A) 16
- (B) 24
- (C) 32
- (D) 8.0
- (E) 4.0



*Take $g = 9.8 \text{ m/s}^2$

Three masses are placed on the y-axis : 2 kg at $y=300$ cm, 6 kg at $y=150$ cm , and 2 kg at $y= -100$ cm. Find their center of mass (in m)

(2 نقطة)



1.1

0.7

1.3

0.9

A particle moving initially with momentum $(2.00 \mathbf{i} + 4.00 \mathbf{j})$ kg m/s is acted on by a force given by

$\mathbf{F} = (3.00 t \mathbf{i} - 4.00 \mathbf{j})$ N, where t is in seconds. The momentum (in kg m/s) of the particle after 4 s is:

Select one:

- $12.0 \mathbf{i} - 16.0 \mathbf{j}$
- $-10.0 \mathbf{i} + 20.0 \mathbf{j}$
- $26.0 \mathbf{i} - 12.0 \mathbf{j}$
- $24.0 \mathbf{i} - 12.0 \mathbf{j}$
- $14.0 \mathbf{i} - 12.0 \mathbf{j}$



$$3) 4) V_{B2} - V_{A2} = V_{A1} - V_{B1}$$

$$V_{B2} - V_{A2} = 6 + 6 = 12$$

$$m_A V_{A1} + m_B V_{B1} = m_A V_{A2} + m_B V_{B2}$$

$$2(6) + 4(-6) = 2V_{A2} + 4V_{B2}$$

$$V_{A2} + 2V_{B2} = -12 \quad \text{--- (II)}$$

$$V_{A2} = -12$$

$$V_{B2} = 0$$

$$\bar{I} = (0+6)4 = 24 \text{ N.s}$$

$$4) \frac{\sum m_i y_i}{\sum m_i} = \frac{2(3) + 2(-1) + 6(1.5)}{2 + 2 + 6} = 1.3$$

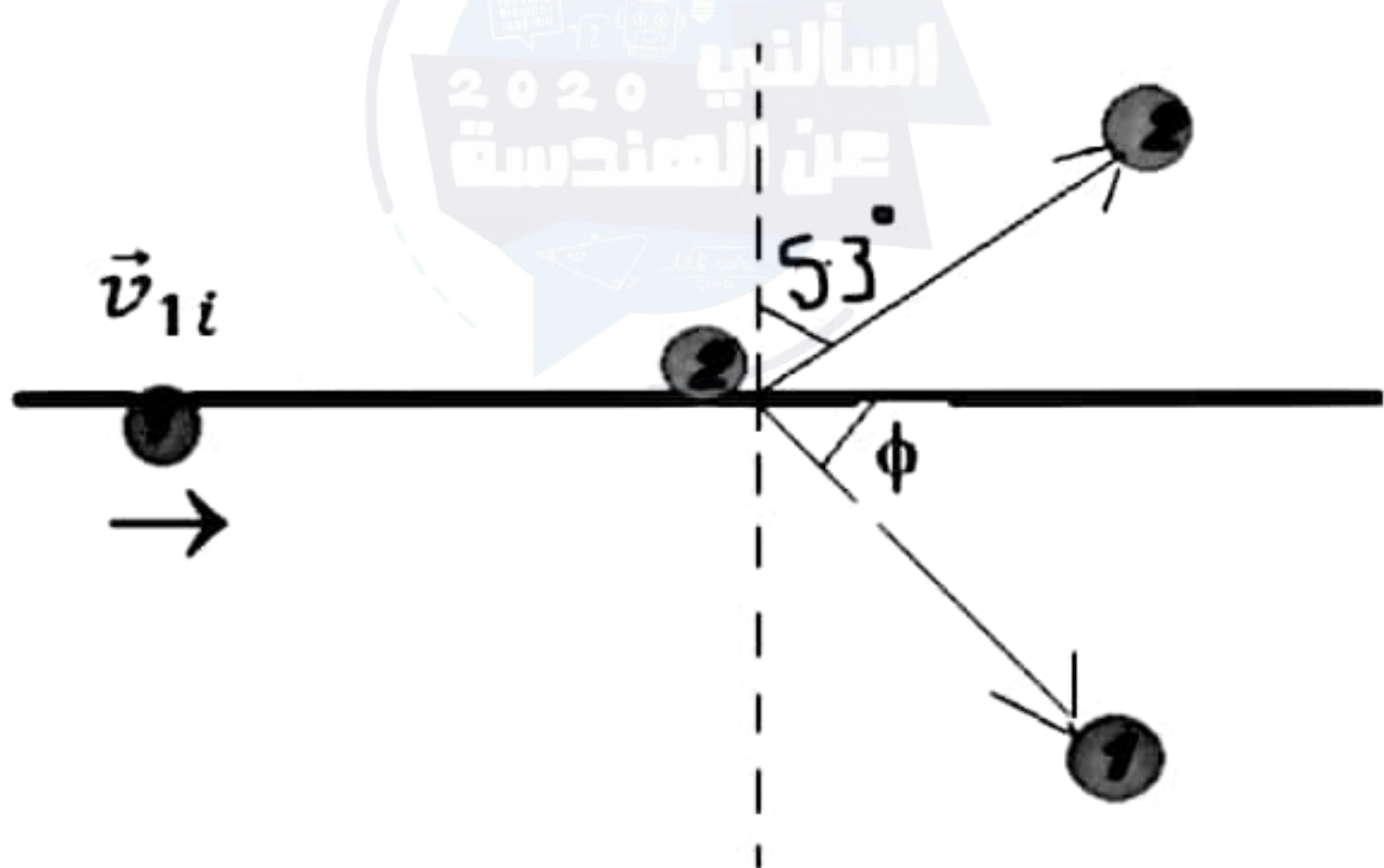
$$5) \int_{P_1}^{P_2} dp = \int_0^4 (3t\hat{i} - 4\hat{j}) \cdot dt$$

$$P_2 - P_1 = 24\hat{i} - 16\hat{j}, \quad P_1 = 2\hat{i} + 4\hat{j}$$

$$P_2 = (24+2)\hat{i} + (-16+4)\hat{j}$$

$$P_2 = 26\hat{i} - 12\hat{j}$$

A proton collides elastically with another proton that is initially at rest. The incoming proton has an initial speed of 3.5×10^5 m/s. After the collision one proton moves off at an angle of 37° to the original direction of motion and the second defects at an angle of ϕ . The angle ϕ is:



$$6) \quad P_{x1} = P_{x2}$$

$$m (3.5 \times 10^5) = m v_1 \cos 37^\circ + m v_2 \cos \phi$$

$$v_1 \cos 37 + v_2 \cos \phi = 3.5 \times 10^5 \text{ ---- } (1)$$

$$P_{y1} = P_{y2}$$

$$v_1 \sin 37 = v_2 \sin \phi \text{ --- } (2)$$

$$KE_1 = KE_2$$

$$(3.5 \times 10^5)^2 = v_1^2 + v_2^2 \text{ ---- } (3)$$

$$(3.5 \times 10^5)^2 = v_1^2 + v_2^2 + v_1 v_2 \cos (37 + \phi)$$

$$(3.5 \times 10^5)^2 = (3.5 \times 10^5)^2 + v_1 v_2 \cos (37 + \phi)$$

$$\cos (37 + \phi) = 0$$

$$37^\circ + \phi = 90^\circ$$

$$\underline{\phi = 53^\circ}$$



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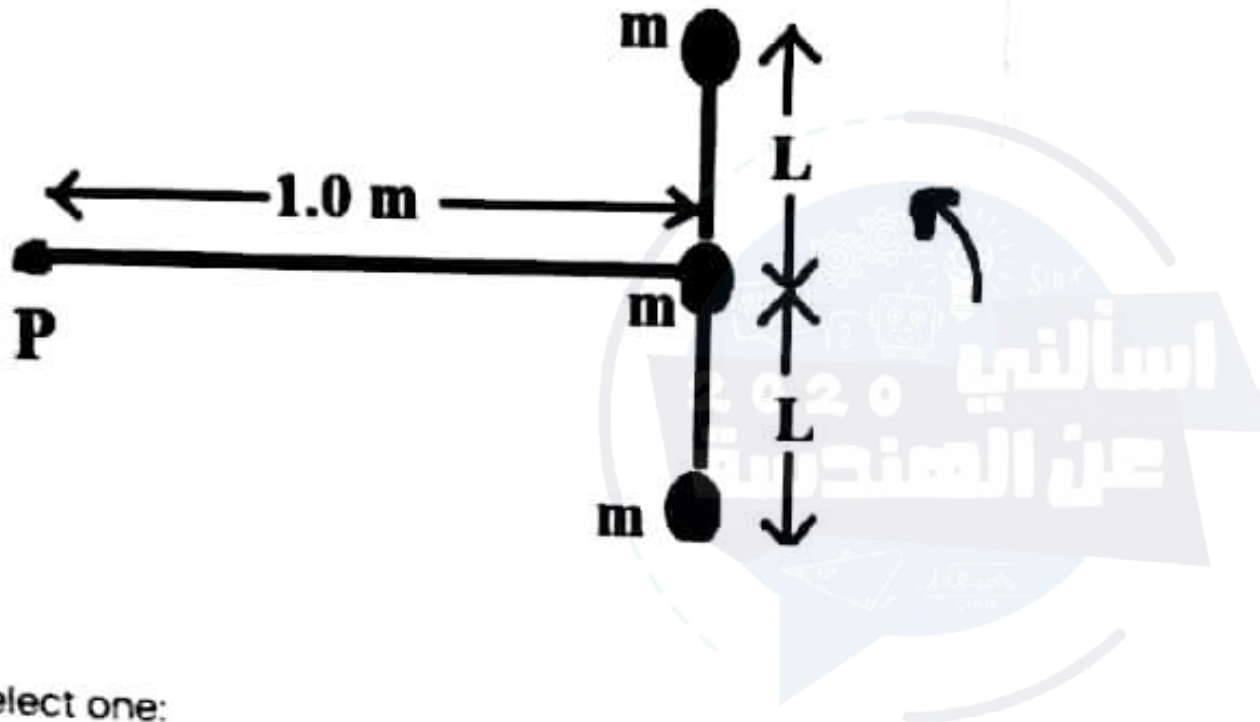
A disc initially rotating clockwise at 7.00 rev/s makes five revolutions clockwise then 4.50 revolutions counterclockwise, all in a time of five seconds. The average angular acceleration (in rad/s^2) during this interval is:

Select one:

- 22.4
- 74.8
- 17.3
- 2.8
- 17.8



Three identical small balls each with mass 0.2 kg m are connected with massless rods as shown in the figure. The combination is rotating counterclockwise with an angular speed ω 3.00 rad/s around an axis passing through the point P and perpendicular to the plane of the rods. If $L = 0.3 \text{ m}$, then the rotational kinetic energy (in J) of the system is:



Select one:

- 2.9
- 19.5
- 2.7
- 2.0
- 0.16

$$\text{[1]} \quad \omega_1 = -7(2\pi) = -44 \text{ rad/s}$$

$$\Delta\theta = \theta_2 - \theta_1 = 4.5 - (-5) = 9.5 \text{ rev.}$$

$$= 9.5(2\pi) = 59.7 \text{ rad.}$$

$$\Delta t = 5 \text{ sec.}$$

$$\Delta\theta = \omega_1 t + \frac{1}{2} \alpha t^2$$

$$59.7 = -44(5) + \frac{1}{2} \alpha (5)^2$$

$$\alpha = 22.4 \text{ rad/s}^2$$

[2]



$$I = I_1 + I_2 + I_3$$

$$= m_1 r_1^2 + m_2 r_2^2 + m_3 r_3^2$$

$$= 0.2(1^2 + 0.3^2) + 0.2(1)^2 + 0.2(1^2 + 0.3^2)$$

$$= 0.636 \text{ kg}\cdot\text{m}^2$$

$$K = \frac{1}{2} I \omega^2 = \frac{1}{2} (0.636) (3)^2 = 2.9 \text{ J}$$

A wheel starts at rest, and has an angular acceleration of 4 rad/s^2 . Through what angle (in radian) does it * ?turn in 3.0 sec
(2 نقطة)

18 32 72 50

A disc initially rotating clockwise at 2.00 rev/s makes three revolutions clockwise then 3.50 revolutions counterclockwise, all in a time of four seconds. The average angular acceleration (in rad/s^2) during this interval is:

Select one:

- 5.9
- 38.1
- 6.7
- 1.1
- 11.4

A disc initially rotating clockwise at 4.00 rev/s makes three revolutions clockwise then 6.50 revolutions counterclockwise, all in a time of five seconds. The average angular acceleration (in rad/s^2) during this interval is:

Select one:

- 8.3
- 1.9
- 14.8
- 49.6
- 11.8

[Clear my choice](#)



③

$$\omega_1 = 0$$

$$\alpha = 4 \text{ rad/s}^2$$

$$t = 3 \text{ sec.}$$

$$\begin{aligned} \Delta\theta &= \omega_1 t + \frac{1}{2} \alpha t^2 \\ &= 0 + \frac{1}{2} (4) (3)^2 = \boxed{18 \text{ rad}} \end{aligned}$$

④ $\omega_1 = -2 (2\pi) = -12.56 \text{ rad/s}$

$$\Delta\theta = 3.5 - (-3) = 6.5 \text{ rev} = 6.5 (2\pi) = 40.84 \text{ rad}$$

$$t = 4 \text{ sec.}$$

$$\begin{aligned} \Delta\theta &= \omega_1 t + \frac{1}{2} \alpha t^2 \\ 40.84 &= -12.56(4) + \frac{1}{2} \alpha (4)^2 \end{aligned}$$

$$\boxed{\alpha = 11.4 \text{ rad/s}^2}$$

⑤ $\omega_1 = -4 (2\pi) = -8\pi = -25.13 \text{ rad/s}$

$$\begin{aligned} \Delta\theta &= \theta_2 - \theta_1 = 6.5 - (-3) = 9.5 \text{ rev} \\ &= 9.5 (2\pi) = 59.7 \text{ rad} \end{aligned}$$

$$t = 5 \text{ sec.}$$

$$\Delta\theta = \omega_1 t + \frac{1}{2} \alpha t^2$$

$$\boxed{\alpha = 14.8 \text{ rad/s}^2}$$

wheel of radius $R = 0.50$ m rolls without slipping along a road and makes 10 complete revolutions, how far did the wheel roll?

Select one:

- a. 62.8 m
- b. 5.0 m
- c. 31.4 m
- d. 7.85 m
- e. 15.70 m



$$\textcircled{6} \Delta\theta = 10 \text{ rev.} = 10(2\pi) = 20\pi \text{ rad}$$

$$s = r\Delta\theta = 0.5(20\pi) = \boxed{31.4 \text{ m}}$$



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A ball is thrown at an original speed of 8.0 m/s at an angle of 30° above the horizontal. What is the speed (m/s) of the ball when it returns to the same horizontal level? use

* $g = 10 \text{ m/s}^2$
(2 نقطة)



6

5

8

7

From given information, $u = 8 \text{ m/s}$ $\theta = 30^\circ$ Then, $T = \frac{2u \sin \theta}{g}$

$$\text{Then, } T = \frac{2 \times 8 \times \sin 30^\circ}{9.8} = \frac{2 \times 8 \times \frac{1}{2}}{9.8} = 0.816336535$$

$$\text{and, } v_x = 8 \text{ m/s, and } v_y = 8 - (9.8)(0.816336) \\ = 8 - 8 = 0$$

$$\text{Then } v = \sqrt{v_x^2 + v_y^2} \Rightarrow \boxed{v = 8 \text{ m/s}}$$

A ballistic pendulum consists of a (2 kg) block hanging vertically on a (1.5 m) length string. A (10 g) bullet is fired horizontally into a block with a velocity of (500 m/s). the bullet embedded in the block, and the entire system swings through a height h . The height h (in m) * above its initial position will the block

(2 نقطة)

0.31

0.45

0.79

0.60

Here, the momentum is conserved. The collision is inelastic. So, the principle of conservation of energy could not be used here.

According to law of conservation of momentum,

$$m \times u = (m+M) \times v \Rightarrow v = \frac{m \times u}{m+M}$$

Here, $m = 10 \text{ g} = 0.01 \text{ kg}$, $M = 2 \text{ kg}$, $u = 500 \text{ m/s}$. So, $v = 2.4876 \text{ m/s}$. The height of the pendulum, $h = \frac{v^2}{2g} = 0.3154 \text{ m}$.

The height of ^{pendulum} ~~momentum~~ would be 0.31 m .

A mass m is traveling at an initial speed $v_0 = 25.0 \text{ m/s}$. It is brought to rest in a distance of 62.5 m by a force of 15.0 N . The mass (in Kg) is:

Select one:

3.00

1.50

3.75

37.5

6.00

$$v_0 = 25 \text{ m/s}$$

$$S = 62.5 \text{ m}$$

$$v_f = 0$$

If acceleration is f . then:

$$v_f^2 = v_0^2 - 2fs$$

$$\rightarrow f = \frac{(25)^2}{2 \times 62.5} = \boxed{5 \text{ m/s}^2}$$

If m is the mass then,

$$m \times 5 = 15$$

$$\boxed{m = 3 \text{ kg}}$$

A mass m is traveling at an initial speed $v_0 = 20.0 \text{ m/s}$. It is brought to rest in a distance of 80.0 m by a force of 15.0 N . The mass (in **kg**) is



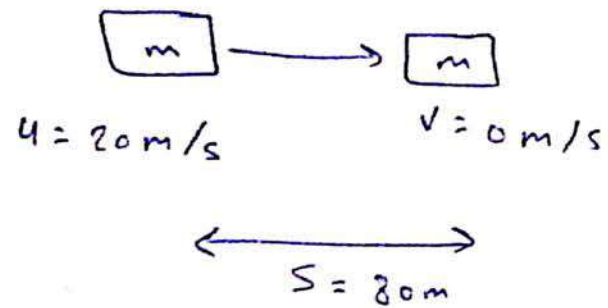
1.50

3.75

6.00

37.5

3.00



we have to apply is force (F) in opposite direction for retardation, So

$$F = ma \quad a = \frac{F}{m} = \frac{15}{m}$$

Now, from eqn of kinetics,

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

$$(20)^2 = 2 \times \frac{15}{m} \times 80$$

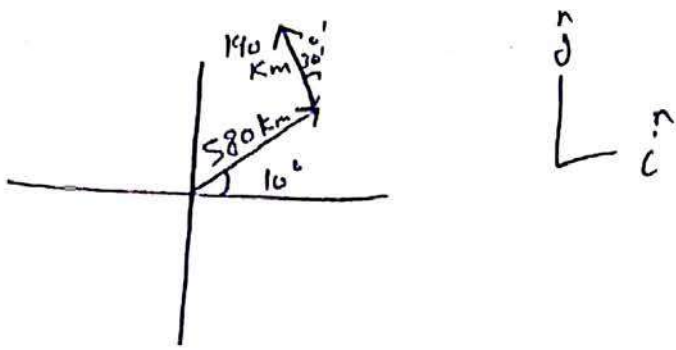
$$\rightarrow 400 = \frac{2 \times 80 \times 15}{m}$$

$$m = 6 \text{ Kg}$$

A plane flies from a base a distance 580 km at a direction of 10.0° north of east for 2 hours and then flies 190 km 30.0° west of north for 1 hour. The magnitude and direction of the plane displacement at the end of this trip are:

Select one:

- 545 km at an angle 29° north of east
- 150 km at an angle 60° west of north
- 280 km at an angle 50° north of east
- 362 km at an angle 40° north of east
- 452 km at an angle 33° north of east



$$\vec{d}_1 = 580 (\cos 10^\circ \hat{i} + \sin 10^\circ \hat{j})$$

$$\vec{d}_1 = 571.2 \hat{i} + 100.72 \hat{j} \text{ km}$$

$$\vec{d}_2 = 190 (-\sin 30^\circ \hat{i} + \cos 30^\circ \hat{j})$$

$$\vec{d}_2 = -95 \hat{i} + 164.5 \hat{j} \text{ km}$$

$$\vec{d} = \vec{d}_1 + \vec{d}_2$$

$$= (571.2 \hat{i} + 100.72 \hat{j}) + (-95 \hat{i} + 164.5 \hat{j})$$

$$= 476.2 \hat{i} + 265.22 \hat{j} \text{ km}$$

$$d = \sqrt{(476.2)^2 + (265.22)^2} \text{ km}$$

$$d = 545 \text{ km}$$

$$\theta = \tan^{-1} \left(\frac{265.22}{476.2} \right) = 29^\circ$$

29° north of east ~~direction~~

A rod with a cross sectional area $A = 4.0 \times 10^{-5} \text{ m}^2$ and a length of $L = 5.00 \text{ m}$ stretches $\Delta L = 0.004 \text{ m}$ when subjected to a tension force of $F = 20000 \text{ N}$. Young's modulus E for this rod is

- a) $5.00 \times 10^{11} \text{ N/m}^2$
- c) $6.25 \times 10^{11} \text{ N/m}^2$
- e) $4.00 \times 10^5 \text{ N/m}^2$

- b) $3.33 \times 10^{11} \text{ N/m}^2$
- d) $7.50 \times 10^{11} \text{ N/m}^2$

Ans.

Correct option is D $E = 7.50 \times 10^{11} \text{ N/m}^2$

Given Data

Force $F = 20000 \text{ N}$ Area $A = 4.0 \times 10^{-5} \text{ m}^2$

$$\text{Stress } \sigma = \frac{F}{A} = \frac{20000}{4.0 \times 10^{-5}} = 500 \times 10^6 \text{ N/m}^2$$

$$\text{Strain} = \frac{\text{Change in Length}}{\text{original length}} = \frac{\Delta L}{L} = \frac{0.004}{6} = 6.66666 \times 10^{-4}$$

From Hooke's Law $\sigma = E\varepsilon$

$\varepsilon = \text{Strain}$ $E = \text{Young Modulus}$

$$E = \frac{\sigma}{\varepsilon} = \frac{500 \times 10^6}{6.66666 \times 10^{-4}} = 7.50 \times 10^{11} \text{ N/m}^2$$

Correct option is D $E = 7.50 \times 10^{11} \text{ N/m}^2$

A box weighing 100 N made of Aluminum is pushed on a horizontal surface made of steel. Using the information given in the Table shown below, the minimum force needed to let the box start skidding is

a) 57 N

b) 47 N

c) 74 N

d) 61 N

e) 52 N.

Coefficients of Friction*

	μ_s	μ_k
Steel on steel	0.74	0.57
Aluminum on steel	0.61	0.47
Copper on steel	0.53	0.36
Rubber on concrete	1.0	0.8
Wood on wood	0.25-0.5	0.2
Glass on glass	0.94	0.4
Waxed wood on wet snow	0.14	0.1
Waxed wood on dry snow	—	0.04
Metal on metal (lubricated)	0.15	0.06
Ice on ice	0.1	0.03
Teflon on Teflon	0.04	0.01
Synovial joints in humans	0.01	0.003

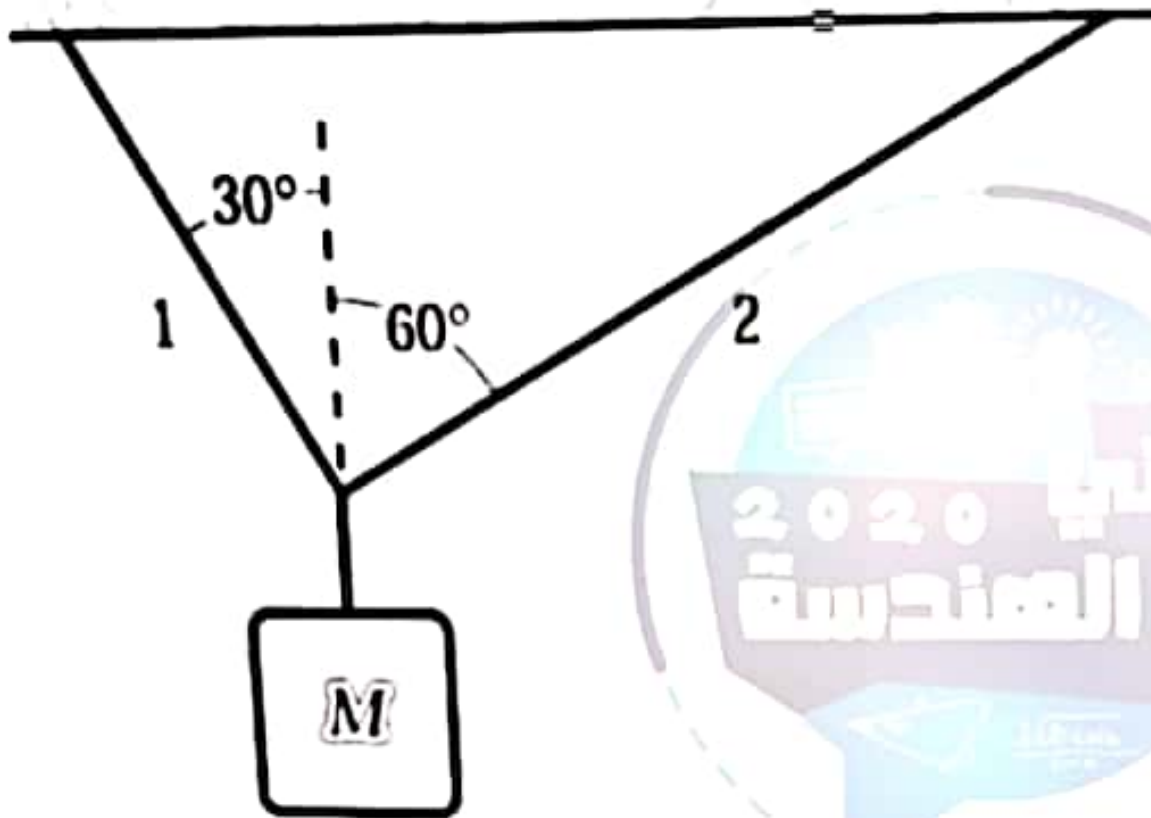
The minimum force needed to move the box

= static friction coefficient \times weight of the box

$$= 0.74 \times 100 \text{ N}$$

$$= 74 \text{ N}$$

An object of mass M is suspended from the ceiling by two cords as shown. The ratio of the magnitude of the vertical component of the tension in T_2 to the vertical component in T_1 is:



Select one

1/2

1/3

2/3

\bar{x}



$$T_1 \sin 30^\circ - T_2 \sin 30^\circ = 0 \quad \text{--- (1)}$$

From eq. (2)

$$T_1 \cos 30^\circ + T_2 \cos 30^\circ = mg$$

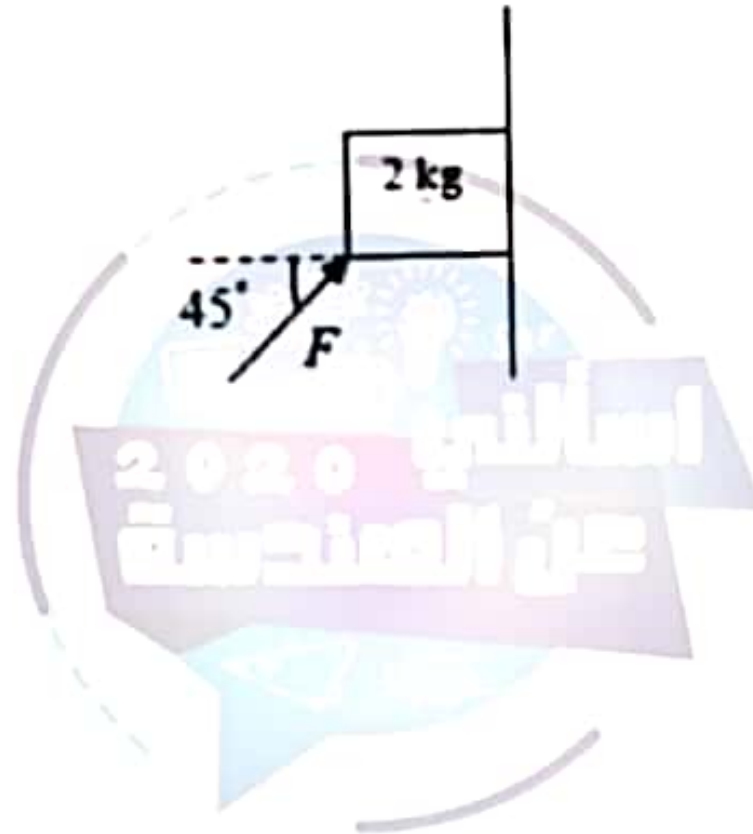
$$\frac{T_2}{T_1} = \frac{\sin 30^\circ}{\sin 30^\circ}$$

to find

$$= \frac{T_2 \cdot \cos 30^\circ}{T_1 \cdot \cos 30^\circ}$$

$$\Rightarrow \frac{\sin 30^\circ \cdot \cos 30^\circ}{\sin 30^\circ \cdot \cos 30^\circ} = \frac{1}{3} = \underline{\underline{0.33}}$$

In the figure below, the coefficient of static friction between the 2 kg block and the wall is 0.15. What is the minimum value of the force F (in N) necessary to prevent (يمنع) the block from sliding down?



Select one:

- a. 94.3
- b. 70.7
- c. 47.1
- d. 24.6
- e. 80.3

$$\mu = 0.15$$

$$\text{Force of friction} = mg + (-F \cos \theta)$$

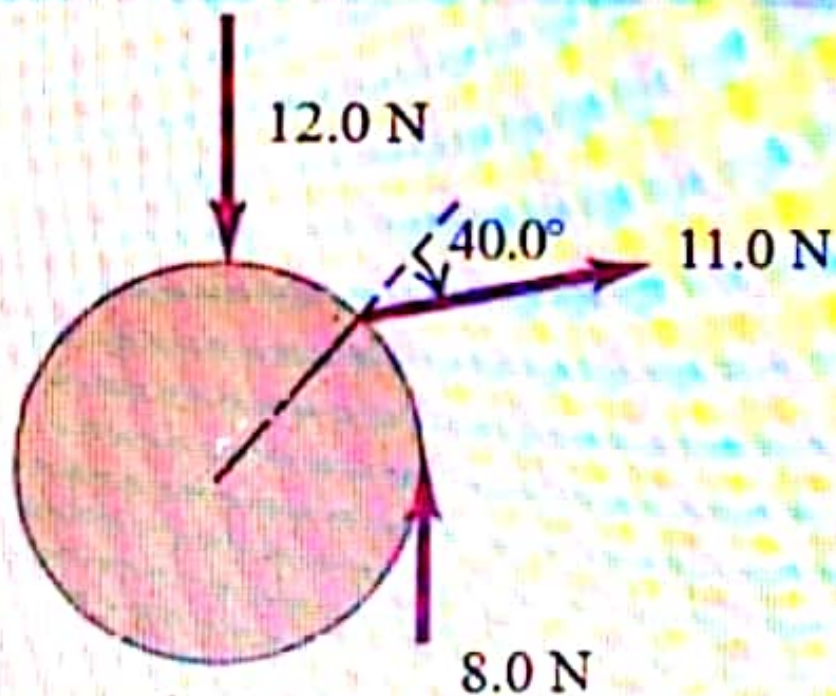
$$\mu F \sin \theta = mg + (-F \cos \theta)$$

$$0.15 \times F + (F \sin 45^\circ) = 2 \times 9.8 + (-F \cos 45^\circ)$$

$$F = \frac{2 \times 9.8}{\left(0.15 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)}$$

$$= \boxed{24.6} \text{ N}$$

The wheel of radius 0.70 m shown in the figure has three forces applied to it. Taking torques that produce counterclockwise rotation as positive, the net torque (in N m) on the wheel due to these three forces for an axis perpendicular to the wheel and passing through its center is:



Select one:

-2.1

10.7

$$\mu = 0.15$$

$$\text{Force of friction} = mg + (-F \cos \theta)$$

$$\mu F \sin \theta = mg + (-F \cos \theta)$$

$$0.15 \times F + (\sin 45^\circ) = 2 \times 9.8 + (-F \cos 45^\circ)$$

$$F = \frac{2 \times 9.8}{\left(0.15 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)}$$

$$= \boxed{24.6} \text{ N}$$

**Assume that an object is in equilibrium.
One of the following statements is false
* ?.Which one
(2 نقطة)**

**The speed of the object remains
constant.**

**The net force acting on the object
is zero.**

**The acceleration of the object is
constant.**

Acceleration of the object is constant is false among the statements.

As we know when object is in equilibrium net force acting on the object is zero as force is zero $F=ma$

Force is directly proportional to acceleration then the acceleration should also be zero.

An object I with a mass of 4 kg is lifted vertically 3 m from the ground level; another object II with a mass of 2 kg is lifted 6 m up. Which of the following statements is true
(2 نقطة)

Object I has greater potential energy since it is heavier

Object II has greater potential energy since it is lifted to a higher position

Two objects have the same potential energy

.non of above

$$25) m_1 = 4 \text{ Kg}, h_1 = 3 \text{ m}$$

$$m_2 = 2 \text{ Kg}, h_2 = 6 \text{ m}$$

$$(P.E)_{I} = 4 \times 9.8 \times 3 = 117.6 \text{ J}$$

$$(P.E)_{II} = 2 \times 9.8 \times 6 = 117.6 \text{ J}$$

option 'c' is correct \rightarrow Both object will have same potential energy

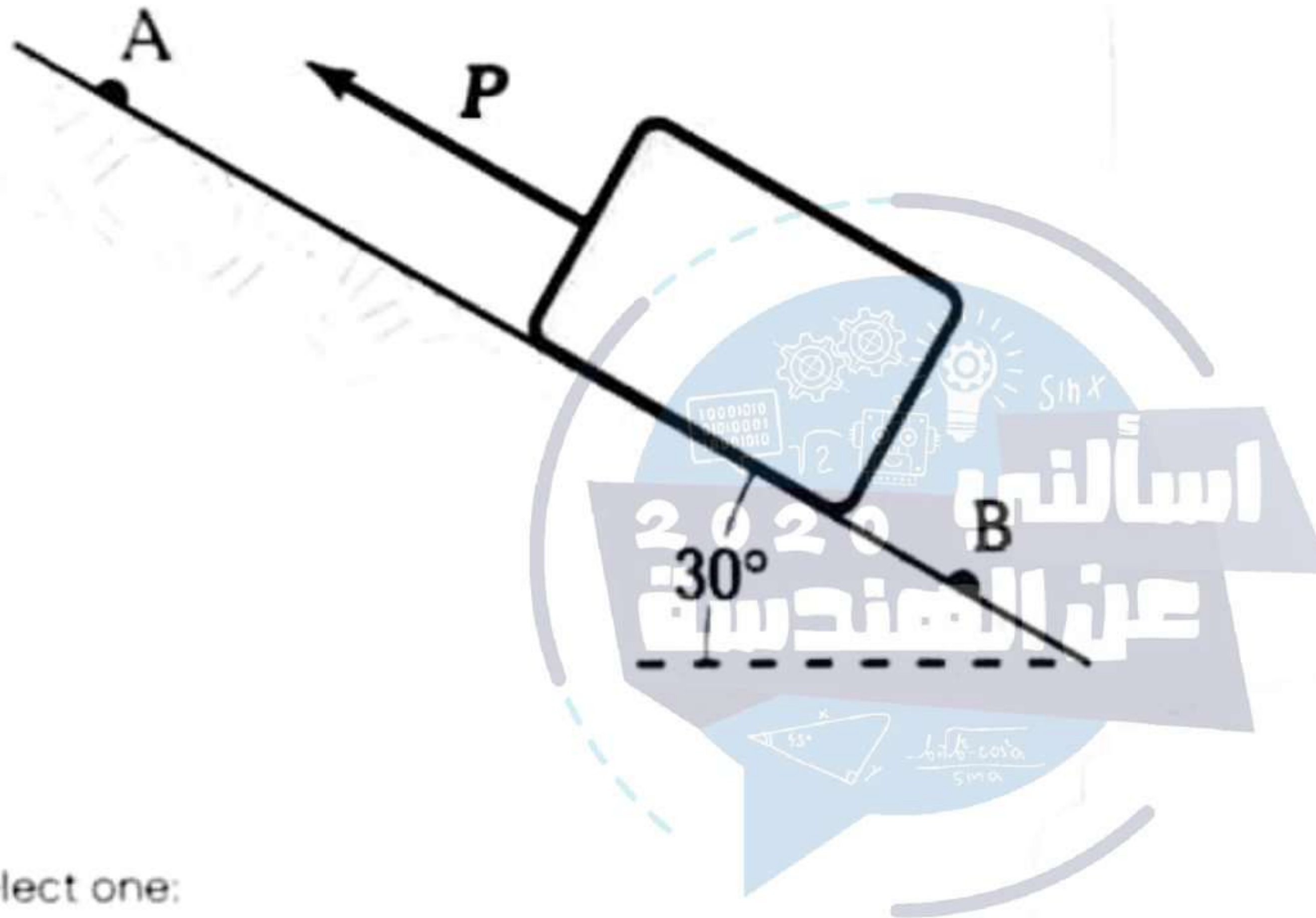
How many joules of energy are used by a 1.0 hp motor that runs for 1.0 hr? (1 hp = * 746 W)
(2 نقطة)

- 
- 10.7×10^6
- 2.7×10^6
- 8.1×10^6
- 5.4×10^6

$$19) \quad 1 \text{ hp} = 746 \text{ W} / 1 \text{ h} = 60 \times 60 = 3600 \text{ s}$$

$$\text{Energy} = 746 \times 3600 = 2685600 \approx 2.7 \times 10^6 \text{ J}$$

A 2.0-kg block slides down a frictionless incline from point A to point B. A force (magnitude $P = 3.0\text{ N}$) acts on the block between A and B, as shown. Points A and B are 2.0 m apart. If the kinetic energy of the block at A is 10 J, then the Kinetic energy (in J) of the block at B, is:



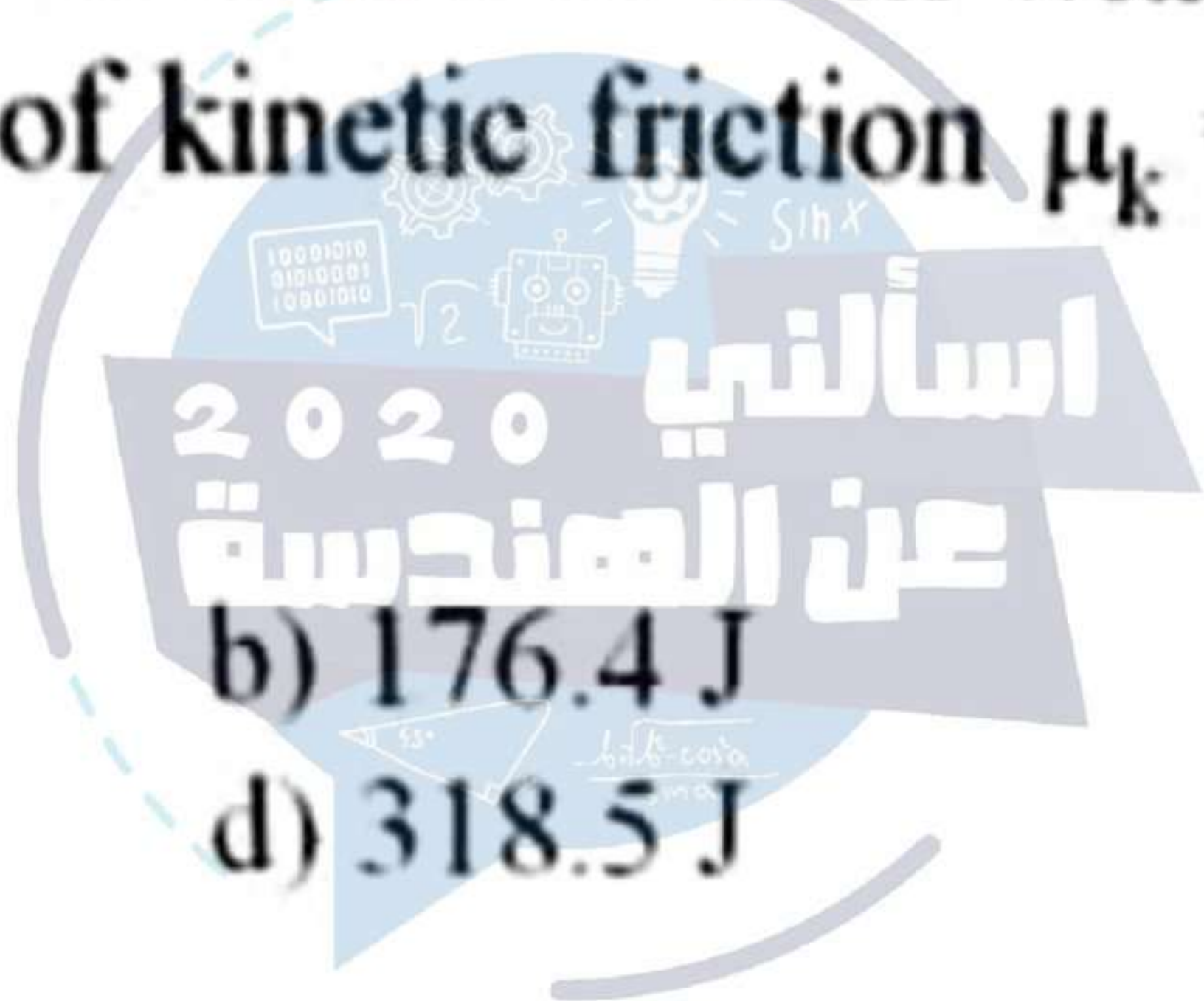
Select one:

- 17.6
- 26.6
- 23.6
- 20.6
- 11.6

A box of mass $m = 5.0 \text{ kg}$ is pulled by a girl on a horizontal floor a distance 13.0 m with constant velocity. If the coefficient of kinetic friction $\mu_k = 0.5$, the work done by the girl is

- a) 117.6 J
- c) 274.4 J
- e) 24.5 J

- b) 176.4 J
- d) 318.5 J



$$W_{\text{net}} = W_1 + W_2 = F_1 d \cos \theta + F_2 d \cos \theta$$

$$+ 24.5 \times 13 = 318.5$$

because velocity
is constant

$$F_{\text{friction}} = F_2 = \mu_k * F_L = .5 * 9.8 * 0.5 = 24.5 \text{ N}$$

$g \cdot \cos \theta$

A small box of mass m and moving in the positive x -direction with a speed v makes an elastic one-dimensional collision with a box that has four times its mass, and rebounds with a speed $5v$ in the opposite direction. The initial velocity of the larger box is:

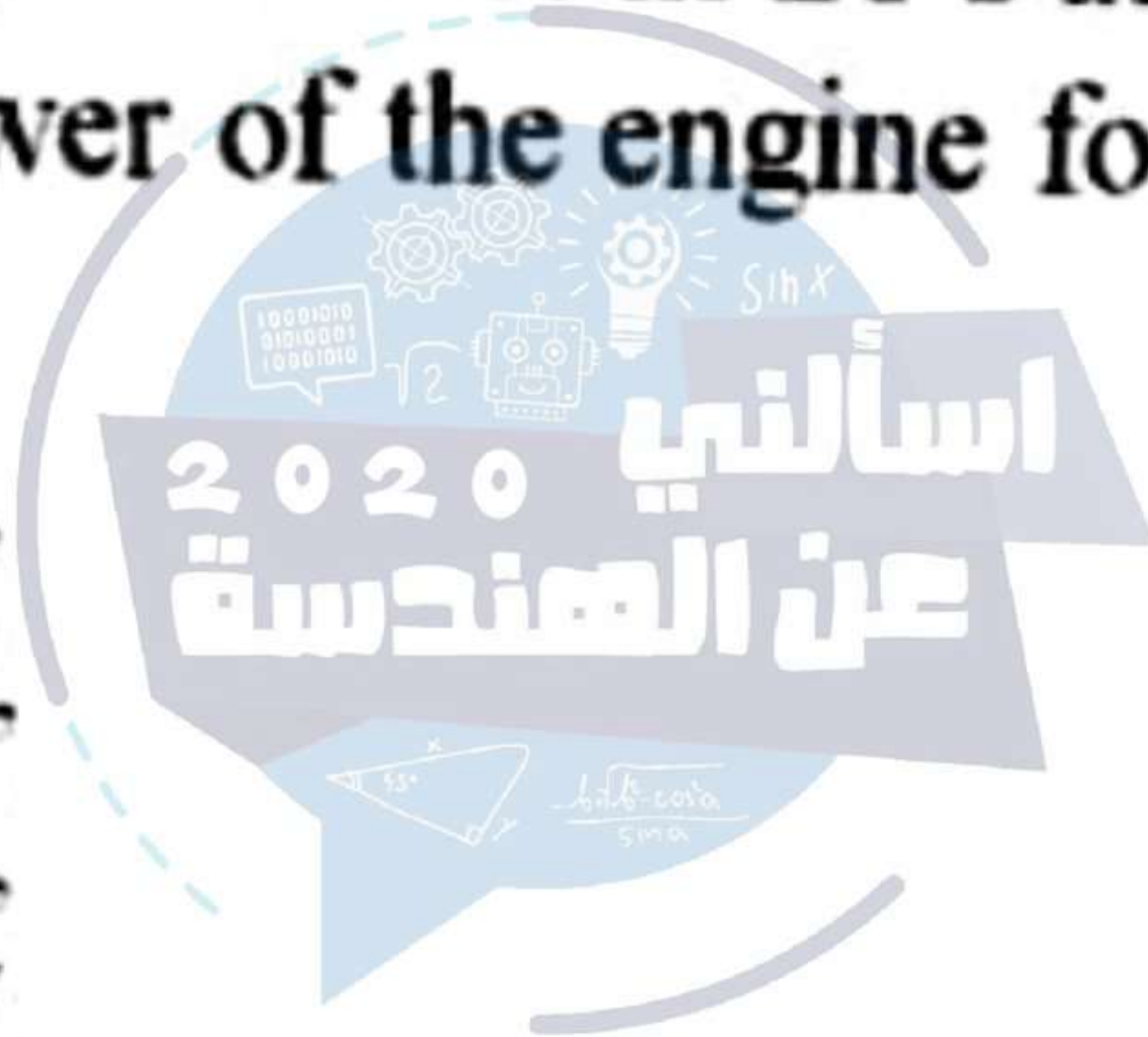
Select one:

- $(7/2)v$
- $(-11/4)v$
- $14v$
- $11v$
- $(-7/2)v$



The car of an elevator has a mass of 3.0×10^3 kg and moves 210 m up the shaft in 21 s at a constant speed. The average power of the engine force is

- a) 2.68×10^5 W,
- b) 2.94×10^5 W,
- c) 2.68×10^5 W,
- d) 2.68×10^5 W,
- e) 6.17×10^6 W.



$$W_{\text{net}} = W_1 + W_2 = \underline{F_1 d \cos \theta} + F_2 d \cos \theta$$

because speed
is constant

$$+ F mg d \cos \theta$$

$$3 \times 10^3 \times 9.8 \times 210$$

$$\therefore \text{Net avg power} = \frac{6174 \times 10^3}{2} = 2.94 \times 10^5$$

A 2.0-kg particle has a speed given by (t^2) m/s, t being in s. The rate (in W) at which the resultant force is doing work on this particle at $t = 1.0$ s is:

- (A) 1.0
- (B) 2.0
- (C) 3.0
- (D) 4.0
- (E) 5.0



*Take $g = 9.8 \text{ m/s}^2$

$$m = 2 \text{ kg} \quad v = t^2 \quad a = \frac{dv}{dt} = 2t \quad t = 1.0 \text{ s}$$

~~work~~ rate = $m \times v \times a = 2 \times (1)^2 \times 2(1) = 4 \text{ W}$

In a given frictionless displacement of a particle, its kinetic energy increases by (35 J) while its potential energy decreases by (10 J). Determine the work (in J) of the non-conservative forces acting on the particle during this

* ?displacement

(2 نقطة)



+15

+25

-25

-15

$$K_f = K_i + 35$$

$$P_f = P_i - 10$$

$$K_i + P_i = K_f + P_f = 35 - 10$$

قوة محافظة

25

Non conservative.

A box with a mass m and moving with a speed of 6.00 m/s makes a completely inelastic collision with another stationary box that has a mass $3m$. The final kinetic energy of the wreckage is 40% of the total initial kinetic energy. The final speed (in m/s) of the wreckage is:

Select one:

- 1.2
- 30
- 0.3
- 0.9
- 0.5



$$K_F = 0.4 * K_i = 0.4 * \frac{1}{2} * 36 * m = 7.2 \text{ m}$$

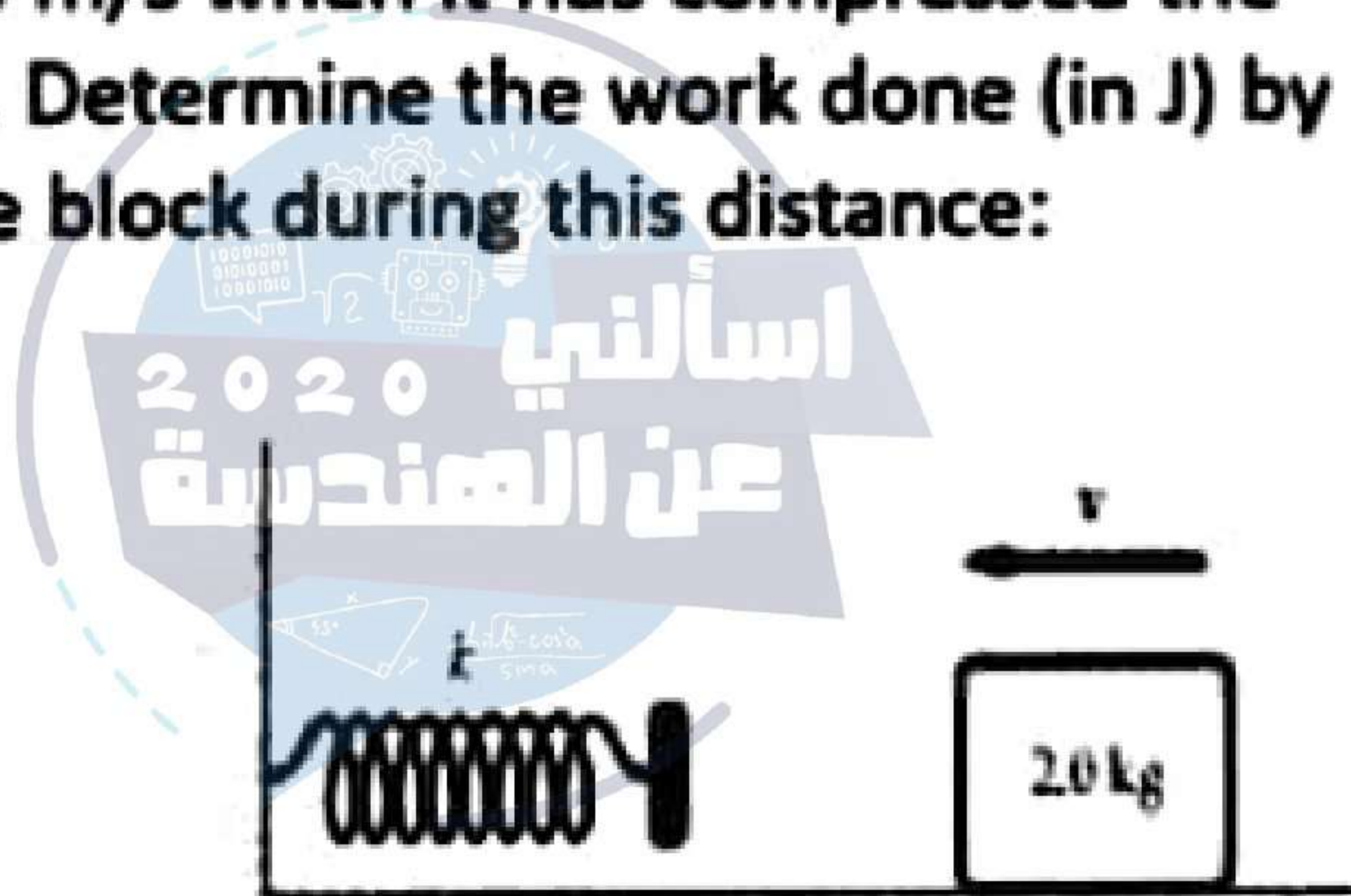
$$K_{F_I} = \frac{1}{2} (m + 3m) * (V_F)^2 = \frac{2 * 7.2 \text{ m}}{4 \text{ m}} = V_F^2 = V_F = 1.8$$

$$\rightarrow K_{F_{II}} = \frac{1}{2} * \frac{1}{4} * 7.2 = \frac{1.8}{2} = \boxed{0.9} \rightarrow \frac{1.8}{4} = V^2 = 0.67$$

$$K_{F_I} - K_{F_{II}} = 1.89 - 0.67 = \boxed{1.2} \text{ m}$$

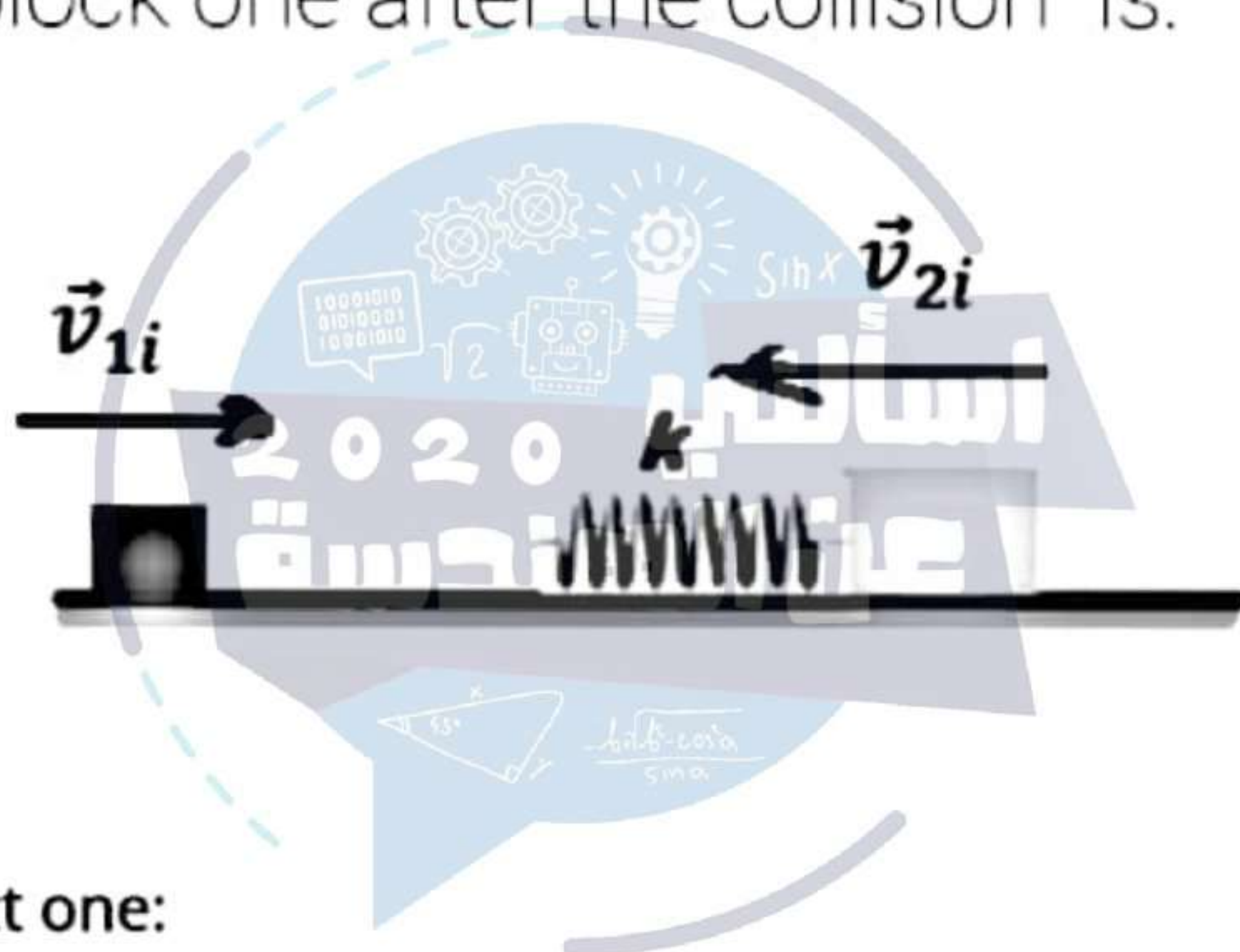
A 2.0-kg block slides on a rough horizontal surface, as shown in the figure below. The speed of the block is 2.0 m/s before it touches the spring ($k = 400$ N/m), and 1.0 m/s when it has compressed the spring 0.10m. Determine the work done (in J) by friction on the block during this distance:

- (A) -3.0
- (B) +3.0
- (C) -1.0
- (D) -2.0
- (E) -4.0



*Take $g = 9.8 \text{ m/s}^2$

A block of mass $m = 1.6$ kg initially moving to the right with a speed of 4 m/s on a frictionless, horizontal track collides with a spring attached to a second block of mass $m = 2.1$ kg initially moving to the left with a speed of 2.5 m/s. the spring constant is 600N/m. the velocity v_{1f} of block one after the collision is:



Select one:

- $3.12 \hat{i} \text{ m/s}$**
- $-1.74 \hat{i} \text{ m/s}$**
- $-3.38 \hat{i} \text{ m/s}$**
- $5.12 \hat{i} \text{ m/s}$**

The force an ideal spring exerts on an object is given by $F_x = -kx$, where x measures the displacement of the object from its equilibrium ($x = 0$) position. If $k = 80 \text{ N/m}$, how much work is done (in J) by this force as the object moves from $x = -0.40 \text{ m}$ to $x = 0$ (2 نقطة)

اسألني
2020
عن الهندسة

5.6

6.4

7.2

4.8

14) The work done is $\rightarrow W = \frac{1}{2} k x^2 = 0.5 (30) (0.45)^2$

6.40 J

The net work done by a conservative force on an object around any closed

* :path is
(2 نقطة)



.zero

.positive

unknown it depends on the
.situation

.negative

* The total work done by conservative force is independent of path resulting in a given displacement and is equal to zero when the path is closed loop

Ans: zero option A is correct



لجنة اسألني عن الهندسة تقدم لكم

حلول اسئلة سنوات فيزياء 1.1



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Two vectors $\mathbf{A} = 3.0 \mathbf{i} - 5.0 \mathbf{k}$ and $\mathbf{B} = 2.0 \mathbf{i} + \mathbf{j} + 5 \mathbf{k}$. The scalar (Dot) product of these two vectors is

Select one:

90

Zero

-19

1

19

[Clear my choice](#)

$$\textcircled{1}: \vec{A} = 3\hat{i} - 5\hat{k} \quad \vec{B} = 2\hat{i} + \hat{j} + 5\hat{k}$$

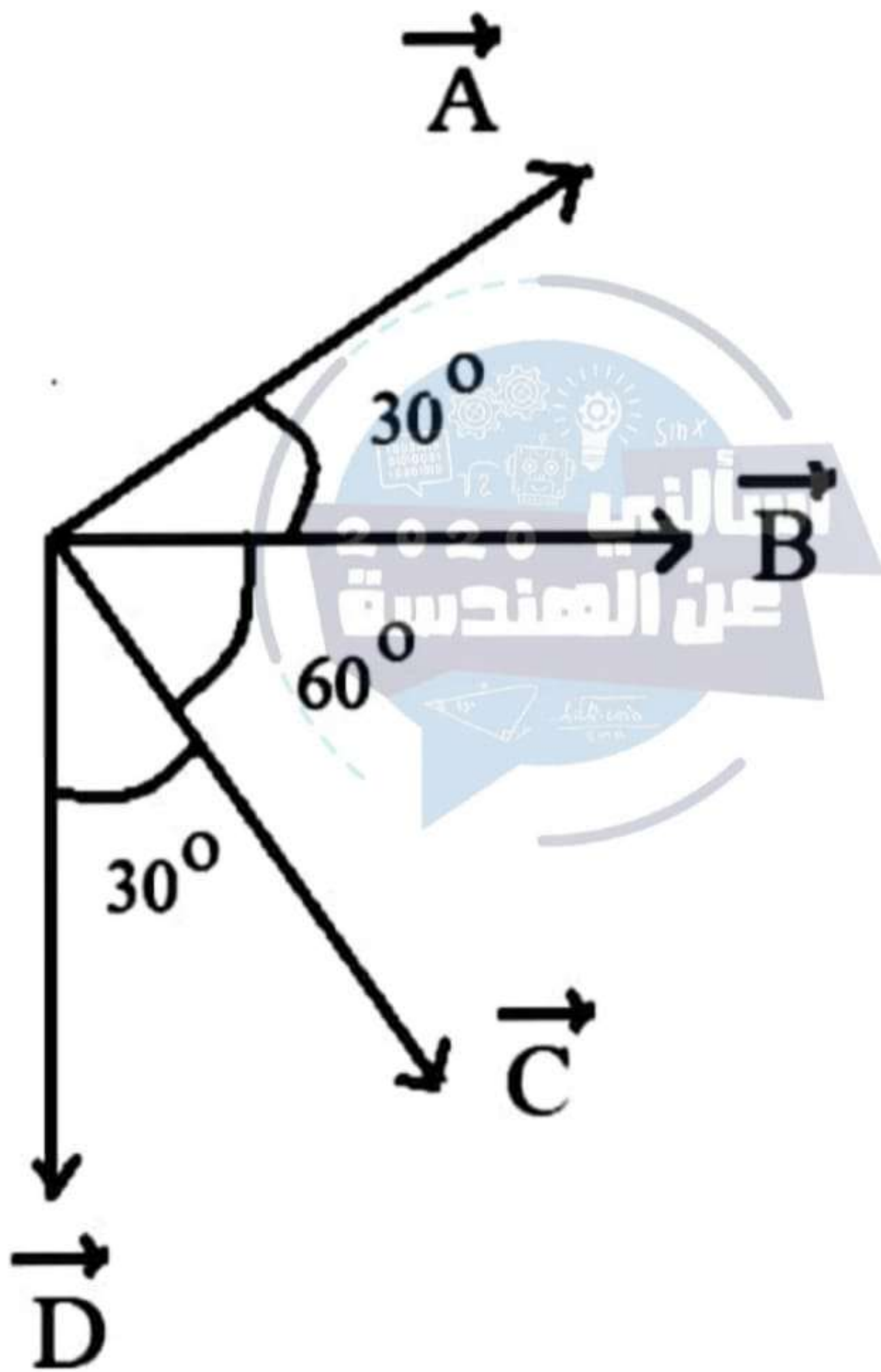
$$\vec{A} \cdot \vec{B} = (3)(2) + (0)(1) + (-5)(5) = -19$$

2020

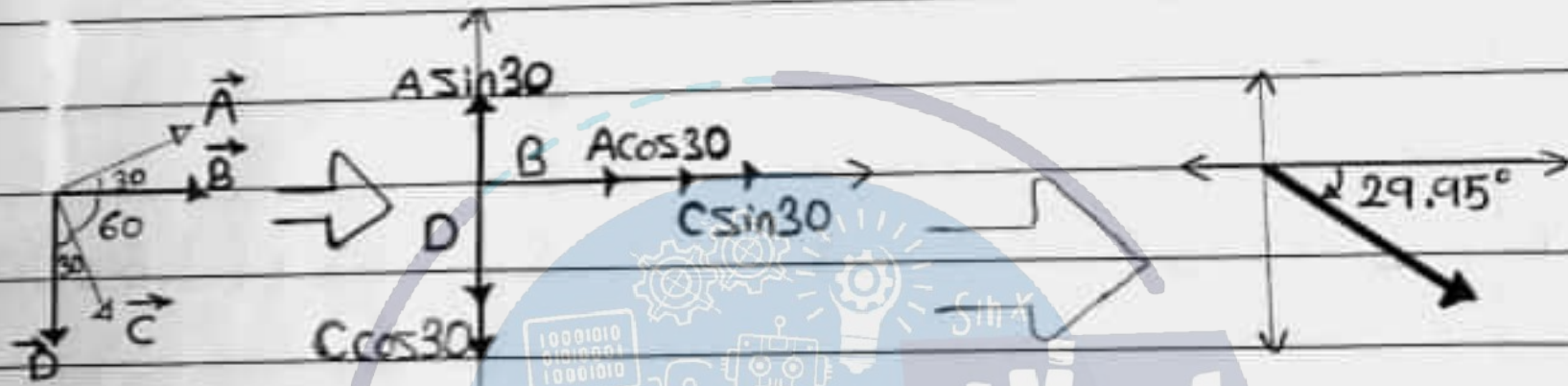
أساسي
عن الهندسة

Four vectors all have the same magnitude. The angles between adjacent vectors is as shown.

The correct vector equation is:



②:



* $A = B = C = D$

On X-axis: $A_x + B + C_x = A \cos 30 + A + A \sin 30 = +2.36A$

On Y-axis: $A_y + C_y + D = A \sin 30 - A \cos 30 - A = -1.36A$

Resultant vector $= \sqrt{(+2.36A)^2 + (-1.36A)^2} = 2.72A$

$\alpha = \tan^{-1}\left(\frac{-1.36A}{+2.36A}\right) = -29.95^\circ$

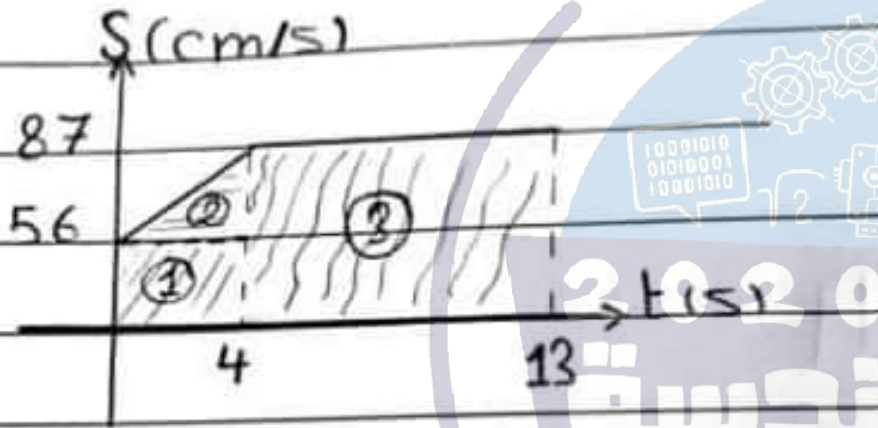
A particle accelerates uniformly from a speed of 56 cm/s to 87 cm/s in 4 seconds and thereafter moves at a constant speed of 87 cm/s for an additional 9 seconds. The average speed (in cm/s) over this total time interval is:



Select one:

- 82
- 91
- 59
- 44
- 28

①:



$$\text{Distance} = (56 \times 4) + (1 \times 4 \times (87 - 56)) + (87 \times 9) = 1067$$

$$S = \frac{D}{\Delta t} = \frac{1067}{13} = 82 \text{ (cm/s)}$$

An object moves along the x-axis according to the equation:

$$x(t) = (2t^3 + t - 1) \text{ m},$$

where t in seconds. The average acceleration between $t = 1 \text{ s}$ and $t = 4 \text{ s}$

(in m/s^2) is:

Select one:

24

10

20

12

16

③:

$$V_{in} = \frac{\partial X}{\partial t} = 6t^2 + 1$$

$$V(4) = 6 * (4)^2 + 1 = 97$$

$$V(1) = 6 * 1 + 1 = 7$$

$$a_{avg} = \frac{\Delta V}{\Delta t} = \frac{V(4) - V(1)}{4 - 1} = 30 \text{ (m/s}^2\text{)}$$

A particle moves along the x-axis. Its position is given by the equation $x = 6 + 7t - 4t^2$ with x in meters and t in seconds. Its position (in meter) when it changes direction is:

Select one:

- 2.56
- 5.56
- 13.1
- 15.3
- 9.06



$$\textcircled{5}: X = 6 + 7t - 4t^2$$

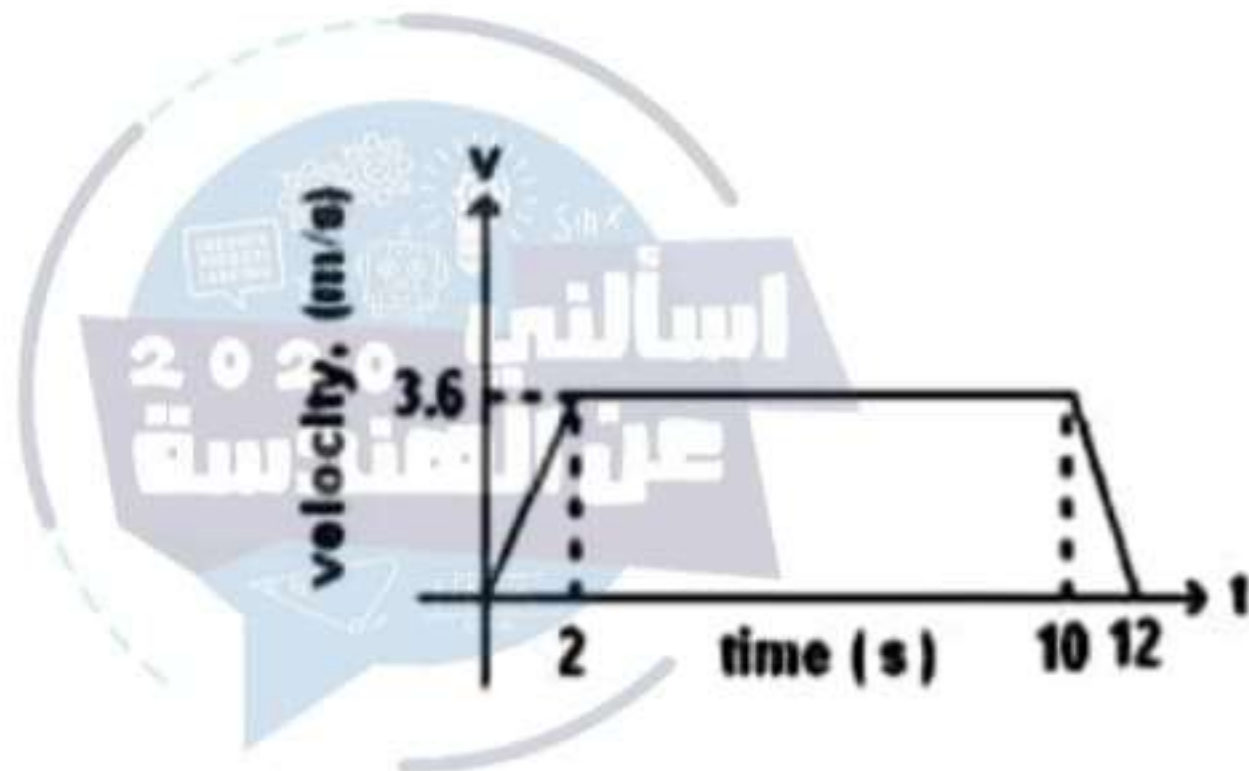
* When it changes direction $v = 0$.

$$v = \frac{\partial X}{\partial t} = 7 - 8t = 0 \Rightarrow t = 0.875$$

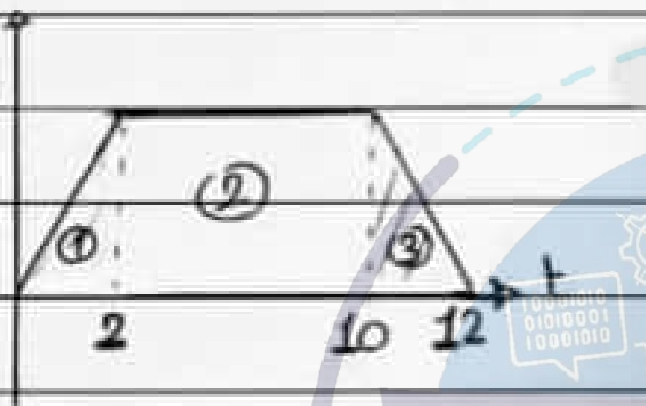
$$X = 6 + 7(0.875) - 4(0.875)^2 = 9.06 \text{ (m)}$$

A lift is going up. The variation in the speed of the lift is as given in the graph. What will be the average velocity of the lift ?

- a) 3 m/s
- b) 2.88 m/s
- c) 3.24 m/s
- d) 1 m/s
- e) none



⑨: 3.6



$$\Delta x = \left(\frac{1}{2} \times 2 \times 3.6 \right) + \left(3.6 \times (10 - 2) \right) + \left(\frac{1}{2} \times (12 - 10) \times 3.6 \right) \Rightarrow$$
$$= 36 \text{ m}$$

$$\vec{v}_{\text{avg}} = \frac{\Delta \vec{x}}{\Delta t} = \frac{36}{12} = 3 \text{ (m/s)}$$

An object starts motion from rest and from the origin and moves along the x axis with constant acceleration of 4 m/s^2 . Its average velocity as it moves from $x = 2 \text{ m}$ to $x = 8 \text{ m}$ is:

Select one:

- 2 m/s
- 6 m/s
- 5 m/s
- 1 m/s
- 3 m/s



$$\textcircled{11}: \quad v_2^2 - v_1^2 + 2a\Delta x \rightarrow v_2^2 = 0 + 2 \times 4 \times (2-0)$$
$$v_2 = \sqrt{16} = 4 \text{ (m/s)}$$

$$\Delta x = v_1 t + \frac{1}{2} a t^2$$
$$(8-2) = 4t + \frac{1}{2} \times 4 \times t^2$$

$$0 = 2t^2 + 4t - 6$$

$$0 = (t-1)(t+3) \rightarrow t=1, t=-3$$

$$\vec{v}_{\text{avg}} = \frac{\Delta x}{\Delta t} = \frac{(8-2)}{1} = 6 \text{ (m/s)}$$

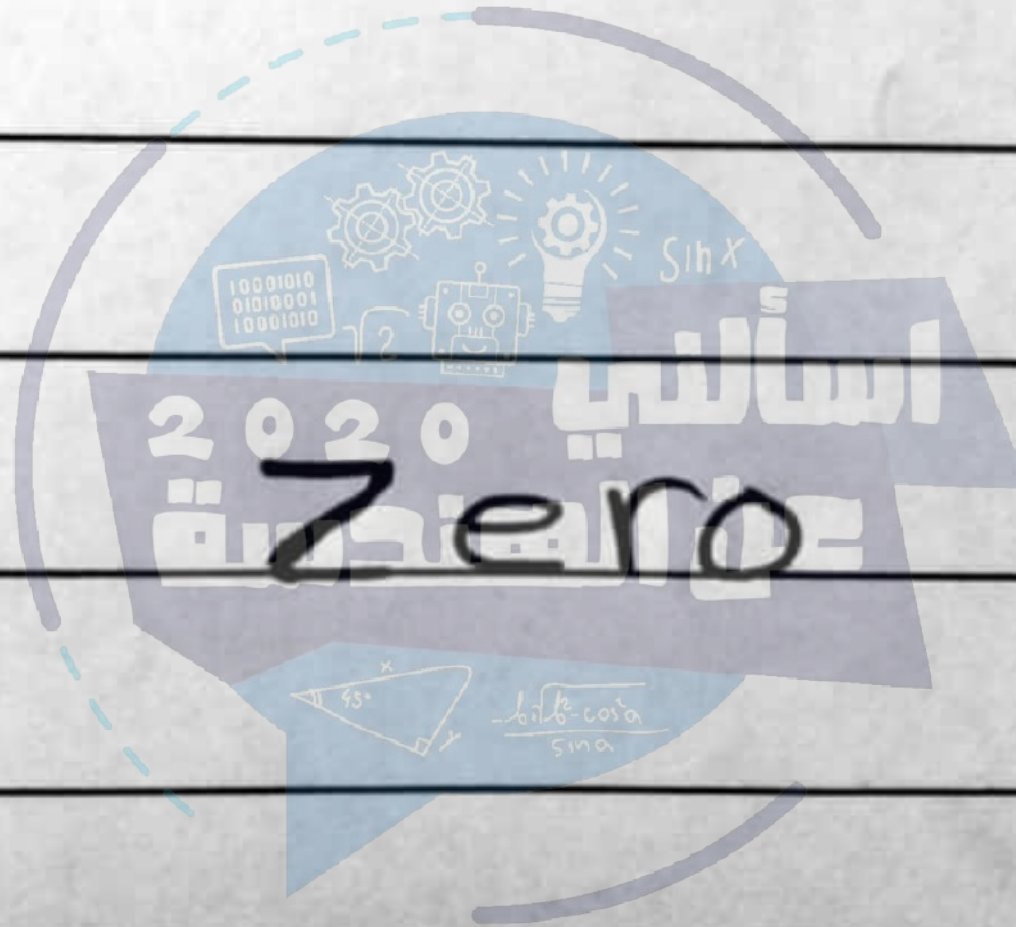
A plane travelling north at 250 m/s turns and then travels south at 250 m/s. The change in its velocity is

Select one:

- 500 m/s north
- 500 m/s south
- zero
- 250 m/s south

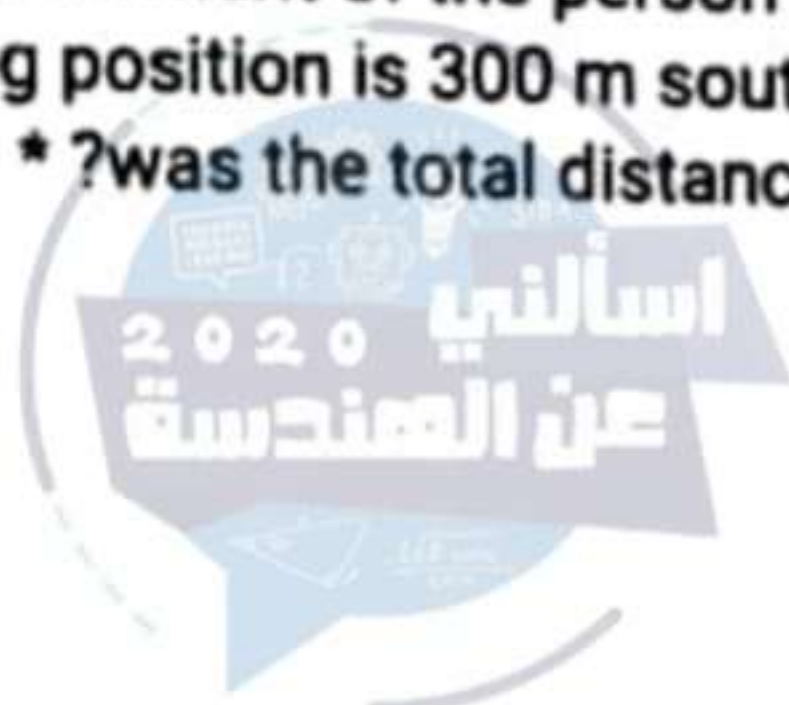


12:



A person walks in a distance x northward, turns around and walks a distance $7.00x$ southward. If the total displacement of the person from his starting position is 300 m south. What * was the total distance walked

(2 نقطة)



800

400

600

200

18:

$$\vec{\Delta} X - X_E - X_i$$

$$-300 = -6X - 0$$

$$X = 50$$

$$D = X + 7X$$

$$= 400(m)$$

$$-6X$$

$$6X$$

$$x$$

$$x$$