



# A

Name:

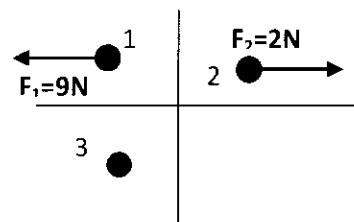
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Section:

1. A 0.4 kg ball is dropped from a window and landed on the street with speed 35 m/s, and then rebound with a speed 25 m/s. **The magnitude of the change of its momentum is:**

a) 40 kg m/s   b) 10 kg m/s   c) 20 kg m/s   d) 24 kg m/s

2. In the figure, **what is the magnitude of the force  $F_3$  acting on particle 3 if the center of mass of the system is stationary?**

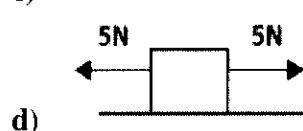
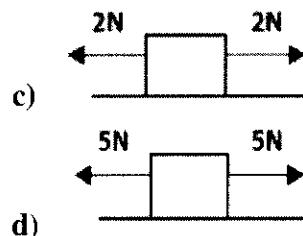
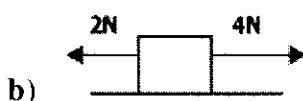
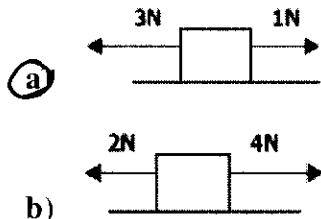


a) 2 N   b) -9 N   c) 7 N   d) 10 N

3. The **kinetic energy of a 2g particle traveling at 500 m/s is:**

a) 0.5 J   b) 500 J   c) 250 J   d) 2500 J

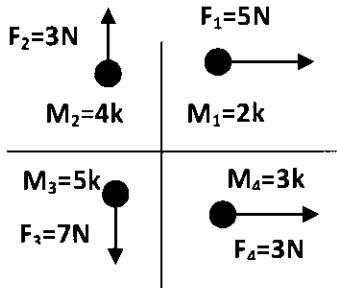
4. A box slides to the right over a frictionless table, in **which figure the net force does a negative work?**



5. In which situation of the following **the work** done by the force is **positive** ?

- a) The angle between  $\vec{F}$  and  $\vec{d}$  is  $76^\circ$
- c)  $\vec{F} = 7\hat{i} + 9\hat{j}$  and  $\vec{d} = -2\hat{i}$
- b) The angle between  $\vec{F}$  and  $\vec{d}$  is  $100^\circ$
- d)  $\vec{F} = 5\hat{i} - 10\hat{j}$  and  $\vec{d} = 2\hat{j}$

6. In the figure, four objects are subjected to external forces. **The x and y components** of acceleration of the center of mass  **$a_x$  and  $a_y$**  are:

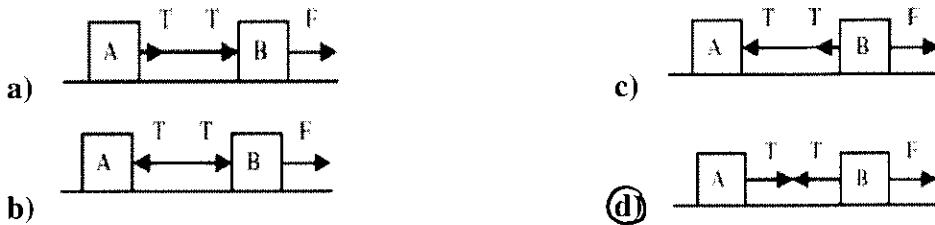


- a)  $a_{com,x} = 0.14 \text{ m/s}^2$ ,  $a_{com,y} = 0.17 \text{ m/s}^2$
- b)  $a_{com,x} = 0.57 \text{ m/s}^2$ ,  $a_{com,y} = -0.29 \text{ m/s}^2$
- c)  $a_{com,x} = 0.71 \text{ m/s}^2$ ,  $a_{com,y} = 0.24 \text{ m/s}^2$
- d)  $a_{com,x} = 0.19 \text{ m/s}^2$ ,  $a_{com,y} = -0.51 \text{ m/s}^2$

7. Which quantity of the following is **a scalar quantity** ?

- a) acceleration
- b) force
- c) work
- d) linear momentum

8. Which figure of the following give **the correct direction of the tension T** ?



9. A particle moves along an x axis, if the velocity of the particle changes from  $-3 \text{ m/s}$  to  $2 \text{ m/s}$ , the **kinetic energy** of the particle

- a) increase
- b) decrease
- c) remain constant
- d) zero

10. A body of mass of  $10 \text{ kg}$  and speed of  $5 \text{ m/s}$ , suddenly split into three bodies. **The momentum** of the body **before the split** is:

- a)  $50 \text{ kg m/s}$
- b)  $25 \text{ kg m/s}$
- c)  $15 \text{ kg m/s}$
- d)  $10 \text{ kg m/s}$

- 11. What is the y-coordinate** of the 4 kg particle in the table below, if the center of mass of the three particle system has the coordinates ( - 0.33m , 1.33m )

Mass	x-coordinate	y-coordinate
2 kg	3 m	2 m
3 kg	1 m	- 4 m
4 kg	-3 m	

- a) 2 m b) - 3 m c) 5 m d) - 4 m
- 12.** Two particles of masses 2 kg and 3 kg are located at 1 m and 2 m from the origin along the x axis respectively. **The position of the center of mass** is:
- a) 1.6 m b) 0 c) 1 m d) 2.7 m
- 13. What velocity** a 5000 kg truck must have in order to have **the same momentum** of a 10000 kg truck whose velocity is 20 m/s ?
- a) 20 m/s b) 40 m/s c) 60 m/s d) 80 m/s

Use the following to answer questions 14-15:

If the kinetic energy of a particle of **mass 2 kg** is **initially 10 J** and there is a net energy transfer of **5 J to the particle**

- 14. The final kinetic energy** of the particle is:

- a) 25 J b) 15 J c) 30 J d) zero

- 15. The initial speed** of the particle is:

- a) 3.16 m/s b) 15 m/s c) 2.24 m/s d) 5 m/s

- 16.** A force of 100 N acts on a box moving with a constant speed of 5 m/s along the positive x axis. **The power due to this force is :**

- a) 5 W b) 50 W c) 250 W d) 500 W

- 17.** A 6 kg body moves with a constant acceleration starting from rest to a speed of 15 m/s. **The work done** on the body is:

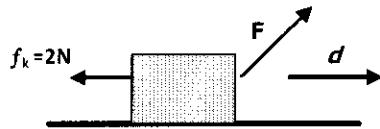
- a) 675 J b) 350 J c) 450 J d) 100 J

18. A force acts on a spring of length 30 cm and compressed it to a length of 25 cm, if the spring constant is 50 N/m. **The work done by the spring is:**

- a) 11.38 J   b) 3750 J   c) 678 J   d) 0.69 J

Use the following to answer questions 19-21:

A force  $\vec{F} = 5\hat{i} + 10\hat{j}$  is applied to a block that moves a distance  $\vec{d} = 2\hat{i}$  on a surface as shown.



19. **The work done on the block by the normal force  $F_N$  is:**

- a)  $F_N d \cos 0^\circ$    b)  $F_N d \cos 90^\circ$    c)  $F_N d$    d)  $F_N d \cos 180^\circ$

20. **The work done on the block by the frictional force  $f_k$  is:**

- a) -3 J   b) 2 J   c) 1 J   d) -4 J

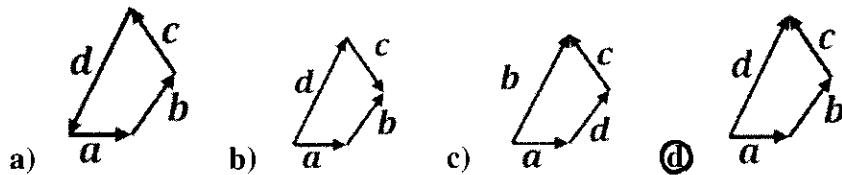
21. **The work done on the block by the force  $F$  is:**

- a) 35 J   b) 30 J   c) 25 J   d) 10 J

22. **The magnitude of the centripetal force is:**

- a)  $F = m \frac{v^2}{R^2}$    b)  $F = m \frac{v^2}{R}$    c)  $F = m \frac{v}{R}$    d)  $F = \frac{v^2}{R}$

23. The vectors  $\vec{a}, \vec{b}, \vec{c}$ , and  $\vec{d}$  are related by  $\vec{a} + \vec{b} + \vec{c} = \vec{d}$ . Which diagram below illustrates this relationship?

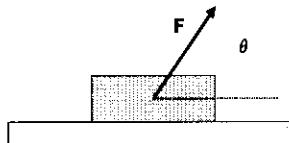


24. A particle travels in a circle of radius  $R$  with constant speed  $v$ . **The period of 3 revolutions is:**

- a)  $\frac{7\pi R}{v}$    b)  $\frac{5\pi R}{v}$    c)  $\frac{6\pi R}{v}$    d)  $\frac{2\pi R}{v}$

Use the following to answer questions 25-26:

In the figure a force  $F$  is applied to a block of mass  $m$  that slides along a floor, the coefficient of kinetic friction between the block and the floor is  $\mu_k$ .



**25. The x-component of the net force is:**

- a)  $F \cos \theta - \mu_k F_N = 0$   
 b)  $F \cos \theta - \mu_k F_N = ma_x$   
 c)  $F \sin \theta - \mu_k = ma_x$   
 d)  $F \sin \theta - mg = ma_x$

**26. The y-component of the net force is:**

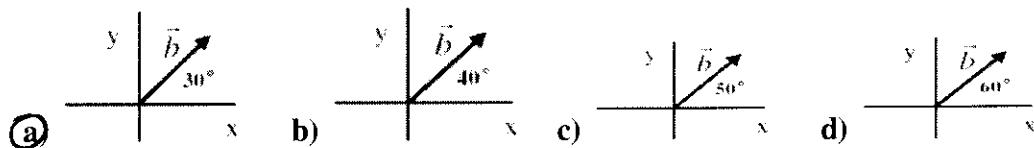
- a)  $F_N - mg = 0$   
 b)  $F \sin \theta - mg = 0$   
 c)  $F_N + F \cos \theta - mg = 0$   
 d)  $F_N + F \sin \theta - mg = 0$

**27.** There are two horizontal forces acting on the 2 kg box but only one force  $F_1 = 20 \text{ N}$  is shown in the figure, the box moves along the x axis with acceleration  $a = 20 \text{ m/s}^2$ . **The second force  $F_2 =$**



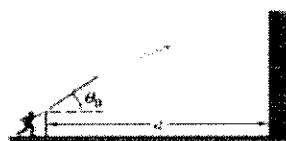
- a) 20 N   b) 10 N   c) 30 N   d) 50 N

**28. In which figure of the following  $b_x = 8.7 \text{ m}$  ? (  $b = 10 \text{ m}$  )**



Use the following to answer questions 29-30:

You throw a ball toward a wall at speed 20 m/s and at angle  $\theta_0 = 33^\circ$  above horizontal. It takes 0.8 s to hit the wall.



29. The vertical component of its velocity as it hits the wall is:

- a) 0.31 m/s b) 31 m/s c) zero **d)** 3.1 m/s

30. The horizontal component of its velocity as it hits the wall is:

- a) zero b) 11 m/s **c)** 16.8 m/s d) 30 m/s

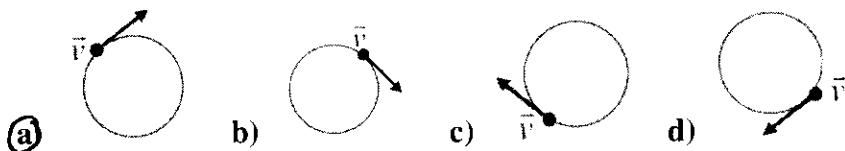
31. The components of  $\vec{a}$  are:  $a_x = 3 \text{ m}$ , and  $a_y = 4 \text{ m}$ , the direction of  $\vec{a}$  is:

- a)**  $53.13^\circ$  b)  $59^\circ$  c)  $63.4^\circ$  d)  $66.8^\circ$

32. If  $\vec{D} = 5\hat{i} + 25\hat{j}$ , then  $\frac{2\vec{D}}{10}$  equals:

- a)  $\hat{i} - 5\hat{j}$  b)  $5\hat{i} - \hat{j}$  **c)**  $\hat{i} + 5\hat{j}$  d)  $5\hat{i} + \hat{j}$

33. In circular motion, which figure represents the velocity  $\vec{v} = 400\hat{i} + 500\hat{j}$



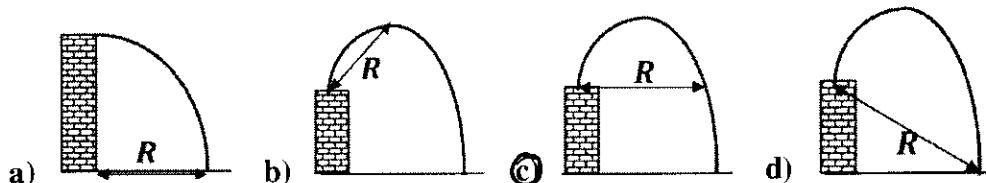
34. A particle undergoes a displacement  $\Delta\vec{r} = 2\hat{i} - 3\hat{j} + 6\hat{k}$ , The average velocity of the particle in 2 s is:

- a)**  $\hat{i} - 1.5\hat{j} + 3\hat{k}$  b)  $\hat{i} - 3\hat{j} + 3\hat{k}$  c)  $2\hat{i} - 3\hat{j} + 6\hat{k}$  d)  $2\hat{i} - 3\hat{j} + 3\hat{k}$

35. The range of a ball thrown at angle  $30^\circ$  above horizontal with velocity  $V_0$  is

- a)  $\frac{V_0^2}{g}$  **b)**  $\frac{V_0^2}{g} \sin 60$  c)  $\frac{V_0^2}{g} \sin 30$  d)  $\frac{V_0^2}{g} \sin 120$

36. In which figure R represents the range of the projectile ?



37. One Watt equals:

- a)  $J/s$  b)  $J/s^2$  c)  $J.s^2$  d)  $J.s$

38. The magnitude of  $\vec{A} \times \vec{B} = 0$  if the angle between  $\vec{A}$  and  $\vec{B}$  is:

- a)  $45^\circ$  b)  $90^\circ$  c)  $270^\circ$  d)  $0^\circ$

39. The magnitude of the vector  $\vec{A} = 5\hat{k}$  is:

- a) 0 b) 5 c) 10 d) 50

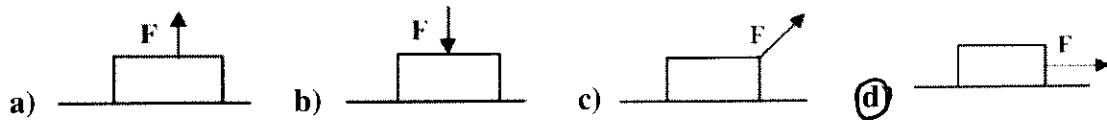
40. The base quantities of the SI units (m, kg, s) respectively are:

- a) (force, mass, time) c) (mass, speed, time)  
b) (length, mass, time) d) (length, weight, time)

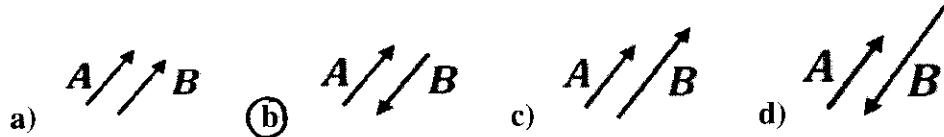
41. The position of a particle is given by:  $x(t) = 10 + t^2$ , the instantaneous acceleration at  $t = 1\text{ s}$  is:

- a)  $8\text{ m/s}^2$  b)  $6\text{ m/s}^2$  c)  $2\text{ m/s}^2$  d)  $4\text{ m/s}^2$

42. In which figure of the following the normal force on the block of mass m equals  $F_N = mg$



43. Which figure shows  $\vec{A} = -\vec{B}$



44. A particle undergoes a displacement  $\Delta\vec{r} = 2\hat{i} - 3\hat{j} + 6\hat{k}$ , If  $\vec{r}_2 = 3\hat{j} - 4\hat{k}$  then:

- a)  $\vec{r}_1 = 2\hat{i} - 9\hat{j} + 10\hat{k}$  b)  $\vec{r}_1 = 2\hat{i} + 2\hat{k}$  c)  $\vec{r}_1 = 2\hat{i} + 10\hat{k}$  d)  $\vec{r}_1 = -2\hat{i} + 6\hat{j} - 10\hat{k}$

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rebound = ارکت

Q(1);

$$|\Delta P| = |P_p - P_i| = m |v_p - v_i|$$

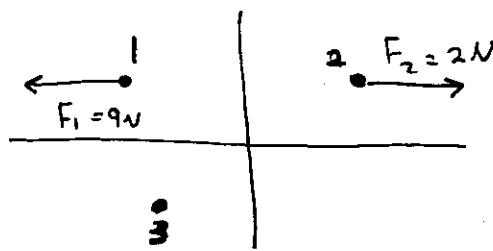
$$= 0.4 |25 - (-35)| = 0.4 |60| = 24 \text{ kg} \cdot \text{m/s} \quad (d)$$

$$v_f = -35 \text{ m/s}$$

$Q(z)$  com is stationary

$$\sum F_x = 0$$

$$F_{1x} + F_{2x} + F_{3x} = 0$$



$$-9 + 2 + F_{3n} = 0 \Rightarrow F_{3n} = +7N \quad \textcircled{C}$$

$$Q(3) \quad m = 2 \text{ g} \quad v = 500 \text{ m/s} \quad \Rightarrow k.E = ??$$

$$= 2 \times 10^{-3} \text{ kg}$$

$$K.E = \frac{1}{2} m v^2 = \frac{1}{2} (2 \times 10^{-3}) (500)^2 = 250 \text{ J} \quad \textcircled{C}$$

Q(4) @



$$F_{\text{act}} = \sum F_x = 1 - 3 = -2 \text{ N}$$



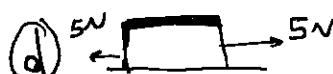
$$F_{net} = 2 - 2 = 0$$

$$w = 0$$

$$F \uparrow/d \text{ (anti-parallel)} \quad \checkmark$$

$$\Theta = 180^\circ \Rightarrow W(\text{+ve})$$

$$\Theta = 180 \Rightarrow \text{W}(\text{negative})$$



$$F_{net} = 5 - 5 = 0$$

$$w = 0$$

b (b)



$$F_{\text{net}} = 4 - 2 = +2 \text{ N}$$

$\longleftrightarrow$  Friction

## نهاء فرحا

$\omega \Rightarrow +ve$      $0 \leq \theta < 90$  or.  $F \parallel d$  (parallel)

Q(5) a)  $\theta = 76^\circ < 90$   
 $\Rightarrow \omega (+ve)$

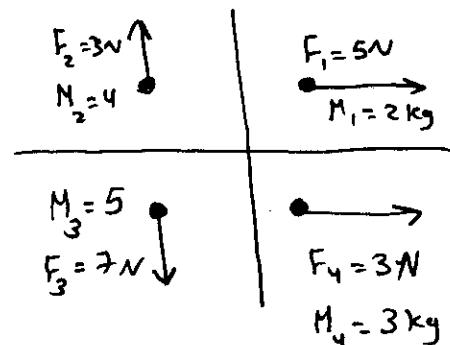
b)  $\theta = 100^\circ > 90 \Rightarrow \omega (-ve)$

c)  $\omega = F \cdot d = 7 \times 2 + 0 = -14 \text{ J} \Rightarrow -ve$

d)  $\omega = 0 - 10 \times 2 = -20 \text{ J} \Rightarrow -ve$

(a)

Particle	mass	$F_x$	$F_y$
1	2	+5	0
2	4	0	+3
3	5	0	-7
4	3	+3	0
	$M = 14$		



$$\sum F_x = M a_{com,x}$$

$$\sum F_y = M a_{com}$$

$$a_{com,x} = \frac{\sum F_x}{M} = \frac{F_{1x} + F_{2x} + F_{3x} + F_{4x}}{M}$$

$$= \frac{5+0+0+3}{14} = 0.57 \text{ m/s}^2$$

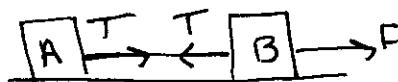
$$a_{com,y} = \frac{\sum F_y}{M} = \frac{F_{1y} + F_{2y} + F_{3y} + F_{4y}}{M}$$

$$= \frac{0+3-7+0}{14} = -0.29 \text{ m/s}^2$$

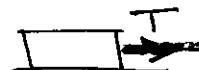
(b)

Q(8)

(d)



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ابعد عن اتجاه ابهل



Q(9)

$$v_i = -3 \text{ m/s}$$

$$v_f = 2 \text{ m/s}$$

$$k_i = \frac{1}{2} m (-3)^2$$

$$= \frac{1}{2} m (9)$$

$$k_f = \frac{1}{2} m (2)^2$$

$$= \frac{1}{2} m (4)$$

$$\text{or } \Delta k = k_f - k_i = \frac{1}{2} m (2^2 - 3^2)$$

$$= \frac{1}{2} m (4 - 9) = -\frac{5}{2} m$$

-ve decrease

$$v : -3 \rightarrow 2$$

$\Rightarrow v$  decrease

$\Rightarrow k$  E decrease

(b)

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Q(10)

$$\begin{array}{l} \textcircled{1} \\ m = 10 \text{ kg} \\ v = +5 \text{ m/s} \\ P_{\text{initial}} \end{array} \xrightarrow{\hspace{1cm}} \begin{array}{l} 2 \\ 3 \\ P_{\text{final}} \end{array}$$

$$P_p = m \cdot v = 10 \times 5 = 50 \text{ kg} \cdot m/s$$

Q(11) (-0.33m, 1.33m)

$$x_{\text{com}}^{\downarrow} \quad y_{\text{com}}^{\downarrow}$$

Mass	X	y
2	3	2
3	1	-4
4	-3	$y_3 = ??$
M = 9	$x_{cm} = -0.33$	$y_{cm} = 1.33$

$$\frac{y}{\text{cm}} = \frac{m_1 y_1 + m_2 y_2 + m_3 y_3}{M}$$

$$1.33 = \frac{2 \times 2 + 3 \times 4 + 4 \times 15}{9}$$

$$9 \times 1.33 = 4 - 12 + 4y_3$$

$$4y_2 = 11.97 - 4 + 12 = 19.97$$

$$\frac{y_3}{3} = \frac{19.97}{4} = 4.99 = 5 \text{ m}$$

Q (12)

P.	M	X
1	2	1
2	3	2
	<u>M=5</u>	

$$\Rightarrow \text{Position} = x_{\text{com}} = \frac{2x_1 + 3x_2}{5} = \frac{2+6}{5}.$$

$$x_{\text{com}} = 1.6 \text{ m} \quad \textcircled{a}$$

Q(13)

$$m = 5000 \text{ kg} \quad v = ??$$

$$m_2 = 100 \text{ kg} \quad v_2 = 20 \text{ m/s}$$

$$P_1 = P_2$$

$$m_1 v_1 = m_2 v_2 \Rightarrow v_f = \frac{m_2 v_2}{m_1} = \frac{1000 \times 20}{5000} = 40 \text{ m/s} \quad (b)$$

Q(14)

$$\frac{m}{\cancel{m}} = 2/cg$$

$$k_0 = 10J$$

$$W_{\text{net}} = \Delta K = +5 \text{ J}$$

Q(14)

$$\Delta K = K_p - K_i$$

$$5 = K_F - 10 \Rightarrow K_F = 5 + 10 = 15 \text{ J} \quad (b)$$

## نهاء فر罕

Q(15)  $K = \frac{1}{2} m v^2 \Rightarrow K_p = \frac{1}{2} m v_p^2$

$$10 = \frac{1}{2} (x) v_p^2 \Rightarrow v_p = \sqrt{10} = 3.16 \text{ m/s}$$

(a)

Q(16)  $F = 100 \text{ N}$   $v = 5 \text{ m/s}$



$$\begin{aligned} P &= F \cdot v = F v \cos \theta \\ &= (100)(5) \cos 0 = 500 \text{ Watt} \end{aligned}$$

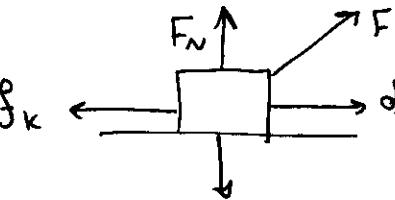
(d)

Q(17)  $m = 6 \text{ kg}$   $a: \text{const.}$   $v_0 = 0$   $v_f = 15 \text{ m/s}$

$$\begin{aligned} W = \Delta K &= \frac{1}{2} m [v_f^2 - v_0^2] \\ &= \frac{1}{2} (6) [15^2 - 0] = 675 \text{ J} \end{aligned}$$

Q(18)  $\vec{F} = 5\hat{i} + 10\hat{j}$   $d = 2\hat{i}$

Q(19)  $W_{FN} = F_N d \cos 90^\circ = 0$  (b)



Q(20)  $W_F = -Fd = -(2)(2) = -4 \text{ J}$  (d)

Q(21)  $W_F = F \cdot d = 5 \times 2 + 10 \times 0 = 10 \text{ J}$  (d)

Q(18)  $x_p = 30 \text{ cm} = 30 \times 10^{-2} \text{ m}$   $x_f = 25 \text{ cm} = 25 \times 10^{-2} \text{ m}$   $k = 50 \text{ N/m}$

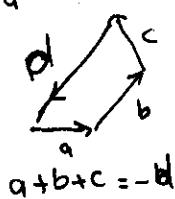
$$W_s = \frac{1}{2} k (x_p^2 - x_f^2) = \frac{1}{2} (50) [(30 \times 10^{-2})^2 - (25 \times 10^{-2})^2] = 0.625 \text{ J}$$

Q(22)  $|F_\perp| = m a_\perp = m \frac{v^2}{r}$  (b)

## هشائء فرحاً

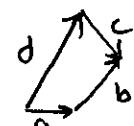
$$\vec{a} + \vec{b} + \vec{c} = \vec{d}$$

Q(23)



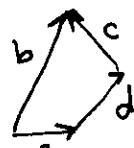
$$a + b + c = -d$$

(b)



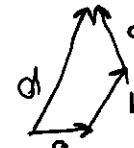
$$a + b - c = d$$

(c)



$$a + d + c = b$$

(d)



$$a + b + c = d$$

(d)

Q(24) 3 revolution =  $3T$

$$T = \frac{\text{distance}}{\text{speed}} = \frac{2\pi r}{v}$$

$$T = \frac{2\pi R}{v}$$

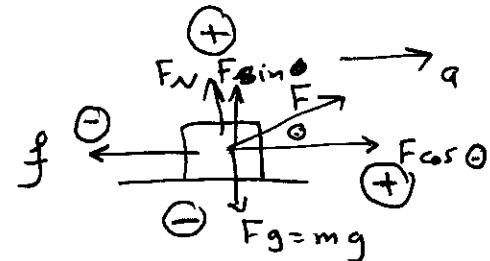
$$t = 3T = 3 \left( \frac{2\pi R}{v} \right) = 6 \frac{\pi R}{v} \quad (c)$$

Q(25)

$$\sum F_x = ma_x$$

$$\sum F_x = F \cos \theta - f_k = ma$$

$$F \cos \theta - \mu_k F_N = ma \quad (b)$$



Q(26)

$$\sum F_y = 0$$

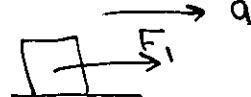
$$F_N + F \sin \theta - mg = 0 \quad (d)$$

Q(27)

$$a = +20 \text{ m/s}$$

$$\sum F_x = ma_x$$

$$F_{1x} + F_{2x} = +ma$$



$$F_{2x} = m a - F_{1x} = (2)(20) - (+20) = 20N \quad (a)$$

Q(28) a)  $b_x = b \cos \theta$

$$\begin{aligned} a) b_x &= 10 \cos 30 \\ &= 8.7 \text{ m} \end{aligned}$$

$$\begin{aligned} b) b_x &= 10 \cos 40 \\ &= 7.7 \text{ m} \end{aligned}$$

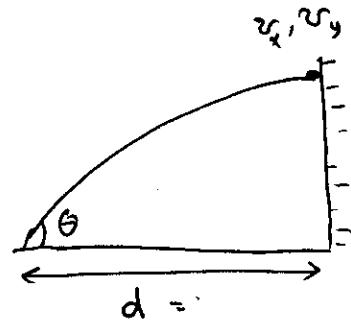
$$\begin{aligned} c) b_x &= 10 \cos 50 \\ &= 6.4 \text{ m} \end{aligned}$$

$$\begin{aligned} d) b_x &= 10 \cos 60 \\ &= 5 \text{ m} \end{aligned}$$

✓  
(a)

هذا فرمان

$$v_0 = 20 \text{ m/s} \quad \theta = 33^\circ \quad t = 0.85$$



$$Q(29) \quad v_y = v_{oy} - gt \\ = v_o \sin \theta_0 - gt \\ = 20 \sin(33) - 9.8(0.8) = 3.1 \text{ m/s} \quad (d)$$

$$Q(30) \quad v_x = v_{ox} \cos \theta = 20 \cos(33) = 16.8 \text{ m/s} \quad (c)$$

$$Q(31) \quad \Theta = \tan^{-1} \frac{ay}{ax} = \tan^{-1} \frac{4}{3} = 53.13^\circ \quad (a)$$

$$Q(32) \quad D = 5^{\circ} + 25^{\circ}$$

$$\frac{2\vec{D}}{10} = \frac{2}{10}(5)\vec{i} + \frac{2}{10}(25)\vec{j} = 5\vec{i} + 25\vec{j} \quad \textcircled{C}$$

$$Q(33) \quad v = 400 \hat{i} + 500 \hat{j}$$



ج) مستحبة في الربع الأول لذاته ( $\rightarrow \rightarrow$ ) ،  $\rightarrow$  و  $\rightarrow$

$$Q(34) \quad \Delta n = 2^{\circ} - 3^{\circ} + 6^{\circ} \quad \Delta t = 2S$$

$$2r = \frac{4N}{4t} = \frac{2}{2} i - \frac{3}{2} j + \frac{6}{2} k = i - 1.5 j + 3k \quad (a)$$

$$Q(35) \quad R = \frac{U_i^2}{g} \sin 2\theta. \quad \theta_0 = 30^\circ \quad 2\theta_0 = 2 \times 30^\circ = 60^\circ$$

$$R = \frac{U_0^2}{g} \sin 60$$

Q(36)



R كم المسافة بين بداية الـ نحلات و العودة  
اى نفس المستوى

**هذاء فرحاً**

$$P = \frac{w}{s}$$

$$Q(37) \quad 1 \text{ Watt} = \frac{J}{s} \quad (a)$$

$$Q(38) \quad A \times B = AB \sin \phi$$

$$A \times B = 0 \Rightarrow \sin \phi = 0 \Rightarrow \phi = 0 \quad (d)$$

$$Q(39) \quad \bar{A} = 5\hat{k} \quad \Rightarrow |A| = \sqrt{5^2} = 5 \quad (b)$$

Q(40)  $(m, kg, s)$   
 $(\downarrow$  length, mass, time) (b)

$$Q(41) \quad x = 10 + t^2 \Rightarrow v = \frac{dx}{dt} = 2t \Rightarrow a = \frac{dv}{dt} = 2 \text{ m/s}^2 \text{ at any time } (c)$$

$$Q(42) \quad a) \quad \begin{array}{c} F \uparrow \\ \square \\ mg \downarrow \end{array}$$

$$F_2 + F = mg$$

$$F_N = mg - F$$

$$F_N = mg + F$$

A free body diagram of a rectangular block on an inclined plane. The incline is labeled  $\theta$ . Four vectors are shown originating from the center of the block:  $F_n$  is perpendicular to the incline pointing upwards;  $F \sin \theta$  is parallel to the incline pointing down;  $F \cos \theta$  is perpendicular to the incline pointing to the right; and  $mg$  is vertical, pointing downwards.

$$F_N + F \sin \theta = mg$$

A free body diagram of a rectangular block. A vertical arrow labeled  $F_n$  points upwards from the bottom center. A horizontal arrow labeled  $F$  points to the right from the right edge. A vertical arrow labeled  $mg$  points downwards from the center.

$$F_g = mg$$

1

Q(43)  $A = -B$    
 A and B equals in  
 mag. and oppose dir. (b)

$$Q(44) \quad \Delta w = 2^{\circ} - 3^{\circ} + 6 \text{ K} \quad \Delta w = w_2 - w_1 \\ w_2 = 3^{\circ} - 4 \text{ K} \quad w_1 = w_2 - \Delta w \\ \Delta w = (+2)^{\circ} (-3)^{\circ} (+6) \text{ K} \\ w_1 = -2^{\circ} + 5^{\circ} - 10 \text{ K} \quad (d)$$