CHAPTER 7

Choose the correct answer:

1. The **kinetic energy** of a **90 kg** football player running at speed **10 m/s** is:

(a) 4500 kg m/s^2 (b) 4500 kg m^2/s^2 (c) 4500 kg m/s (d) 4500 kg^2 m^2/s^2

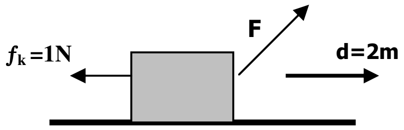
---

2. A force $\vec{F} = 3\hat{i} + 5\hat{j}$ is applied to a block that moves a distance $\vec{d} = 2\hat{i}$ on a surface. The **work** done on the block **by the force F** is:

(a) 6 J (b) 10 J (c) 16 J (d) 11.7 J

---

3. In the figure the force F moved the block a distance d, the **work** done on the block **by the frictional force** is:



(a) 2 J (b) 0 (c) -1 J (d) - 2 J

---

4. Which of the following particles that moves along the x-axis has a **negative work done on it** ?

Particle	K_i (initial KE)	K_f (final KE)
A	9 J	4 J
B	4 J	4 J
C	5 J	8 J
D	3 J	Zero

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

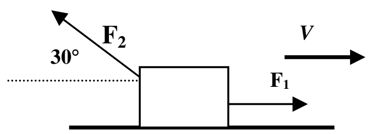
---

5. The work done by the gravitational force on a **5 kg** body raised vertically (رفع إلى أعلى) a distance **0.5 m** is:

(a) + 24.5 J (b) + 2.5 J (c) – 24.5 J (d) – 2.5 J

---

6. The **power** due to **F_1** and **F_2** acting on a box sliding **to the right** across a frictionless floor with velocity **v** is:



(a) $P_1 = F_1$ v cos 180, $P_2 = F_2$ v cos 150
(b) $P_1 = F_1$ v cos 180, $P_2 = F_2$ v cos 30
(c) $P_1 = F_1$ v cos 0, $P_2 = F_2$ v cos 30
(d) $P_1 = F_1$ v cos 0, $P_2 = F_2$ v cos 150

---

7. In which of the following situation the **net power = zero ?**

situation	P_1	P_2	P_3
A	**12**	**5**	**-7**
B	**-13**	**3**	**-2**

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C	**15**	**-12**	**-3**
D	**10**	**2**	**-7**

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

---

8. A spring of **k = 408 N/m** is pulled to the position **x = 17 mm**, the **work done by the spring force** is:

(a) – 5.9 x 10^{-2} J (b) – 59 x 10^{-2} J (c) – 0.59 x 10^{-2} J (d) – 590 x 10^{-2} J

---

9. If the kinetic energy of a particle is **initially 5 J** and there is a net transfer of **2 J to the particle**, then the **final kinetic energy** is :

(a) 3 J (b) 7 J (c) 5 J (d) 2.5 J

---

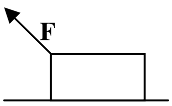
10. Which of the following bodies has the **largest kinetic energy** ?

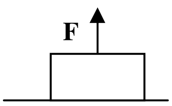
Body	**Mass (kg)**	**Velocity(m/s)**
A	**3 m**	**V**
B	**3 m**	**2 V**
C	**2 m**	**3 V**
D	**m**	**4 V**

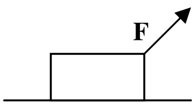
(a) body A (b) body B (c) body C (d) body D

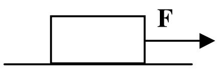
---

11. A force **F** acts on a box that **slides to the right** a distance **d** across a **frictionless** floor. In which situatin of the following the **work done** by this force on the box is **zero** ?

(a) 

(b) 

(c) 

(d) 

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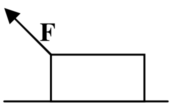
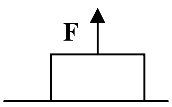
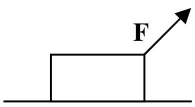
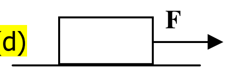
12. In **question 11**, which figure gives **W = F d** ?

(a) 

(b) 

(c) 

(d) 

---

13. Which of the following is the correct **unit of work** ?

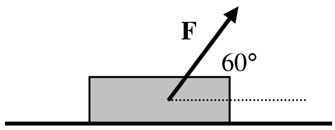
(a) $N.m^2$ (b) $N^2.m$ (c) Joule (d) Joule.m

---

14. A particle moves through a **displacement** $\vec{d} = (15m)\hat{i} - (12m)\hat{j}$ along a straight line while being acted on by a **force** $\vec{F} = (210N)\hat{i} - (150N)\hat{j}$. **The work** done on the particle by this force is:

(a) 4950 J (b) 1350 J (c) 3150 J (d) 1800 J

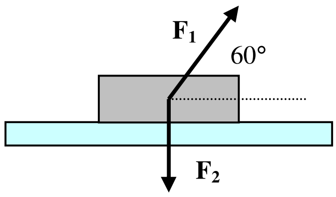
15. The figure shows a force **F** applied to a box that **moves to the right** for a **distance d** over a frictionless floor. The **work done on the box** by the force **F** is:



(a) F cos 60 (b) F d cos 60 (c) F sin 60 (d) F d sin 60

---

16. The figure shows two forces applied to a box that **moves to the right** for a **distance of 3 m** over a frictionless floor. The force magnitudes are **F_1=9 N , F_2=3 N**.
What is the **work done on the box** by the force **F_1**?



(a) 23.4 J (b) zero (c) 13.5 J (d) 27 J

---

17. In **question 16**, what is the work done by the force **F_2?**

(a) 23.4 J (b) zero (c) 13.5 J (d) 9 J

---

18. A force F acts on a box that **slides to the right** a distance d across a **frictionless** floor. In which situation of the following the **work done** by this force on the box is **zero**?

(a) The angle between $\vec{F}$ and $\vec{d}$ is 150° (b) The angle between $\vec{F}$ and $\vec{d}$ is 90° (c) The angle between $\vec{F}$ and $\vec{d}$ is 45° (d) The angle between $\vec{F}$ and $\vec{d}$ is 0°

---

19. In **question 27**, which situation gives **W =** $F\ d$?

(a) The angle between $\vec{F}$ and $\vec{d}$ is 150° (b) The angle between $\vec{F}$ and $\vec{d}$ is 90° (c) The angle between $\vec{F}$ and $\vec{d}$ is 45° (d) The angle between $\vec{F}$ and $\vec{d}$ is 0°

---

20. A particle moves through a **displacement** $\vec{d} = -\ 4\hat{i}$ meter along a straight line while being acted on by a **force** $\vec{F} = 2\hat{i} - 3\hat{j}$ Newton. **The work** done on the particle by this force is:

(a) +2 J (b) – 4 J (c) +5 J (d) – 8 J

---

21. Two men sliding a box of mass **m** a displacement **d** along the x-axis, if the work done by the first man was **W_1= 60 J**, and the net work on the box was **W=120 J**. What is the work **W_2** done by the second man?

(a) W_2= 0 (b) W_2= 60 J (c) W_2= 120 J (d) W_2= 180 J

---

22. In **question 21**, What is the work done on the box (**W_g**) by the **gravitational force**?

(a) 0 (b) 60 J (c) 120 J (d) 180 J

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23. In **question 21**, if the box was initially **stationary**, what is its speed v_f at the end of the displacement?

(a) $v_f = \sqrt{\frac{2W}{m}}$ (b) $v_f = \sqrt{\frac{m}{2W}}$ (c) $v_f = \sqrt{\frac{2m}{W}}$ (d) $v_f = \sqrt{\frac{W}{2m}}$

24. Which of the following bodies has the **smallest kinetic energy** ?

Body	Mass(kg)	Velocity(m/s)
A	3 m	1 V
B	3 m	2 V
C	2 m	3 V
D	1 m	4 V

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

25. A block lies on a frictionless floor attached to a spring of **spring constant k=408 N/m, how much work** does the spring force do on the block if it is pulled from $\mathbf{x_1=0}$ to $\mathbf{x_2=10}$ **mm**?

(a) – 0.03 J (b) – 0.02 J (c) – 0.04 J (d) – 0.05 J

26. A block of weight **100 N** lifted up **1 m** by a man, **the work done by the gravitational force** on it is:

(a) 100 J (b) – 100 J (c) 10.2 J (d) -10.2 J

27. A block is pulled at a **constant speed of 2 m/s** across a horizontal floor by an applied force of **2 N** directed **60°** above the horizontal. **What is the power acting on the block due to the force**?

(a) 2 Watt (b) 3 Watt (c) 4 Watt (d) 6 Watt

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CHAPTER 9

28. In the **closed** and **isolated** system :

(a) mass = constant $F_{external}$ = zero
(b) mass = zero $F_{external}$ =constant
(c) mass = constant $F_{external}$ =constant
(d) mass = zero $F_{external}$ = zero

---

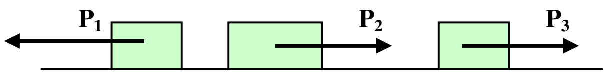
29. How fast would a man of mass 80 kg have to run to have the **same linear momentum** as a **1600 kg** car moving at **1.2 km/h**?

(a) 0.24 km/h (b) 2.4 km/h (c) 24 km/h (d) 240 km/h

---

30. A box sliding along x-axis on a frictionless surface, suddenly **explodes** into three pieces.The figure shows the momenta of the three pieces, **find the initial momentum** of the box?

P_1 = 10 kg m/s
P_2 = 2 kg m/s
P_3 = 6 kg m/s



(a) – 18 kg m/s (b) 18 kg m/s (c) 2 kg m/s (d) – 2 kg m/s

---

31. A **2 kg** body moving with velocity **3 m/s** and a **3 kg** body moving with velocity **–1 m/s** along the **x-axis. Find** the **total linear momentum** of the system of the two bodies?

(a) 3 kg m/s (b) 9 kg m/s (c) 8 kg m/s (d) 2 kg m/s

---

32. A box of mass **m=6 kg** slides with velocity **v= +4 m/s** across a frictionless floor suddenly explodes into two pieces. One piece **m_1=2 kg** moves with velocity **v_1=+8 m/s. What is** the **velocity v_2 of the second piece m_2**?

(a) 24 m/s (b) 16 m/s (c) 8 m/s (d) 2 m/s

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Chapter 1: MEASUREMENT

Choose the correct answer:

1. We can write the speed of light **(c = 299,000,000 m/s)** using the **scientific notation as:**

(a) 2.99×10^{8} (b) 29.9×10^{8} (c) 0.299×10^{8} (d) 299×10^{8}

---

2. A car moving with a speed of **100 km/h**, what is its speed in **m/s**?

(a) 27.8 m/s (b) 16.7 m/s (c) 277.8 m/s (d) 167.7 m/s

---

3. We can express the very small number (**0.000 000 004 56**) using the scientific notation as:

(a) 4.56×10^{-8} (b) 4.56×10^{-9} (c) 4.56×10^{-10} (d) 4.56×10^{-11}

---

4. The conversion factor to convert **3 min to seconds** is

(a) $\frac{3600 s}{3 \min}$ (b) $\frac{60 s}{3 \min}$ (c) $\frac{3600 s}{1 \min}$ (d) $\frac{60 s}{1 \min}$

---

5. Which of the following is **not a base quantity** ?

(a) speed (b) mass (c) length (d) time

---

6. How many **centimeters in 1 km**?

(a) 10^{5} cm (b) 10^{2} cm (c) 10 cm (d) 10^{4} cm

---

7. The **conversion factor** to convert **hours to seconds** is:

(a) $\frac{1\ s}{3600\ h}$ (b) $\frac{3600\ h}{1\ s}$ (c) $\frac{1\ h}{3600\ s}$ (d) $\frac{3600\ s}{1\ h}$

---

8. (**1 m = 3.281 ft**) then **1.5 ft/h** equals:

(a) 1.37×10^{-3} m/s (b) 1.27×10^{-4} m/s (c) 1645.8 m/s (d) 17717.4 m/s

---

9. A **square** with an **edge** of **1 cm** has an area of: (area = edge^2)

(a) 10^{2} m^2 (b) 10^{4} m^2 (c) 10^{-4} m^2 (d) 10^{-6} m^2

---

10. **10^3 gigawatts** is:

(a) 10^{12} watts (b) 10^{9} watts (c) 10^{-6} watts (d) 10^{-3} watts

---

11. The **conversion factor** to convert **10 kg to g** is:

(a) $\frac{10^{3} g}{1 kg}$ (b) $\frac{10^{3} g}{10 kg}$ (c) $\frac{1 kg}{10^{3} g}$ (d) $\frac{10 kg}{10^{3} g}$

---

12. Which prefix is **true**?

(a) milli = 10^3 (b) micro = 10^{-9} (c) mega = 10^6 (d) pico = 10^9

13. **1 mm^2** =

(a) 10^{-3} m^2 (b) 10^{-6} m^2 (c) 10^{-9} m^2 (d) 10^{-12} m^2

14. If the **length, height, and width** of a **rectangular block** are **3 cm, 4 cm, and 5 cm** respectively, then the **volume** is

(a) 60 m^3 (b) 60 cm^3 (c) 60 m (d) 60 cm

15. If **1 mi = 1609 m** then **55 mi/h** is

(a) 15.4 m/s (b) 24.6 m/s (c) 66.3 m/s (d) 88.1 m/s

16. A **nanosecond** is:

(a) 10^{9} s (b) 10^{-9} s (c) 10^{10} s (d) 10^{-10} s

17. A **gram** is**:**

(a) 10^{-6} kg (b) 10^{-3} kg (c) 10^{6} kg (d) 10^{3} kg

18. The **SI base unit** for **mass** is**:**

(a) gram (b) pound (c) kilogram (d) kilopound

19. There are **1000 meters** in

(a) 1 kilometer (b) 10 kilometer (c) 100 cm (d) 10,000 cm

20. How many **centimeters in 1 km**?

(a) 10^5 cm (b) 10^2 cm (c) 10 cm (d) 10^4 cm

21. The **conversion factor** to convert **hours to seconds** is:

(a) $\frac{1\ s}{3600\ h}$ (b) $\frac{3600\ h}{1\ s}$ (c) $\frac{1\ h}{3600\ s}$ (d) $\frac{3600\ s}{1\ h}$

22. If **1m = 3.281 ft**, then **3.375 ft^3 =**

(a) 1.2×10^2 m^3 (b) 9.6×10^{-2} m^3 (c) 10.5 m^3 (d) 0.21 m^3

23. 10^{-9} second is

(a) millisecond (b) microsecond (c) nanosecond (d) gigasecond

24. A **10 kilogram** =

(a) 10^{6} g (b) 10^{3} g (c) 10^{4} g (d) 10^{2} g

25. The SI units of the base quantities (Length, Mass, Time) are:

(a) m, kg, s (b) cm, g, s (c) km, g, s (d) km, kg, s

26. (0.000 000 00636) is equal to:

(a) 6.36×10^{-7} (b) 6.36×10^{-8} (c) 6.36×10^{-9} (d) 6.36×10^{-10}

27. 50 km =

(a) 5×10^{5} cm (b) 5×10^{6} cm (c) 5×10^{7} cm (d) 5×10^{8} cm

28. 100 g/cm^{3} =

(a) 10^{3} kg/m^{3} (b) 10^{4} kg/m^{3} (c) 10^{5} kg/m^{3} (d) 10^{6} kg/m^{3}

29. a microsecond is:

(a) 10^{6} s (b) 10^{-6} s (c) 10^{9} s (d) 10^{-9} s

30. The **conversion factor** to convert **6 m to mm** is:

(a) $\frac{10^{3}\,mm}{1m}$ (b) $\frac{10^{3}\,mm}{6m}$ (c) $\frac{1m}{10^{3}\,mm}$ (d) $\frac{6m}{10^{3}\,mm}$

Are the following statements (**True** ✓) or (**False** ×) ?

31. The SI base unit for mass is gram.

(a) True (b) False

32. There are 1209600 seconds in one week.

(a) True (b) False

Chapter 2: MOTION ALONG A STRAIGHT LINE

Choose the correct answer:

1. Suppose the motion of a particle is described by the equation**:** $\mathbf{X = 20 + 4\,t^2}$**.** Find the **instantaneous velocity at t =5 s** ?

(a) 16 m/s (b) 60 m/s (c) 40 m/s (d) 36 m/s

---

2. A ball thrown vertically upward with an initial velocity of **12 m/s**, **what is the ball's maximum height**?

(a) 7.35 m (b) 14.7 m (c) 0.61 m (d) 1.22 m

---

3. A body moves along the x-axis with constant acceleration $\mathbf{a = 4\ m/s^2}$. At **t=0** the body is at $\mathbf{x_0 = 5\ m}$ and has velocity $\mathbf{v_0 = 3\ m/s}$. Find its **position at t = 2 s** ?

(a) 14 m (b) 19 m (c) 15 m (d) 18 m

---

4. Suppose the velocity of the particle is given by the: $\mathbf{v = 10 + 2\,t^2}$ where **v** is in m/s and **t** is in s . Find **the change in velocity** of the particle in the time interval between $\mathbf{t_1 = 2\ s}$ **and** $\mathbf{t_2 = 5\ s}$?

(a) 41 m/s (b) 14 m/s (c) 24 m/s (d) 42 m/s

---

5. In question 4, Find **the instantaneous acceleration when t = 2 s** ?

(a) 4 m/s^2 (b) 14 m/s^2 (c) 8 m/s^2 (d) 18 m/s^2

---

6. Which pair of the following **initial and final positions** along the x-axis give a **positive** displacement?

(a) - 3m, +5m (b) - 3m, - 4m (c) 5m, - 3m (d) 4m, 3m

---

7. You walk a distance **1.22 m in 1 s** and then run a distance **3.05 m in 1 s**, what is your **average speed**?

(a) 0.92 m/s (b) 4.27 m/s (c) 2.14 m/s (d) 1.83 m/s

---

8. The following are equations of the velocity v(t) of a particle, in which situation the **acceleration is constant**?

(a) $v = 3t + 6$ (b) $v = 4\,t^2$ (c) $v = 3\,t^2 - 4\,t$ (d) $v = 5\,t^3 - 3$

---

9. A particle's position on the x-axis is given by $X = 8 - 5\,t + 25\,t^2$, with X in meters and t in seconds. Find the particles **velocity function**?

(a) $v = -5 + 25\,t$ (b) $v = -5 + 50\,t$ (c) $v = 8 - 5 + 25\,t$ (d) $v = 8 + 5 + 50\,t$

---

10. A rocket ship moves with **constant acceleration** equal to 9.8 m/s^2, if it starts from rest **how long** will it take to reach a velocity $\frac{1}{10}$ the velocity of light? (V_{light} =3 x 10^8 m/s)

(a) 3.1 x 10^5 s (b) 3.1 x 10^7 s (c) 3.1 x 10^6 s (d) 3.1 x 10^4 s

---

11. In **question 10**, **how far** will the rocket ship travel?

(a) 4.6 x 10^{13} m (b) 4.6 x 10^{10} m (c) 4.6 x 10^{12} m (d) 4.6 x 10^{11} m

---

12. A ball thrown vertically upward with an initial velocity of **12 m/s**, **how long** does the ball take to reach its **maximum height**?

(a) 0.74 s (b) 1.35 s (c) 0.82 s (d) 1.22 s

---

13. A car moving with a constant acceleration covered a **distance** between two points **60 m** apart in **6 s**, what was its **initial speed** if the **final speed was 15 m/s**?

(a) -10 m/s (b) -5 m/s (c) 5 m/s (d) 17.5 m/s

---

14. The **instantaneous acceleration** a equals:

(a) $\frac{dx}{dt}$ (b) $\frac{d}{dt}\left(\frac{d^2x}{dt^2}\right)$ (c) $\frac{d^2}{dt^2}\left(\frac{dx}{dt}\right)$ (d) $\frac{d}{dt}\left(\frac{dx}{dt}\right)$

---

15. Suppose the motion of a particle is described by the equation**: X = 20 + 4 t ^{2}**. Find the **average velocity** of the particle in the time interval **t_1=2 s to t_2=5 s** ?

(a) 29 m/s (b) 28 m/s (c) 84 m/s (d) 10 m/s

---

16. **In question 15**, Find the **instantaneous velocity at t =5 s** ?

(a) 16 m/s (b) 60 m/s (c) 40 m/s (d) 36 m/s

---

17. A rock is dropped from rest from the top of a **100 m** tall building**, how long does it take to fall the first 50 m** ?

(a) 3.2 s (b) 10.2 s (c) 20.4 s (d) 4.5 s

---

18. The following are equations of the position of a particle, in which situation the **velocity of the particle is constant** ?

(a) $x = 4t^2 - 2$ (b) $x = -2t^3$ (c) $x = -3t - 2$ (d) $x = 4t^{-2}$

---

19. A ball thrown vertically upward with an initial velocity of **12 m/s**, **what is the ball's maximum height**?

(a) 7.35 m (b) 14.7 m (c) 0.61 m (d) 1.22 m

---

20. A body moves along the x-axis with constant acceleration **a =4 m/s²** . At **t=0** the body is at **x=5 m** and has velocity **v = 3 m/s**. Find its **position at t = 2 s** ?

(a) 14 m (b) 19 m (c) 15 m (d) 18 m

---

21. In question 20, where is the body when its velocity is **5 m/s** ?

(a) 7 m (b) 9 m (c) 11 m (d) 2 m

---

22. A man runs a distance of **1 mile** in exactly **4 minutes**, What is his **average velocity** in **mi/hr** ?

(a) 900 mi/hr (b) 15 mi/hr (c) 6.71 mi/hr (d)15000 mi/hr

---

23. You walk a distance of **73.2 m** at a speed of **1.22 m/s** and then run **73.2 m** in **24 s.** What is your overall **displacement**?

(a) 97.2 m (b) 73.2 m (c) 146.4 m (d) zero

---

24. In question **23,** what is the **time interval** from the start to the end?

(a) 24 s (b) 84 s (c) 36 s (d) 4.27 s

---

25. If t_1**=2 s** and t_2**=4 s** find the **average acceleration** when the velocity changes from **8 m/s** to **12 m/s**?

(a) 1 m/s^2 (b) 3.33 m/s^2 (c) 5 m/s^2 (d) 2 m/s^2

---

26. What is the **initial speed** of a car moving a **distance** of **60 m** in **6 s** if the **final speed was 15 m/s**?

(a) -10 m/s (b) -5 m/s (c) 5 m/s (d) 17.5 m/s

---

27. If the total distance moved by a bus before stopping was **56.7 m** with **initial speed** of **22.36 m/s.** What is the magnitude of the **acceleration**?

(a) 8.82 m/s^2 (b) 4.41 m/s^2 (c) 17.63 m/s^2 (d) 2.21 m/s^2

---

28. A pipe dropped from a building struck the ground with **a speed of 24 m/s**. what **height** was it dropped from?

(a) 58.8 m (b) 2.44 m (c) 1.22 m (d) 29.4 m

---

29. What is the **initial speed** of a ball thrown upward vertically reaching a **height of 0.544 m** in **0.2 s** ?

(a) 4.68 m/s (b) 3.7 m/s (c) 2.1 m/s (d) 0.74 m/s

---

30. The **initial and the final positions** of a particle moving along the x-axis are **-2 m, 10 m**, then its **displacement** Δ**x** equals:

(a) +12 m (b) +8 m (c) -12 m (d) -8 m

31. In which situation of the following the displacement is **positive**?

Situation	X_1(m)	X_2(m)
A	-3	5
B	-3	-7
C	-3	-3
D	2	5

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

32. The position of a body moving along the x axis is given by $x = 3t - 4t^2 + t^3$. Its position at **t = 2 s** is:

(a) 6 m (b) 2 m (c) -6 m (d) –2 m

33. **In question 32,** the **displacement** of the object in the time interval **t = 0** to **t = 4 s** is:

(a) $\Delta x = 3m$ (b) $\Delta x = 12m$ (c) $\Delta x = -3m$ (d) $\Delta x = -12m$

34. A car travelled **40 km in 0.5 h**, then travelled **40 km in 1 h**. Its **average speed** is:

(a) 26.7 km/h (b) 160 km/h (c) 80 km/h (d) 53.3 km/h

35. A car starts from point **A** moved a distance **50 km** to point **B** then returns to point **A** in a time interval of **2 hours**. Its **average velocity** is:

(a) zero (b) 50 km/h (c) 100 km/h (d) 25 km/h

36. The position of a particle moving along the x-axis is given by: $x = 2t^3$ **. Its acceleration is:**

(a) $6t^2$ m/s^2 (b) 12t m/s^2 (c) constant (d) zero

37. A ball dropped from a building ,its **velocity and position** after **1 s** are:

(a) V= -9.8 m/s y= -9.8 m (b) V= -4.9 m/s y= -9.8 m (c) V= -9.8 m/s y= -4.9 m (d) V= -4.9 m/s y= -4.9 m

38. An electron has an initial velocity V_0**= 1x10^5 m/s** travels a distance **0.01 m**, if the final velocity was **V=2x10^6 m/s**, then its **acceleration is:**

(a) 1995×10^{14} m/s^2 (b) 195×10^6 m/s^2 (c) 95×10^6 m/s^2 (d) 1.995×10^{14} m/s^2

39. A particle moving in the **+ x direction** with **increasing speed** :

(a) Its velocity is positive and acceleration is negative
(b) Its velocity is negative and acceleration positive
(c) Its velocity and acceleration are both positive
(d) Its velocity is positive and acceleration is zero

40. In which situation of the following the **velocity** is in the **negative** x direction?

Situation	Position of the particle
A	$X = -2t^2 - 2$
B	$X = 3t^3 - 5$
C	$X = -2t^{-2} + 1$
D	$X = -5 + 5t$

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

41. A ball is thrown vertically upward. Its **displacement** is:

(a) positive during rising and negative during falling
(b) negative during rising and positive during falling
(c) positive during rising and falling
(d) negative during rising and falling

42. A man walks **4 m** from point A **due east**, then **3 m due north**. What is his **displacement** from the point A?

(a) 7 m (b) 6 m (c) 5 m (d) 10 m

43. The following are equations of the velocity v(t) of a particle, in which situation the **acceleration is constant**?

(a) $v = 3t + 6$ (b) $v = 4t^2$ (c) $v = 3t^2 - 4t$ (d) $v = 5t^3 - 3$

44. You are throwing a ball straight up in the air. At the highest point, the ball's velocity and acceleration are**:**

(a) $v = 0$, $a = -g$ (b) $v = v_0$, $a = 0$ (c) $v > v_0$, $a = -g$ (d) $v < v_0$, $a < -g$

45. If the **sign** of the **velocity and acceleration** of a particle are **opposite**, then the **speed of the particle**

(a) is zero (b) decreases (c) increases (d) does not change

46. A particle moves **from x_1= 5 m to x_2= 12 m**, **then:**

(a) Δx is positive (b) Δx is negative (c) Δx is zero (d) Δx = 12m

47. You **walked a distance of 2 km** along a road **in 0.5 h**, then walked back to **the initial position in 0.75 h.** Your overall **displacement** is:

(a) 6 km (b) 0 (c) 4 km (d) 2 km

48. **In question 62**, your **average speed** is :

(a) 5.3 km/h (b) 1.6 km/h (c) 3.2 km/h (d) 0

49. The position of a car changes from **x_1= 20 m to x_2= 100 m** in the **time interval** from **2s** to **4s**, the **average velocity** of the car is:

(a) 40 m/s (b) 30 m/s (c) 45 m/s (d) 25 m/s

50. The position of a particle is given by: **x(t)= 10 + t^2** ,the **instantaneous acceleration at t= 1 s** is:

(a) 8 m/s^2 (b) 6 m/s^2 (c) 4 m/s^2 (d) 2 m/s^2

51. The **free fall acceleration** is:

(a) zero (b) – 9.8 m/s^2 (c) +9.8 m/s^2 (d) – 32 m/s^2

52. In which situation of the following the **velocity is constant** ?

Situation	Position of the particle
A	**X= 3 t – 2**
B	**X= 2 t^2 – 2**
C	**X= - 2 t^3**
D	**X= 2 – 5 t^2**

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

53. **A car starts from rest,** travels with constant accelertion a distance **500 m**, the final velocity is **50 m/s.** Its **acceleration** is:

(a) 1.6 m/s^2 (b) 2.5 m/s^2 (c) 3.6 m/s^2 (d) 4.9 m/s^2

54. The equation that represents the **motion with constant acceleration** is:

(a) $v^2 = v_0^2 + 2at$ (b) $v = v_0 + 2a(x - x_0)$ (c) $x - x_0 = v_0 t + \frac{1}{2}at^2$ (d) $v = v_0 + \frac{1}{2}at^2$

55. When an object is thrown **vertically upward ↑,** while it is **rising:**

(a) its velocity and acceleration are both upward ↑

(b) its velocity is upward ↑ and its acceleration is downward ↓

(c) its velocity and acceleration are both downward ↓

(d) its velocity is downward ↓ and its acceleration is upward ↑

Are the following statements (**True ✓**) or (**False ×**) ?

56. Speed is the magnitude of instantaneous velocity.

(a) True (b) False

57. Average acceleration is the ratio of (النسـبة بـين) the change of velocity Δv to the time interval Δt.

(a) True (b) False

58. **The free fall motion** is an example of motion along a straight line with constant acceleration.

(a) True (b) False

Chapter (3): VECTORS

Choose the correct answer:

1. A vector has two components ($\mathbf{A_x = 3}$ **cm** and $\mathbf{A_y = -4}$ **cm**). What is the **magnitude of** $\vec{A}$?

(a) 4 cm　(b) 5 cm　(c) 1 cm　(d) 7 cm

---

2. In question 2, What is the **direction of** $\vec{A}$?

(a) -53.1°　(b) -25.3°　(c) -17.9°　(d) -36.9°

---

3. Given the two vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$, Find $\vec{c}$ where $\vec{c} = \vec{a} + \vec{b}$?

(a) $\vec{c} = 3\hat{i} + 5\hat{j} + 7\hat{k}$　(b) $\vec{c} = 3\hat{i} + \hat{j} + 7\hat{k}$　(c) $\vec{c} = \hat{i} + \hat{j} + 7\hat{k}$　(d) $\vec{c} = \hat{i} + 5\hat{j} + \hat{k}$

---

4. In question 3, Find $\vec{a} \cdot \vec{b}$?

(a) 5　(b) 15　(c) 20　(d) 8

---

5. Vectors $\vec{C}$ *and* $\vec{D}$ have magnitudes of **3 units** and **4 units** respectively. What is the **angle between the directions of** $\vec{C}$ *and* $\vec{D}$ **if** $\vec{C} \times \vec{D}$ **= 12**

(a) 90°　(b) 180°　(c) 270°　(d) 0°

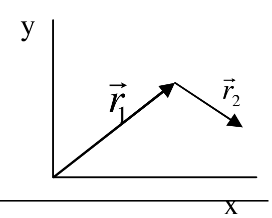
---

6. A vectors $\vec{a}$ has two component, $a_x = 2.6$ m, $a_y = -2.3$ m , what is the **direction** of $\vec{a}$?

(a) – 48.5°　(b) 48.5°　(c) – 41.3°　(d) 41.3°

---

7. In the figure **what are the signs** of the **x and y** component of $\vec{r}_1 + \vec{r}_2$?



(a) (+ , +)　(b) (- , -)　(c) (+ , -)　(d) (- , +)

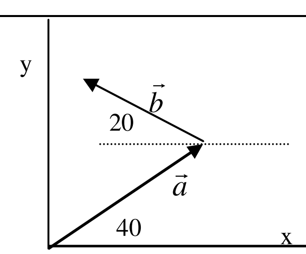
---

8. If $\vec{a} \times \vec{b} = \vec{c}$ then **the value of** c_y equals:

(a) $a_z b_x - b_z a_x$　(b) $a_x b_y - b_x a_y$　(c) $a_y b_z - b_y a_z$　(d) $a_y b_x - b_y a_x$

---

9. Two vectors $\vec{a}$ *and* $\vec{b}$, $\vec{a}$ has a magnitude of **12 m** and has an **angle of 40°** from the +x direction, and $\vec{b}$ has a magnitude of **9 m** in the **direction shown**. **Find the x component of their vector sum**?



(a) 17.65 m　(b) 10.79 m　(c) 0.73 m　(d) 3.21 m

---

10. Two vectors $\vec{a} = (4m)\hat{i} - (3m)\hat{j}$ and $\vec{b} = (6m)\hat{i} + (8m)\hat{j}$, What is **the magnitude** of $\vec{a}$?

(a) 1 m (b) 4 m (c) 5 m (d) 7 m

11. In **question 10**, find $\vec{a} + \vec{b}$?

(a) $10\,\hat{i} + 5\,\hat{j}$ (b) $2\hat{i} + 11\,\hat{j}$ (c) $10\,\hat{i} + 11\,\hat{j}$ (d) $9\,\hat{i} + 12\,\hat{j}$

12. In **question 10**, Find $\vec{a} \cdot \vec{b}$?
(a) 1 (b) 24 (c) 48 (d) zero

13. In **question 10,** Find $\frac{\vec{b}}{2}$?

(a) $3\hat{i} + 4\,\hat{j}$ (b) $-3\hat{i} - 4\,\hat{j}$ (c) $12\,\hat{i} + 16\,\hat{j}$ (d) $-12\,\hat{i} - 16\,\hat{j}$

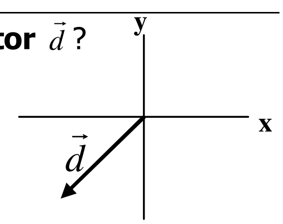
14. Given the two vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$, Find $\vec{c}$ where $\vec{c} = \vec{a} + \vec{b}$?

(a) $\vec{c} = 3\hat{i} + 5\hat{j} + 7\hat{k}$ (b) $\vec{c} = 3\hat{i} + \hat{j} + 7\hat{k}$ (c) $\vec{c} = \hat{i} + \hat{j} + 7\hat{k}$ (d) $\vec{c} = \hat{i} + 5\hat{j} + \hat{k}$

15. Vector $\vec{A}$ has a **magnitude of 6 units** and is in the **direction of positive x-axis**, vector $\vec{B}$ has a **magnitude of 4 units** and making an angle of **30° with the positive x-axis**. What is the **magnitude of** $\vec{A} \times \vec{B}$?

(a) 12 units (b) 24 units (c) 20.8 units (d) 28 units

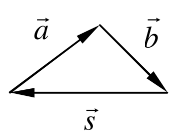
16. In the figure, what is the **signs of the x and y components of vector** $\vec{d}$?

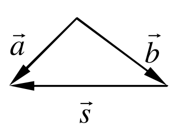


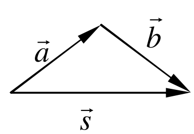
(a) (+ , +) (b) (+ , -) (c) (- , -) (d) (- , +)

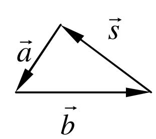
17. Two vectors : $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = \hat{i} - 2\hat{j} + 3\hat{k}$. Find $\vec{A} \cdot \vec{B}$?
(a) 5 (b) 15 (c) 20 (d) 8

18. **Which figure** of the following represent the relation $\vec{s} = \vec{a} + \vec{b}$:

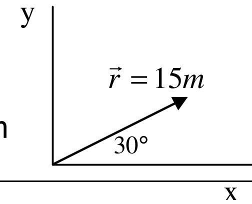
(a) 

(b) 

(c) 

(d) 

19. from the figure, **the y component** of the vector $\vec{r}$ equals:



(a) 13 m (b) 7.5 m (c) 8.7 m (d) 7.8 m

20. Which one of the following is the **scalar quantity**?
(a) Displacement (b) Length (c) Velocity (d) acceleration

21. Vector $\vec{A}$ has two components, $\boldsymbol{A_x = -25}$ **m** , $\boldsymbol{A_y = 40}$ **m**, what is the direction of $\vec{A}$?

(a) 32° (b) -32° (c) 58° (d) -58°

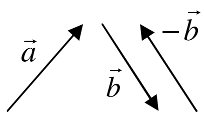
22. If the **x component** of vector $\vec{r}$ **is 2.6 m** and the **y component is -2.3 m** then $\vec{r}$ in **unit-vector notation** is:

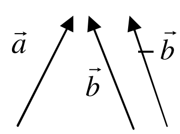
(a) $2.6\ \hat{i} - 2.3\ \hat{j}$ (b) $-2.3\ \hat{i} + 2.6\ \hat{j}$ (c) $2.6\ \hat{i} - (-2.3)\hat{j}$ (d) $2.6\ \hat{i} - 2.3\ \hat{j} + \hat{k}$

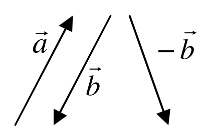
23. Vector $\vec{c}$ has the **magnitude of 36**, what is the magnitude of $\frac{\vec{c}}{4} - 9$?

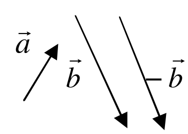
(a) zero (b) 6 (c) 9 (d) 27

24. Which one of the following figures **shows the three vectors** $\vec{a}$**,** $\vec{b}$ **and** $-\vec{b}$ **:**

(a) 

(b) 

(c) 

(d) 

25. Two vectors are given by: $\vec{a} = 4\hat{i} - 3\hat{j} + \hat{k}$ **and** $\vec{b} = 6\hat{i} + 8\hat{j} + 4\hat{k}$

Find $\vec{c}$ **where** $\vec{a} - \vec{b} + \vec{c} = 0$

(a) $4\hat{i} - 3\hat{j} + \hat{k}$ (b) $2\hat{i} + 11\hat{j} + 3\hat{k}$ (c) $-2\hat{i} - 5\hat{j} + \hat{k}$ (d) $\hat{i} + 3\hat{j} + 11\hat{k}$

26. If **the angle between** $\vec{A}$ *and* $\vec{B}$ **is 60°**, and **A = 5 units, B = 6 units,** then **the magnitude** of the **vector product** $\vec{A} \times \vec{B}$ is:

(a) 30 (b) 20.89 (c) 15 (d) 25.98

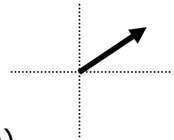
27. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, $\vec{B} = -3\hat{i} + 4\hat{j} + 2\hat{k}$**. Find** $\vec{A} \cdot \vec{B}$
(a) – 4 (b) – 2 (c) - 8 (d) – 10

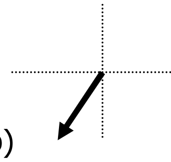
28. In question 27, the **magnitude** of vector $\vec{A}$ equals:
(a) 5.4 (b) 3 © 1.7 (d) 4.2

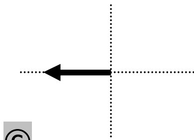
29. If $\vec{a} \times \vec{b} = \vec{c}$ then **the value of** $\boldsymbol{c_x}$ equals:

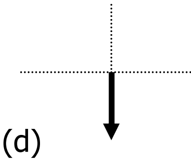
(a) $a_z\, b_x - b_z\, a_x$ (b) $a_x\, b_y - b_x\, a_y$ (c) $a_y\, b_z - a_z\, b_y$ (d) $a_y\, b_x - b_y\, a_x$

30. Which **vector** of the following has the **y-component equals zero**:

(a) 

(b) 

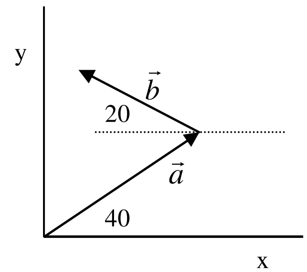
(c) 

(d) 

31. Vectors $\vec{C}$ *and* $\vec{D}$ have magnitudes of **3 units** and **4 units** respectively. What is the **angle between the directions of** $\vec{C}$ *and* $\vec{D}$ **if** $\vec{C}\cdot\vec{D}$ **= 12 units?**

(a) 90° (b) 180° (c) 270° (d) 0°

32. Two vectors $\vec{a}$ *and* $\vec{b}$ shown in the figure, if $\vec{r}=\vec{a}+\vec{b}$ then :



(a) $r_x = a\cos 40 + b\cos 20$

(b) $r_x = a\cos 40 + b\cos 160$

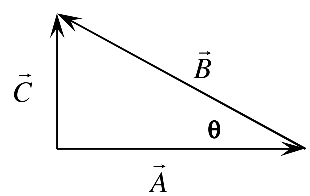
(c) $r_x = a\sin 40 + b\sin 20$

(d) $r_x = a\sin 40 + b\sin 160$

33. If $\vec{A}=3\hat{i}-3\hat{j}$ and $\vec{B}=\hat{i}-2\hat{j}$, then $\vec{A}-2\vec{B}=$

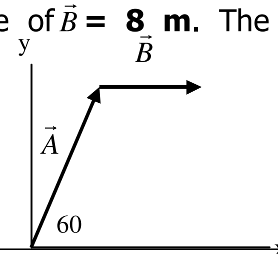
(a) $\hat{i}+\hat{j}$ (b) $2\hat{i}-\hat{j}$ (c) $5\hat{i}-7\hat{j}$ (d) $4\hat{i}-5\hat{j}$

34. The vector $\vec{B}$ in the diagram is equal to:



(a) $\vec{B}=\vec{A}-\vec{C}$
(b) $\vec{B}=\vec{A}+\vec{C}$
(c) $\vec{B}=\vec{C}-\vec{A}$
(d) $\vec{B}=-\vec{A}-\vec{C}$

35. In the diagram, the magnitude of $\vec{A}$ **= 12 m** and the magnitude of $\vec{B}$ **= 8 m**. The **x component** of $\vec{A}+\vec{B}=$



(a) 14 m (b) 10 m (c) 6 m (d) 18.4 m

36. Vectors $\vec{A}$ *and* $\vec{B}$ each has **magnitude 4** and the angle between them is **30°.** The value of $\vec{A}\cdot\vec{B}=$

(a) 3.46 (b) 13.86 (c) 16 (d) 8

37. Let $\vec{C}=\vec{A}\times\vec{B}$ and ϕ is the angle between $\vec{A}$ *and* $\vec{B}$, which of the following is **true**?

(a) The magnitude of $\vec{C}=AB\cos\phi$

(b) $\vec{A}\times\vec{B}=\vec{B}\times\vec{A}$

(c) $-\vec{C}=\vec{B}\times\vec{A}$

(d) The angle between $\vec{C}$ *and* $\vec{A}$ $=0^\circ$

38. Vectors $\vec{a}$ *and* $\vec{b}$ have magnitudes **5 units** and **2 units**, respectively. If $\vec{a} \times \vec{b} = 5$ units, then the **angle** ϕ between $\vec{a}$ *and* $\vec{b}$ equals:

(a) 0° (b) 30° (c) 60° (d) 90°

39. If vector $\vec{A} = 6\hat{i} - 8\hat{j}$ then $4\vec{A}$ has a **magnitude** :

(a) 10 (b) 20 (c) 30 (d) 40

40. A vector $\vec{a}$ has a **magnitude of 25 m** and an **a_x= 12 m**. The **angle** it makes with the positive x axis is:

(a) 26° (b) 29° (c) 61° (d) 64°

41. Let $\vec{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ **and** $\vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$. The **vector sum** $\vec{S} = \vec{A} + \vec{B}$ is:

(a) $6\hat{i} + 8\hat{j} - 2\hat{k}$ (b) $-2\hat{i} + 4\hat{j} - 4\hat{k}$ (c) $2\hat{i} - 4\hat{j} + 4\hat{k}$ (d) $8\hat{i} + 12\hat{j} - 3\hat{k}$

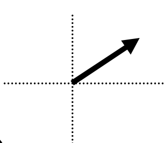
42. Let $\vec{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ **and** $\vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$. Then $\vec{A} \cdot \vec{B} =$

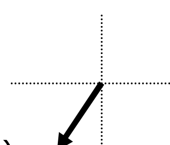
(a) $8\hat{i} + 12\hat{j} - 3\hat{k}$ (b) $12\hat{i} - 14\hat{j} - 20\hat{k}$ (c) 23 (d) 17

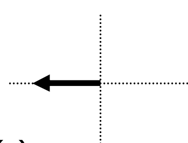
43. Vectors $\vec{A}$ and $\vec{B}$ each have **magnitude L**. When the angle between them is **60°**. The **magnitude** of $\vec{A} \times \vec{B}$ is:

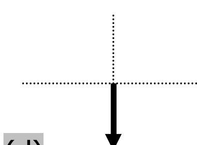
(a) 0.5 L^2 (b) L^2 (c) 0.866 L^2 (d) 2 L^2

44. Which **vector** of the following has the **x-component equals zero**:


(a)


(b)


(c)


(d)

45. The **angle between** $\vec{A} = -25\hat{i} + 45\hat{j}$ and the x axis is

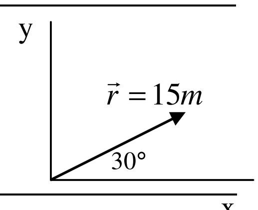
(a) – 29° (b) 29° (c) – 60.9° (d) 60.9°

46. Let $\vec{V} = 2\hat{i} + 6\hat{j} - 3\hat{k}$. The **magnitude of** $\vec{V}$ is

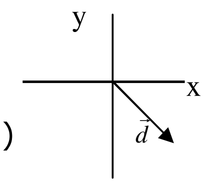
(a) 5 (b) 5.57 (c) 7 (d) 7.42

47. from the figure, **the y component** of the vector $\vec{r}$ equals:

(a) 13 m (b) 7.5 m (c) 8.7 m (d) 7.8 m



48. In the figure, what is **the signs of the x and y components** Of the vector $\vec{d}$:



(a) (+ , +) (b) (- , -) (c) (+ , -) (d) (- , +)

---

49. Two vectors are given by: $\vec{a} = 4\hat{i} - 3\hat{j} + \hat{k}$ **and** $\vec{b} = 6\hat{i} + 8\hat{j} + 4\hat{k}$

Find $\vec{c}$ **where** $\vec{a} - \vec{b} + \vec{c} = 0$

(a) $4\hat{i} - 3\hat{j} + \hat{k}$ (b) $2\hat{i} + 11\hat{j} + 3\hat{k}$ (c) $-2\hat{i} - 5\hat{j} + \hat{k}$ (d) $\hat{i} + 3\hat{j} + 11\hat{k}$

---

50. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, $\vec{B} = -3\hat{i} + 4\hat{j} + 2\hat{k}$

Find $\vec{A} \cdot \vec{B}$

(a) - 4 (b) – 2 (c) - 8 (d) – 10

---

51. Vector $\vec{a}$ has three components, **a_x =10 m, a_y =10 m, and a_z =5 m**. Its magnitude is:

(a) 225 m (b) 25 m (c) 20 m (d) 15 m

---

52. **If** $\vec{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ and $\vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$. **Then** $\vec{A} - \vec{B} =$

(a) $6\hat{i} + 8\hat{j} - 2\hat{k}$ (b) $-2\hat{i} + 4\hat{j} - 4\hat{k}$ (c) $2\hat{i} - 4\hat{j} + 4\hat{k}$ (d) $8\hat{i} + 12\hat{j} - 3\hat{k}$

---

53. Vectors $\vec{C}$ *and* $\vec{D}$ have magnitudes of **3 units** and **4 units** respectively. What is the **angle between the directions of** $\vec{C}$ *and* $\vec{D}$ **if** $\vec{C} \cdot \vec{D}$ **= 12 units?**

(a) 90° (b) 180° (c) 270° (d) 0°

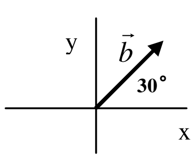
---

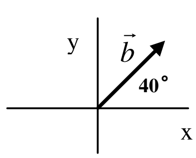
54. The vector $-\vec{b}$ has the same **magnitude** as the vector $\vec{b}$ but

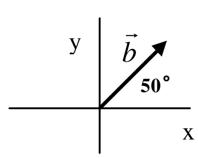
(a) perpendicular to $\vec{b}$
(b) paralell to $\vec{b}$
(c) the opposite direction of $\vec{b}$
(d) the same direction of $\vec{b}$

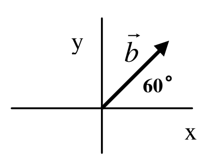
---

55. In which figure of the following **b_x= 8.7 m ?** (**b = 10 m**)

(a) 

(b) 

(c) 

(d) 

---

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

(a) 66.8° (b) 63.4° (c) 59° (d) 53.13°

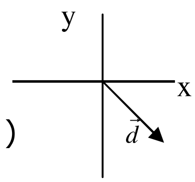
---

57. **In question 59**, the magnitude of $\vec{a}$ is**:**

(a) 6.71 m (b) 5.83 m (c) 7.62 m (d) 5 m

---

58. In the figure, **the signs of the x and y components** Of the vector $\vec{d}$ are:



(a) (+ , +) (b) (- , -) (c) (+ , -) (d) (- , +)

---

59. The **vector product** $\hat{j}\times\hat{k}$ is equal to:

(a) 0 (b) 1 (c) $\hat{i}$ (d) $-\hat{i}$

---

60. If $\vec{a}=4\hat{i}-3\hat{j}$ **and** $\vec{b}=6\hat{i}+8\hat{j}$,then $\vec{b}-\vec{a}=$

(a) $4\hat{i}-3\hat{j}$ (b) $2\hat{i}+11\hat{j}$ (c) $-2\hat{i}-5\hat{j}$ (d) $\hat{i}+3\hat{j}$

---

61. If ***A* = 4 units, *B* = 6 units,** and the angle ϕ **=60°**, then **the magnitude** of the **vector product** $\vec{A}\times\vec{B}$ is:

(a) 31.2 units (b) 20.78 units (c) 15.6 units (d) 25.98 units

---

62. For the following two vectors: $\vec{A}=2\hat{i}+3\hat{j}-4\hat{k}$, $\vec{B}=-3\hat{i}+2\hat{j}+2\hat{k}$. **Find** $\vec{A}\cdot\vec{B}$

(a) – 5 (b) – 2 (c) - 8 (d) – 11

---

63. If ***C* = 3** units, ***D* = 4** units and $\vec{C}\cdot\vec{D}$ **= -12 units** then the **angle between the directions of** $\vec{C}$ *and* $\vec{D}$ **is:**

(a) 90° (b) 180° (c) 270° (d) 0°

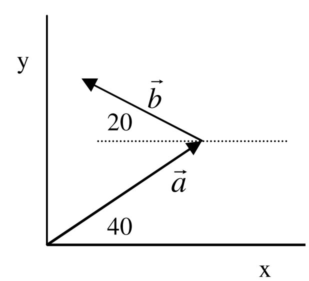
---

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

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

---

65. Two vectors $\vec{a}$ *and* $\vec{b}$ shown in the figure, if $\vec{r}=\vec{a}+\vec{b}$ then :



(a) r_x = a cos 40 + b cos 20

(b) r_x = a cos 40 + b cos 160

(c) r_x = a sin 40 + b sin 20

(d) r_x = a sin 40 + b sin 160

Are the following statements (**True** ✓) or (**False** ×) ?

66. **The component of a vector** is the projection of the vector (مسقط المتجه) on an axis.

(a) True (b) False

67. The magnitude of $\vec{A} \cdot \vec{B}$ is maximum when the angle between $\vec{A}$ *and* $\vec{B}$ is 90°.

(a) True (b) False

68. The value of $\hat{i} \cdot (\hat{j} \times \hat{k})$ is zero.

(a) True (b) False

69. a_x *and* a_y are vector components of $\vec{a}$.

(a) True (b) False

70. The magnitude of the unit vector equals 1.

(a) True (b) False

Chapter 4: MOTIN IN 2D AND 3D

1. If the x component of vector $\vec{r}$ is 2.6 m and the y component is -2.3 m then $\vec{r}$ in unit-vector notation is:

(A) $2.6\ \hat{i} - 2.3\ \hat{j}$ (B) $-2.3\ \hat{i} + 2.6\ \hat{j}$ (C) $6.2\ \hat{i} + 3.2\ \hat{j}$ (D) $3.2\ \hat{i} - 6.2\ \hat{j}$

---

2. The displacement of a particle moving from $\vec{r}_1 = 5\hat{i} - 6\hat{j} + 2\hat{k}$ to $\vec{r}_2 = -2\hat{i} + 6\hat{j} + 2\hat{k}$ is

(A) $-7\hat{i} + 12\hat{j}$ (B) $3\hat{i} + 4\hat{k}$ (C) $7\hat{i} - 12\hat{j}$ (D) $-3\hat{i} - 4\hat{k}$

---

3. A particle goes from (x_1=-2m, y_1=3m, z_1=1m) to (x_2=3m, y_2=-1m, z_2=4m). Its displacement is:

(a) $\hat{i} + 2\hat{j} + 5\hat{k}$ (b) $5\hat{i} - 4\hat{j} + 3\hat{k}$ (c) $-5\hat{i} + 4\hat{j} - 3\hat{k}$ (d) $-\hat{i} - 2\hat{j} - 5\hat{k}$

---

4. The coordinates of a car's position as function of time is given by: $x = 5t^2 + 16$, and $y = -t^3 + 5$, the magnitude of position vector $\bar{r}$ at t=2s is:

(a) 5 m (b) 1 m (c) 2.6 m (d) 4 m

---

5. The components of a car's velocity as a function of time are given by :

V_x= 2 t + 3, and V_y= 4 t – 1, its velocity $\vec{V}$ at (t= 1 s) is:

(A) $\vec{V} = 9\hat{i} + 11\hat{j}$ (B) $\vec{V} = 5\hat{i} + 3\hat{j}$ (C) $\vec{V} = 7\hat{i} + 7\hat{j}$ (D) $\vec{V} = 11\hat{i} + 15\hat{j}$

---

6. Velocity is defined as:

(a) rate of change of position with time (b) position divided by time (c) a speeding up or slowing down (d) change of position

---

7. The position of a particle moving on an x axis is given by: $X = t^2 + 2$, its average velocity in the time interval from t=1s to t=2s is:

(a) 4 m/s (b) 2 m/s (c) 3 m/s (d) 1 m/s

---

8. A car travels east at 200 m/s and then travels west at 200 m/s, the change in its velocity is:

(a) zero (b) 400 m/s east (c) 400 m/s west (d) 200 m/s west

---

9. The position vector for a moving particle is: $\bar{r} = \hat{i} + 4t^2\hat{j} + t\hat{k}$, its velocity and acceleration as a function of time are:

(a) $\bar{v} = 8t\hat{j} + \hat{k}$, $\bar{a} = 8\hat{j}$

(b) $\bar{v} = \hat{i} + 8t\hat{j} + \hat{k}$, $\bar{a} = 8\hat{j} + \hat{k}$

(c) $\bar{v} = 8t\hat{j}$, $\bar{a} = \hat{i} + 8\hat{j}$

(d) $\bar{v} = 8t^2\hat{j} + t\hat{k}$, $\bar{a} = 8\hat{j}$

---

10. A particle moves in the xy plane. In which situation of the following V_x and V_y are both constant

Situation	X(m)	Y(m)
A	$2t^2$	$4t + 3$
B	$4t^3 - 2$	$+3$
C	$5t$	$2t + 1$
D	$-3t$	$t^2 - 1$

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

11. The components of a car's velocity as a function of time are given by $v_x = 6t^2 - 5$, $v_y = -3t^3$. The acceleration components are:

(A) $a_x = 10t$, $a_y = -12t^2$

(B) $a_x = 4t$, $a_y = -6t^2$

(C) $a_x = 6t$, $a_y = -15t^2$

(D) $a_x = 12t$, $a_y = -9t^2$

12. A particle moving with initial velocity $\vec{v}_0 = -2\hat{i} + 4\hat{j}$ m/s, and acceleration $\vec{a} = -5\hat{i} + 8\hat{j}$ m/s^2, the x-component v_x of the final velocity at (t=1 s) is ?

(A) -7 m/s (B) - 17 m/s (C) -27 m/s (D) -37 m/s

13. Acceleration is defined as:

(a) rate of change of position with time

(b) speed divided by time

(c) rate of change of velocity with time

(d) change of velocity

14. A particle had a speed of 18 m/s in the +x direction and after 2.4 s its speed was 30 m/s in the –x direction. Its average acceleration during this time is:

(a) $a = \frac{-30-18}{2.4}$ (b) $a = \frac{30-18}{2.4}$ (c) $a = \frac{18+30}{2.4}$ (d) $a = \frac{18-30}{2.4}$

15. A particle moving with $\vec{v}_0 = 2\hat{i} + 5\hat{j}$ and acceleration $\vec{a} = 5\hat{j}$. Its velocity after 2s is:

(a) 15 m/s (b) 12 m/s (c) $\sqrt{29}$ m/s (d) $\sqrt{43.2}$ m/s

16. A particle leaves the origin with initial velocity $\vec{v}_0 = 8\hat{i} + 12\hat{j}$ m/s and a constant acceleration $\vec{a} = 4\hat{i} - 2\hat{j}$ m/s^2. The particle's velocity at t = 6 s is:

(a) $\vec{v} = 24\hat{j}$ $\vec{v} = 32\hat{i} + 24\hat{j}$ (c) $\vec{v} = 32\hat{i}$ (d) $\vec{v} = 32\hat{i} - 12\hat{j}$

17. Acceleration is equal to

(a) $\frac{d\vec{v}}{dt}$ (b) $\frac{d\vec{r}}{dt}$ (c) $\frac{d\vec{v}}{dr}$ (d) $\frac{\Delta\vec{r}}{\Delta t}$

18. The range of a ball is thrown at an angle of 30° above the horizontal with an initial speed 50 m/s is:

(A) 318.1 m (B) 267.3 m (C) 373.4 m (D) 220.9 m

19. The maximum range of a projectile is at launch angle

(A) $\theta = 25°$ (B) $\theta = 35°$ (C) $\theta = 45°$ (D) $\theta = 55°$

20. In the projectile motion the acceleration in the horizontal direction is:

(A) 19.6 m/s^2 (B) zero (C) 9.8 m/s^2 (D) 4.9 m/s^2

21. The range of a ball is thrown at an angle of 30° above the horizontal with an initial speed 50 m/s is:

(A) 318.1 m (B) 267.3 m (C) 373.4 m (D) 220.9 m

22. A large cannon fired a ball at an angle of 30^0 above the horizontal with initial speed 980m the projectile will travel what horizontal distance before striking the ground?

(a) 4.3 km (b) 8.5 km (c) 43 km (d) 85 km

23. A stone thrown from the top of a tall building follows a path that is:

(a) circular (b) parabolic (c) hyperbolic (d) a straight line

24. Two projectiles are in flight at the same time. The acceleration of one relative to the other:

(a) is always 9.8 m/s^2 (b) can be as large as 19.8 m/s^2 (c) can be horizontal (d) is zero

25. A ball is thrown at V_0 and angle θ_0 above horizontal and returned to its initial height. The path of the ball is called:

(a) Range (b) Trajectory (c) Horizontal path (d) Vertical path

26. In question 25, the horizontal component of the ball's velocity V_{x0} is:

(a) V_{x0} = unchanged (b) V_{x0} = zero (c) $V_{x0} = V_0$ (d) V_{x0} is changed

27. In question 25, at the maximum height, the vertical component of the ball's velocity V_y is:

(a) $V_y = V_x$ (b) $V_y = V_0$ (c) V_y = zero (d) $V_y = V_{0y}$

28. A ball is thrown with initial velocity v_0=120 m/s at an angle θ_0=60° above the horizontal, the velocity v_0 in unit vector notation is:

(a) $\overline{v}_0 = 104\hat{i} + 60\hat{j}$ (b) $\overline{v}_0 = 60\hat{i} + 104\hat{j}$ (c) $\overline{v}_0 = 60\hat{i}$ (d) $\overline{v}_0 = 104\hat{j}$

29. In question 28, the acceleration in the horizontal direction when t=5 s is:

(a) 24 m/s^2 (b) – 9.8 m/s^2 (c) zero (d) 600 m/s^2

30. In question 28, the maximum range of the ball is:

(a) 1469.4 m (b) 1272.5 m (c) 1649.4 m (d) 1722.5 m

31. The horizontal range is the horizontal distance the projectile has traveled when it returns to ……

(a) the origin (b) its max. height (c) its final height (d) its initial height

32. You are to launch a rocket, from just above the ground, with one of the following initial velocity vectors: (1) $\bar{v}_0 = 20\hat{i} + 70\hat{j}$, (2) $\bar{v}_0 = -20\hat{i} + 70\hat{j}$, (3) $\bar{v}_0 = 20\hat{i} - 70\hat{j}$, (4) $\bar{v}_0 = -20\hat{i} - 70\hat{j}$. Rank the vector according to the launch speed greatest first.

(a) 4 >3 > 2 > 1 (b) 4 > 2 > 3 >1 (c) 1 > 2 > 3 > 4 (d) all the same

33. In the projectile motion, the vertical velocity component v_y

(a) changes continuously (b) remains constant (c) equals zero (d) v_y equals v_x

34. The maximum range of a projectile is at launch angle

(a) θ = 25° (b) θ = 35° (c) θ = 45° (d) θ = 55°

35. In the projectile motion the horizontal velocity component v_x remains constant because the acceleration in the horizontal direction is:

(a) $a_x > 0$ (b) $a_x = g$ (c) $a_x > g$ (d) $a_x = 0$

36. The range of a ball is thrown at an angle of 30° above the horizontal with an initial speed 50 m/s is:

(a) 318.1 m (b) 267.3 m (c) 373.4 m (d) 220.9 m

37. A ball is thrown at an angle of 30° above the horizontal with an intial speed 980 m/s. The ball's range is:

(a) 4.3 km (b) 8.5 km (c) 43 km (d) 85 km

38. In the projectile motion the horizontal velocity component v_x remains constant because the acceleration in the horizontal direction is:

(a) $a_x = 0$ (b) $a_x > 0$ (c) $a_x = g$ (d) $a_x > g$

39. A ball is thrown at V_0 and angle θ_0 above horizontal and returned to its initial height. The path of the ball is called:

(a) Range (b) Trajectory (c) Horizontal path (d) Vertical path

40. In question 39, the horizontal component of the ball's velocity V_{x0} is:

(a) V_{x0} = unchanged (b) V_{x0} = zero (c) $V_{x0} = V_0$ (d) V_{x0} is changed

41. In question 39, at the maximum height, the vertical component of the ball's velocity V_y is:

(a) $V_y = V_x$ (b) $V_y = V_0$ (c) V_y = zero (d) $V_y = V_{0y}$

42. The period of an objects moving at a constant speed of 4 m/s on a circular path of radius 2 m is:

(A) π s (B) 2π s (C) 4π s (D) 8π s

43. The period of an objects moving at a constant speed of 4 m/s on a circular path of radius 2 m is:

(A) π s (B) 2π s (C) 4π s (D) 8π s

44. A particle moves at constant speed in a circular path. The instantaneous velocity and instantaneous acceleration vectors are:

(a) both tangent to the circular path (b) both perpendicular to the circular path (c) perpendicular to each other (d) opposite to each other

45. For a biological sample in a 1:0-m radius centrifuge to have a centripetal acceleration of 25g, its speed must be:

(a) 11 m/s (b) 16 m/s (c) 50 m/s (d) 122 m/s

46. A stone is tied to a 0.50-m string and whirled at a constant speed of 4m/s in a vertical circle. Its acceleration at the top of the circle is:

(a) 9.8 m/s^2, up (b) 9.8 m/s^2, down (c) 32 m/s^2, up (d) 32 m/s^2, down

47. A stone is tied to a 0.50-m string and whirled at a constant speed of 40m/s in a vertical circle. Its acceleration at the bottom of the circle is:

(a) 9.8 m/s^2, up (b) 9.8 m/s^2, down (c) 32 m/s^2, up (d) 32 m/s^2, down

48. A car rounds a 20-m radius curve at 10m/s. The magnitude of its acceleration is:

(a) zero (b) 0.2 m/s^2 (c) 5 m/s^2 (d) 40 m/s^2

49. The speed of a car moving in a circular path of radius 20 m with a centripetal acceleration of 5 m/s^2 is:

(a) 10 m/s (b) 100 m/s (c) 4 m/s (d) 2000 m/s

50. The period of a plane that enters a horizontal circular turn with $\bar{v}_i = 200\hat{i} + 600\hat{j}$ m/s and 32 s later leaves the turn with $\bar{v}_f = 200\hat{i} + 600\hat{j}$ is:

(a) 12 (b) 16 (c) 32 (d) 64

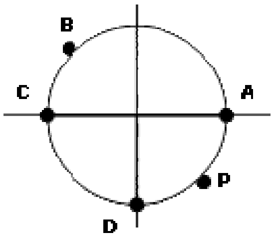
51. The period of an objects moving at a constant speed of 4 m/s on a circular path of radius 2 m is:

(a) π s (b) 2π s (c) 4π s (d) 8π s

52. Referring to question 51, the acceleration of the object is:

(a) 1 m/s^2 (b) 2 m/s^2 (c) 4 m/s^2 (d) 8 m/s^2

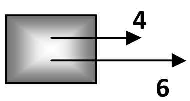
53. A particle is moving in circular path, at point P the particles velocity is: $\vec{v} = 3\hat{i} + 4\hat{j}$ at which point the velocity is $\vec{v} = -3\hat{i} - 4\hat{j}$

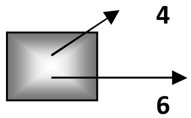


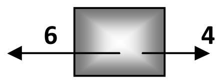
(a) A (b) B (c) C (d) D

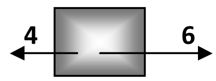
Chapter 5: FORCE AND MOTIN I

1. The figures below shows four situation in which forces act on a block that lies on a frictionless floor. In which figure the block has the **greatest acceleration**?

(a) 

(b) 

(c) 

(d) 

---

2. A force of **0.2 N** acts on a mass of **100 g**, what is its **acceleration**?

(a) 2×10^{-2} m/s^2 (b) 2×10^{-6} m/s^2 (c) 2×10^{-3} m/s^2 (d) 2 m/s^2

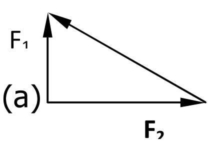
---

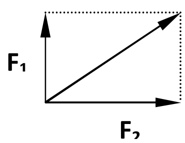
3. A man **pulls** a box of **mass 3 kgvertically upward** with a force of magnitude **40 N**. What is the **acceleration of the box**?

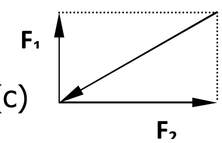
(a) $a = \dfrac{T - mg}{m}$ (b) $a = \dfrac{mg - T}{m}$ (c) $a = \dfrac{T + mg}{m}$ (d) $a = \dfrac{m}{T + mg}$

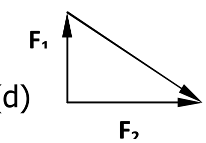
---

4. Which of the following figures correctly show the vector **addition of forces F_1 and F_2** ?

(a) 

(b) 

(c) 

(d) 

---

5. If the **1 kg** body has an **acceleration of 2 m/s^2** at an angle of **20°** above the positive direction of the x-axis. What is the **net force** in unit vctor notation?

(a) $\vec{F} = 0.34\hat{i} + 0.94\hat{j}$ (b) $\vec{F} = 1.88\hat{i} + 0.68\hat{j}$ (c) $\vec{F} = 0.68\hat{i} + 1.88\hat{j}$ (d) $\vec{F} = 0.94\hat{i} + 0.34\hat{j}$

---

6. Two forces act on a particle that moves with **constantvelocity** $\vec{v} = 3\hat{i} - 4\hat{j}$ **m/s**, one of the forces is $\vec{F}_1 = 2\hat{i} - 6\hat{j}$ **N**,what is the other force?

(a) $\vec{F}_2 = 2\hat{i} - 6\hat{j}$ (b) $\vec{F}_2 = 6\hat{i} - 10\hat{j}$ (c) $\vec{F}_2 = -2\hat{i} + 6\hat{j}$ (d) $\vec{F}_2 = -6\hat{i} + 10\hat{j}$

---

7. A particle has a **weight of 22 N** at a point where **g = 9.8 m/s^2**, what are its **mass and weight** at a point where **g = 0** ?

(a) m = 2.2 kg
W = 0

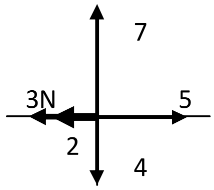
(b) m = 0
W = 2.2 N

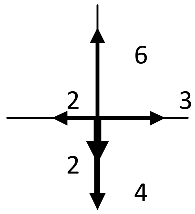
(c) m = 0.45 kg
W = 0

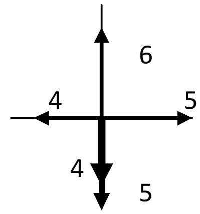
(d) m = 0
W = 45 N

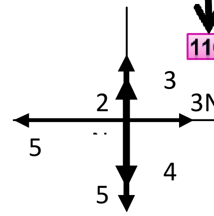
---

8. In which figure of the following the **y-component of the net force is zero**?

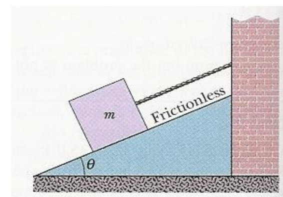
(a) 

(b) 

(c) 

(d) 

9. In the figure a cord holds stationary a block of mass **m = 8.5 kg** on a frictionless plane that is inclined at An angle **θ = 30°**, **the tension in the cord T** equals:



(a) 72.14 N (b) 83.3 N (c) 53.14 N (d) 41.65 N

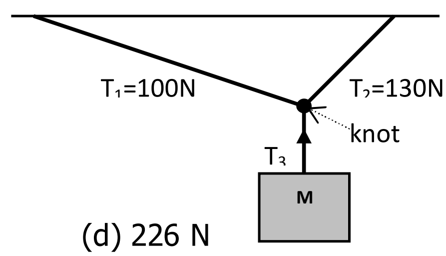
10. **In question9,** the **Normal forceN** acting on the block is:

(a) N= $F_g - mg\cos\theta$ (b) N= $F_g\cos\theta$ (c) N= $F_g + mg\cos\theta$ (d) N= F_g

11. **In question9,** if the cord is **cut** then the mass will slide with **acceleration equals**:

(a) a = - 4.9 m/s^2 (b) a = - 9.8 m/s^2 (c) a = - 8.5 m/s^2 (d) a = - 3.4 m/s^2

12. A block of mass **M= 20 kg** hangs from three cords by means of a knot, **(**the mass M does not move**)**, **what is the value of tensionT_3**?

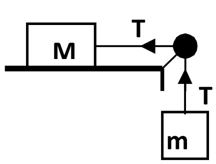


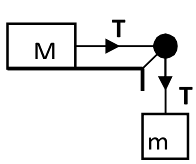
(a) 230 N (b) 196 N (c) 426 N (d) 226 N

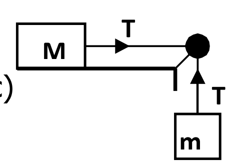
13. **What is the net force** acting on a body of a **mass of 48 kg** , when its **acceleration is 6 m/s^2** ?

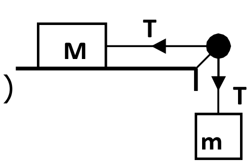
(a) 758 N (b) 182 N (c) 288 N (d) 470 N

14. Which figure of the following shows **the right direction of the tension T**? (the two masses are stationary).

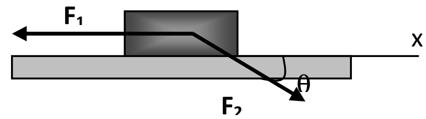
(a) 

(b) 

(c) 

(d) 

15. Two forces act on a block of mass **m= 0.5 kg** that Moves along the x-axis on a frictionless table, **F_1= 3 N** and **F_2= 1 N** directed at angle **θ=30°** as shown,
What is the acceleration of the block?



(a) – 4.3 m/s^2 (b) – 7.7 m/s^2 (c) - 5 m/s^2 (d) - 7 m/s^2

---

16. If **m_1= 2 kg** and **m_2= 4 kg** and the **same force is applied to both masses**, then the **ratio of their accelerations is**:

(a) $\frac{a_2}{a_1} = \frac{1}{2}$ (b) $\frac{a_2}{a_1} = 2$ (c) $\frac{a_2}{a_1} = \frac{1}{4}$ (d) $\frac{a_2}{a_1} = 4$

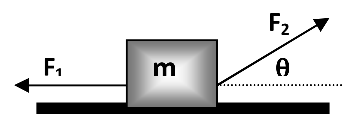
---

17. A force **F** applied to a body of mass **m_0** giving it an acceleration **a_0**, what is the mass of a body **x** if the same force is applied to it and accelerate it by **a_x** ?

(a) $m_x = m_0 \frac{a_x}{a_0}$ (b) $m_x = m_0 \frac{a_0}{a_x}$ (c) $m_x = \frac{a_x}{a_0}$ (d) $m_x = \frac{a_0}{a_x}$

---

18. In the figure, two forces acting on a box of mass **m** moving over a **frictionless** ice along the **x-axis** .
What is the **acceleration** of the box?



(a) $a_x = \frac{F_1 + F_2 \cos\theta}{m}$ (b) $a_x = \frac{F_2 \cos\theta - F_1}{m}$ (c) $a_x = \frac{F_2 \cos\theta}{m}$ (d) $a_x = \frac{F_1 - F_2}{m}$

---

19. The magnitude of the **centripetal force** is

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

---

1. What is the **gravitational force** on a man of mass **m** when he is sitting in a car that accelerates at **a** ?

(a) F_g= m a (b) F_g= m (g – a) (c) F_g= m g (d) F_g= m (a – g)

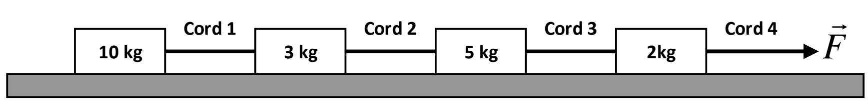
---

20. Two forces act on a particle that moves with **constantvelocity** $\vec{v} = 3\hat{i} - 4\hat{j}$ **m/s**, one of the forces is $\vec{F}_1 = 2\hat{i} - 6\hat{j}$ **N**,what is the other force?

(a) $\vec{F}_2 = 2\hat{i} - 6\hat{j}$ (b) $\vec{F}_2 = 6\hat{i} - 10\hat{j}$ (c) $\vec{F}_2 = -2\hat{i} + 6\hat{j}$ (d) $\vec{F}_2 = -6\hat{i} + 10\hat{j}$

---

21. The figure shows a train of four blocks being pulled across a frictionless floor by force $\vec{F}$, what **total mass is accelerated to the right byCord 2**?

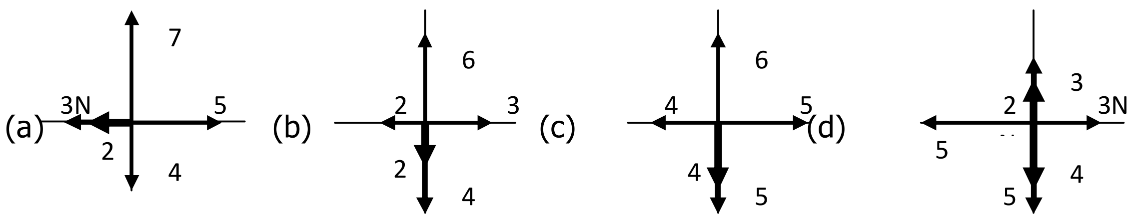


(a) 10 kg (b) 18 kg (c) 13 kg (d) 7 kg

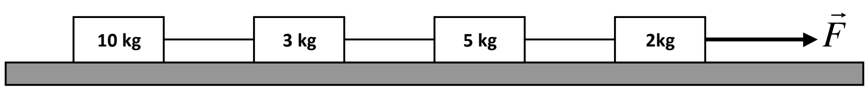
22. A particle has a **weight of 22 N** at a point where **$g = 9.8\ m/s^2$**, what are its **mass and weight** at a point where **g = 0** ?

(a) m = 2.2 kg, W = 0
(b) m = 0, W = 2.2 N
(c) m = 0.45 kg, W = 0
(d) m = 0, W = 45 N

23. In which figure of the following the **y-component of the net force is zero**?



24. The figure shows a train of four blocks being pulled across a frictionless floor by force $\vec{F}$, what total mass is accelerated to the right by force $\vec{F}$?

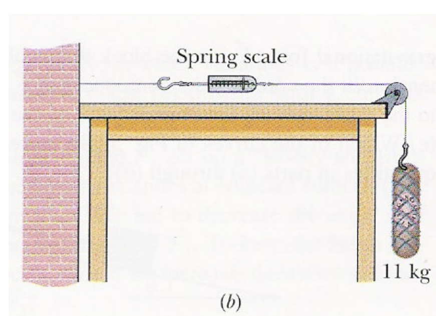


(a) 10 kg (b) 18 kg (c) 13 kg (d) 245 m/s

25. Three forces act on a particle that moves with **unchanging** velocity $\vec{v} = 2\hat{i} - 7\hat{j}$, two of the forces are $\vec{F}_1 = 2\hat{i} + 3\hat{j} - 2\hat{k}$ and $\vec{F}_2 = -5\hat{i} + 8\hat{j} - 2\hat{k}$. what is the **third force** ?

(a) $3\hat{i} - 11\hat{j} + 4\hat{k}$ (b) $7\hat{i} - 5\hat{j}$ (c) $-3\hat{i} + 11\hat{j} - 4\hat{k}$ (d) $-7\hat{i} + 5\hat{j}$

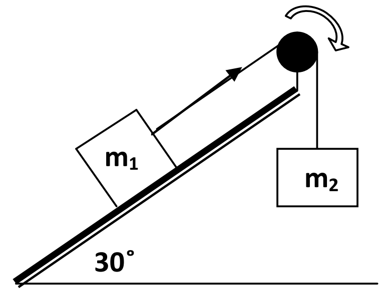
26. An **11 kg** object is supported by a cord that Runs around a pulley and to a scale. The opposite end of the scale is attached by a cord to a wall.
What is the reading on the scale?



(a) 11 N (b) 9.8 N (c) 107.8 N (d) 215.6 N

27. A block of mass $\mathbf{m_1=3.7}$ **kg** on frictionless inclined plane of angle **30°** is connected by a cord over a massless frictionless pulley to a second block of mass $\mathbf{m_2=2.3}$ **kg** hanging vertically **as shown**.

If the magnitude of the **acceleration** of each block is **0.735 m/s²**, what is the **tension in the cord** ?



(a) 36.3 N (b) 22.5 N (c) 20.8 N (d) 18.1 N

28. **In question 27**, what is the **normal force** acting on the block $\mathbf{m_1}$?

(a) $N=F_g - m_1 g \cos\theta$ (b) $N=F_g \cos\theta$ (c) $N=F_g + m_1 g \cos\theta$ (d) $N=F_g$

29. **In question 27**, if the cord is cut what is the **acceleration** of mass $\mathbf{m_2}$?

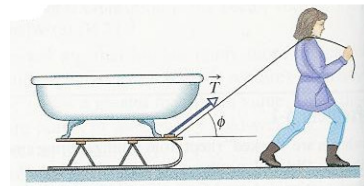
(a) a = - 4.9 m/s^2 (b)a = - 9.8 m/s^2 (c) a = -0.735 m/s^2 (d) a = zero

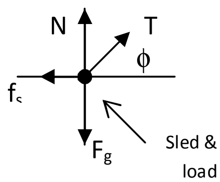
30. If the **1 kg** body has an **acceleration of 2 m/s²** at an angle of **20°** above the positive direction of the x-axis. What is the **net force** in unit vctor notation?

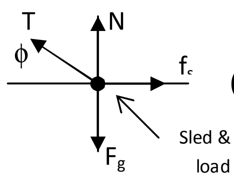
(a) $\vec{F} = 0.34\hat{i} + 0.94\hat{j}$ (b) $\vec{F} = 1.88\hat{i} + 0.68\hat{j}$ (c) $\vec{F} = 0.68\hat{i} + 1.88\hat{j}$ (d) $\vec{F} = 0.94\hat{i} + 0.34\hat{j}$

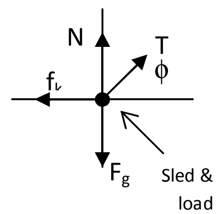
Chapter 6: FORCE AND MOTIN II

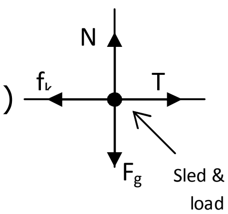
1. In the figure a woman **pulls** a loaded sled of mass **m** along a horizontal surface at **constant velocity**. The coefficient of kinetic friction between the runners and the snow is μ_k .
Which figure shows the correct **free body diagram** for the sled and load?



(a) 

(b) 

(c) 

(d) 

---

2. In question 2, The **equation of the forces acting on the load and sled** (from Newton's second law) is:

(a) $\vec{T}+\vec{N}+\vec{F}_g+\vec{f}_k=0$

(b) $\vec{T}+\vec{N}+\vec{F}_g+\vec{f}_s=0$

(c) $\vec{T}+\vec{N}+\vec{F}_g+\vec{f}_k=m\vec{a}$

(d) $\vec{T}+\vec{N}+\vec{F}_g+\vec{f}_s=m\vec{a}$

---

3. A **12 N** horizontal force pushes a block of **weight 5 N** to make it move with **constant speed**, the value of the **coefficient of friction** μ_k is:

(a) 2.4 (b) 0.24 (c) 4.1 (d) 0.41

---

4. A car has a **weight of 1.1 N** slides on the road with acceleration **a=1.24 m/s^2**, **what is the force of friction** between the car and the road?

(a) - 1.13 N (b) - 11 N (c) - 1.4 N (d) - 0.14 N

---

5. A **12 N** horizontal force pushes a block of **weight 5 N** to make it move with **constant speed**, the value of the **coefficient of friction** μ_k is:

(a) 2.4 (b) 0.24 (c) 4.1 (d) 0.41

6. A block lies on a floor.If the maximum value $f_{x,max}$ of the static frictional force on the block is **10 N**, what is the magnitude of the **frictional force** if the magnitude of the horizontally applied force is **8 N**?

(a) 10 N (b) 8 N (c) 2 N (d) 18 N

7. A **470 N** horizontal force pushes a block of **mass 79 kg** to make it move with **constant speed**, what is the value of the **coefficient of friction** μ_k ?

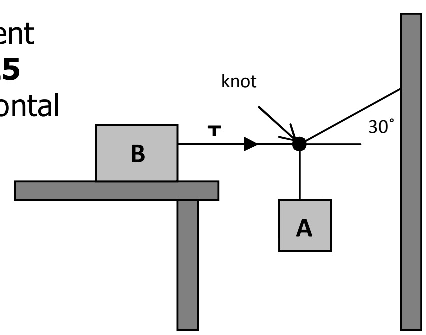
(a) 0.61 (b) 6 (c) 1.6 (d) 0.06

8. A block lies on a floor.If the maximum value $f_{x,max}$ of the static frictional force on the block is **10 N**, what is the magnitude of the frictional force if the magnitude of the horizontally applied force is **12 N**?

(a) 10 N (b) 12 N (c) 2 N (d) 22 N

9. In the figure, **block B weighs 711 N**. The coefficient of static friction between the block and the table is **0.25** assume that the cord between **B** and the **knot** is horizontal

What is the magnitude of the tension T?



(a) 205.2 N (b) 355.5 N (c) 820.1 N (d) 1422 N

10. **In question 9**, the weight of block **A** is :

(a) T cos 30 (b) T sin 30 (c) F_g – T cos 30 (d) F_g – T sin 30

CH 1

قاعدة / إذا كانت الفاصلة يمين ← الأس موجب
يسار ← الأس سالب.

1- $2,99,000,000$ (1 2 3 4 5 6 7 8)
2.99×10^{8}

قاعدة / من كبير لصغير ← نضرب.
من صغير لكبير ← نقسم

2- $100\ km/h \longrightarrow m/s$
$100 \times \frac{10^{3}}{3600} = 27.77\ m/s$

3- $0,000\ 000\ 004\ 56$ (1 2 3 4 5 6 7 8 9)
4.56×10^{-9}

معامل التحويل / ① أكتب العلاقة الأساسية.
② الشي اللي ما ابغا اشوفو أقسم عليه عشان اطيرو.

4- $\frac{1\ min}{1\ min} = \frac{60\ s}{1\ min}$

5- [speed] ← * مين من الاثنين، ان موكمية أساسية ؟

6- $1\ km \xrightarrow{10^{3}} m \xrightarrow{10^{2}} cm \Rightarrow 10^{5}\ cm$

7- $\frac{1h}{1h} = \frac{3600\ s}{1\ h}$

8- $1\ m = 3,281\ ft$
$??\ = 1,5\ ft$ $= \frac{1,5}{3,281} = 0,457 \div 3600 = 1,269 \times 10^{-4}\ m/s$

عشان نحول من ساعة إلى ثانية.

9- $1\ cm \xrightarrow{\times 10^{-2}} m$
$cm^{2} \xrightarrow{(\times 10^{-2})^{2}} m^{2}$
$= 10^{-4}\ m^{2}$

10- $10^{3}\ GW \xrightarrow{\times 10^{9}} W$
$= 10^{12}\ watt$

تابع CH 1

11- $\frac{1\,kg}{1\,kg} = \frac{10^3\,g}{1\,kg}$

12- milli = 10^3 ✗ خطأ , milli = 10^{-3} ✓

micro = 10^{-9} ✗ خطأ , micro = 10^{-6} ✓

mega = 10^6 ✓ صح .

pico = 10^9 ✗ خطأ , pico = 10^{-12} ✓

13- 1 mm $\xrightarrow{(\times 10^{-3})}$ m

$1\,mm^2 \xrightarrow{(\times 10^{-3})^2} m^2 \Rightarrow 10^{-6}\,m^2$

14- الحجم = الطول × العرض × الارتفاع

= 3 × 4 × 5 = 60 cm^3

15- $55 \times \frac{1609}{3600} = 24.58$ m/s

16- 1 ns $\xrightarrow{\times 10^{-9}}$ s

17- 1 gram = 10^{-3} kg

18- mass ⟶ kilogram. . الوحدة الأساسية للكتلة ← الكيلو جرام

19- 1000 meters = 1 kilometer

20- 1 km $\xrightarrow{\times 10^3}$ m $\xrightarrow{\times 10^2}$ cm ⇒ 10^5 cm

21- $\frac{1\,h}{1\,h} = \frac{3600\,s}{1\,h}$

22- 1 m = 3.281 ft

$1\,m^3 = (3.281)^3\,ft^3$

$1\,m^3 = 35.31\,ft^3$

$1\,m^3 = 35.31\,ft^3$

?? ✗ = $3.375\,ft^3$

$= 0.0955\,m^3 = 9.6 \times 10^{-2}\,m^3$

23- $\boxed{10^{-9}}$ second = nonosecond
↓ nano

24- 10 kg $\xrightarrow{\times 10^3}$ g = $10^1 \times 10^3 = 10^4$ g "إذا الأساسات متساوية نجمع الأسس"

25- Length = m , Mass = kg , Time = s.

26- 0.000 000 006 36
1 2 3 4 5 6 7 8 9
6.36×10^{-9}

27- 50 km $\xrightarrow{\times 10^5}$ cm
$= 5 \times 10^6$ cm

28- $100\ g/cm^3 = 100 \times \frac{10^{-3}}{10^{-6}} = 100000 = 10^1 \times 10^4 = 10^5\ kg/m^3$
4 3 2 1

29- (micro) second = 10^{-6} s
↓ 10^{-6}

30- $\frac{1\ m}{1\ m} = \frac{10^3\ mm}{1\ m}$

31- الوحدة الأساسية للكتلة هي الكيلو جرام
(gram) X خطأ

32- في الساعة فيه 3600 ثانية
يعني في اليوم بيكون $24 \times 3600 = 86400$
يعني في الأسبوع بيكون $7 \times 86400 =$
604800 ثانية.

CH 2

1- $X = 20 + 4t^2$

$v = 8t$

$= 8(5) = 40$ m/s

ملاحظة / إذا أعطانا x في معادلة : نفاضل مرة وحدة عشان نجيب السرعة v

نفاضل مرتين عشان نجيب التسارع a .

2- $v_0 = 12$, $v = 0$, $g = 9.8$, $\Delta y = ??$

$v^2 = v_0^2 - 2g\Delta y$

$0 = 144 - 2 \times 9.8 \times \Delta y$

$\frac{-144}{-19.6} = \frac{-19.6}{-19.6}\Delta y$

$\Delta y = 7.35$ m

* إذا شفنا كلمة upward يعني نستخدم معادلات السقوط الحر .
* كلمة Maximum height يعني السرعة النهائية v = 0 .

3- $t = 0$, $x_0 = 5$, $v_0 = 3$, $x = ??$ عندما $t = 2$

$x - x_0 = v_0 t + \frac{1}{2} a t^2$

$x - 5 = 3(2) + \frac{1}{2}(4)(2^2)$

$x - 5 = 14$

$x = 14 + 5 = 19$ m

4- $v = 10 + 2t^2$

$v_1 = 10 + 2(2)^2 = 18$ m/s

$v_2 = 10 + 2(5)^2 = 60$ m/s

$\Delta v = 60 - 18 = 42$ m/s

* هنا يعني التغير في السرعة يعني Δv وقانونها

$\Delta v = v_2 - v_1$

يعني لازم نعوض ونجيب v_1 , v_2

5 $v = 10 + 2t^2$ نفاضل عشان نجيب التسارع

$a = 4t$

$= 4(2) = 8$ m/s^2

6- a) $5 + 3 = 8$ m

b) $-4 + 3 = -1$ m

c) $-3 - 5 = -8$ m

d) $3 - 4 = -1$ m

* أي واحد من الخيارات الإزاحة فيه موجبة ؟

$\Delta x = x_f - x_i$

CH2 تابع

7- $x_1=0$, $t_1=0$ → 1.22 m, 1 s → 3.05 m, 1 s → $x_2 = 1.22 + 3.05 = 4.27$ m, $t_2 = 2$ s

$$S_{avg} = \frac{4.27}{2} = 2.135 \text{ m/s}$$

8- a) $v = 3t + 6 \rightarrow a = 3$

* أي المعادلات التسارع فيها ثابت؟
يعني رقم بس بدون t.

b) $v = 4t^2 \rightarrow a = 8t$

c) $v = 3t^2 - 4t \rightarrow a = 6t - 4$

d) $v = 5t^3 - 3 \rightarrow a = 15t^2$

9- $x = 8 - 5t + 25t^2$ — نفاضل مرة واحدة ونجيب السرعة

$v = -5 + 50t$

10- $v_0 = 0$, $v = \frac{1}{10}(3\times10^8)$, $a = 9.8$, $t = ??$

* لما نشوف كلمة starts the rest يعني السرعة الابتدائية $v_0 = 0$
* هذا السؤال يبغى الزمن المستغرق إلى أن توصل الحركة إلى عُشر سرعة الضوء يعني السرعة النهائية تكون $v = \frac{1}{10}(3\times10^8)$

$v = v_0 + at$

$(\frac{1}{10}\times3\times10^8) = 0 + 9.8t$

$\frac{(3\times10^7)}{9.8} = \frac{9.8\,t}{9.8}$

$t = 3.1\times10^6$ s

11- $v^2 = v_0^2 + 2a\Delta x$

* حنستخدم نفس المعطيات في سؤال 10 بس نغير القانون المناسب.

$(\frac{1}{10}\times3\times10^8)^2 = 0 + 2\times9.8\,\Delta x$

$\Delta x = 4.59\times10^{13}$ m

12- $v_0 = 12$, $v = 0$, $g = 9.8$, $t = ?$

$v = v_0 - gt$

$0 = 12 - 9.8t$

$\frac{-12}{-9.8} = \frac{-9.8\,t}{-9.8}$

$t = 1.22$ s

CH 2 تابع

13- $\Delta x = 60$, $t = 6$, $v = 15$, $v_0 = ??$

$$x - x_0 = \frac{1}{2}(v_0 + v)t$$

$$2 \times (60) = \left(\frac{1}{2}(v_0 + 15)\,6\right) \times 2$$

$$120 = (v_0 + 15)\,6$$

$$120 = 6v_0 + 90$$

$$\frac{6v_0}{6} = \frac{30}{6}$$

$$v_0 = 5 \text{ m/s}$$

14- $a = \frac{dv}{dt} = \frac{d}{dt}\left(\frac{dx}{dt}\right) = \frac{d^2x}{dt^2}$ ← حفظ ☺

15- $x_1 = 20 + 4(2)^2 = 36$ m

$x_2 = 20 + 4(5)^2 = 120$ m

$$v_{avg} = \frac{120 - 36}{5 - 2} = 28 \text{ m/s}$$

16- $v = 8t$

$= 8(5) = 40$ m/s

17- $v_0 = 0$, $g = 9.8$, $y = 50$, $t = ??$

$$\Delta y = v_0 t - \frac{1}{2} g t^2$$

$$-50 = -\frac{1}{2} \times 9.8\, t^2$$

$$\frac{-50}{4.9} = \frac{4.9}{4.9} t^2$$

$$\sqrt{t^2} = \sqrt{10.2}$$

$$t = 3.19 \text{ s}$$

18 – a) $x = 4t^2 - 2 \rightarrow v = 8t$

b) $x = -2t^3 \rightarrow v = -6t^2$

c) $x = -3t - 2 \rightarrow v = -3$

d) $x = 4t^{-2} \rightarrow v = -8t^{-1}$

* أي المعادلات فيها السرعة ثابتة ؟

لازم نفاضل وإذا طلع عدد بس يعني ثابتة .

19 – $v_0 = 12$, $v = 0$, $g = 9.8$, $y = ??$

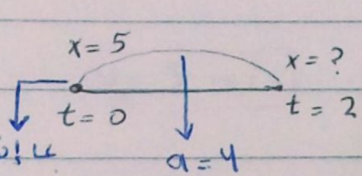
$v^2 = v_0^2 - 2g\,\Delta y$

$0 = 144 - 2 \times 9.8\,\Delta y$

$\frac{-144}{-19.6} = \frac{-19.6}{-19.6}\,\Delta y$

$\Delta y = 7.346$

20 –



عنا إنو الزمن صفر وتأكيد السرعة الي أعطانا ابتدائية . $V_0 = 3$

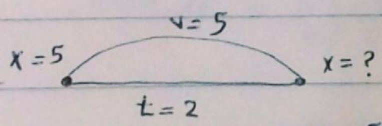
$x - x_0 = v_0 t + \frac{1}{2} a t^2$

$x - 5 = 3(2) + \frac{1}{2}(4)(2)^2$

$x - 5 = 14$

$x = 19$

21 –



$x - 5 = 5(2) - \frac{1}{2}(4)(2)^2$

$x - 5 = 2$

$x = 7\ m$

22 – $v_{avg} = \frac{1}{\left(\frac{4}{60}\right)} = 15\ mi/hr$

للتحويل من دقيقة إلى ساعة .

23 – displacement = $73.2 + 73.2 = 146.4\ m$

* لما يجيب كلمة overall displacment يعني نجمع على طول .

24- $t_1 = \frac{d}{v} = \frac{73.2}{1.22} = 60$

$t_2 = 24$ ← أعطانا ياها في السؤال

$60 + 24 = 84\ s$

25- $a_{avg} = \frac{12-8}{4-2} = 2\ m/s^2$

26- $x = 60$, $t = 6$, $v = 15$, $\boxed{v_0 = ??}$

$\Delta x = \frac{1}{2}(v_0 + v)t$

$2 \times (60) = (\frac{1}{2}(v_0 + 15)6) \times 2$

$120 = 6v_0 + 90$

$\frac{6 v_0}{6} = \frac{30}{6}$

$\boxed{v_0 = 5\ m/s}$

27- $v^2 = v_0^2 + 2a(x - x_0)$

$0 = (22.36)^2 + 2a(56.7)$

$\frac{-499.96}{113.4} = \frac{113.4}{113.4} a$

$a = -4.41\ m/s^2$

* إذا شفنا كلمة stop يعني السرعة النهائية $v = 0$

هنا قال يعني القيمة المطلقة يعني الإجابة ← ناخذها موجبة.

28- $v^2 = v_0^2 - 2g\Delta y$

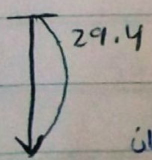
$(-24)^2 = 0 - 2 \times 9.8\ \Delta y$

$\frac{576}{-19.6} = \frac{-19.6}{-19.6} \Delta y$

$\Delta y = -29.38\ m$

ملاحظة! إذا كان الجسم نازل لأسفل يعني المسافة سالبة.

وإذا شفنا كلمة dropped يعني السرعة الابتدائية $v_0 = 0$



* هنا بس يعني كم كان الارتفاع مالو صلاح في الإشارة.

Scanned by CamScanner

29- $\Delta y = v_0 t - \frac{1}{2} g t^2$

$0.544 = v_0 (0.2) - \frac{1}{2} \times 9.8 \times (0.2)^2$

$0.544 = 0.2\, v_0 - 0.196$

$\frac{0.74}{0.2} = \frac{0.2}{0.2} v_0$

$v_0 = 3.7 \ m/s$

30- $\Delta X = 10 - (-2) = 10 + 2 = 12 \ m$

31- * أي الحالات فيها الإزاحة موجبة؟

A) $5 + 3 = 8$ ✓

B) $-7 + 3 = -4$

C) $-3 + 3 = 0$

D) $5 - 2 = 3$ ✓

32- $X = 3t - 4t^2 + t^3$

$X = 3(2) - 4(2)^2 + (2)^3 = -2 \ m$

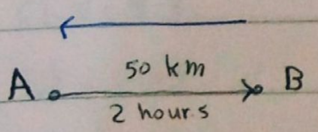
33- $X_1 = 3(0) - 4(0)^2 + (0)^3 = 0$

$X_2 = 3(4) - 4(4)^2 + (4)^3 = 12$

$\Delta X = 12 - 0 = 12 \ m$

34- $S_{avg} = \frac{40 + 40}{0.5 + 1} = 53.3 \ km/h$

35-



* لما يقول إنو مشي مسافة كذا ... وبعدين رجع يعني نطرح.

$V_{avg} = \frac{50 - 50}{2} = 0$

CH2 تابع

36- $X = 2t^3$

$v = 6t^2$ * تفاضل مرة وحدة ← السرعة .

$a = 12t$ * تفاضل مرتين ← التسارع .

37- $V_0 = 0$, $g = 9.8$, $t = 1$, $v = ??$, $y = ??$

* $v = v_0 - gt$

$v = 0 - 9.8(1) = -9.8$ m/s

* $\Delta y = v_0 t - \frac{1}{2} g t^2$

$\Delta y = 0(1) - \frac{1}{2}(9.8)(1)^2$

$= -4.9$ m

38- $v^2 = v_0^2 + 2a(x - x_0)$

$(2 \times 10^6)^2 = (1 \times 10^5)^2 + 2a(0.01)$

$4 \times 10^{12} = 1 \times 10^{10} + 0.02a$

$\frac{3.99 \times 10^{12}}{0.02} = \frac{0.02a}{0.02}$

$a = 1.995 \times 10^{14}$ m/s

39- speed increase ← إذا السرعة والتسارع كلها موجبة

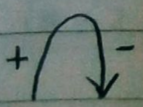
أو كلها سالبة .

40- (A) $v = -4t$ ✓ أي وحدة منها لو فاضلنا وجبنا السرعة

B) $v = 9t^2$ حتكون سالبة .

c) $v = 4t^{-1}$

D) = $v = 5$

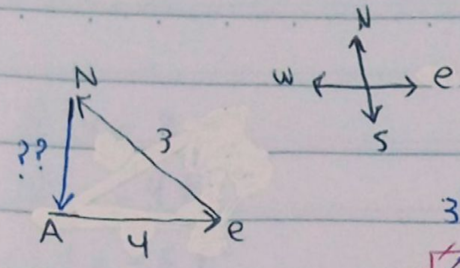
41- 

الإزاحة موجبة في الصعود

وسالبة في الهبوط .

CH2 تابع

42-



$3^2 = 4^2 + x^2$

$\sqrt{x^2} = \sqrt{25}$

$\boxed{x = 5}$

* نظرية فيثاغورس *

43- (a) $v = 3t + 6 \rightarrow a = 3$ ✓

b) $v = 4t^2 \rightarrow a = 8t$

c) $v = 3t^2 - 4t \rightarrow a = 6t$

d) $v = 5t^3 - 3 \rightarrow a = 15t^2$

* أي المعادلات لو فاضلنا حيطلع التسارع ثابت [عدد بس] ؟

44- $v = 0$

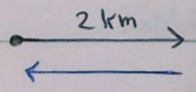
$a = -g$

* في أقصى ارتفاع السرعة دايمًا تكون صفر
والتسارع في كل الاتجاهات دايمًا يكون g-

45- speed decrease ← إذا السرعة والتسارع بإشارات مختلفة

46- $\Delta x = 12 - 5 = +8$ [موجبة]

47-



إذا رجعنا للخلف يعني نطرح

$\therefore$ displacement $= 2 - 2 = 0$

48- $S_{avg} = \frac{2+2}{0.5+0.75} = 3.2$ m/s

المسافة الكلية / الزمن الكلي.

49- $V_{avg} = \frac{100-20}{4-2} = 40$ m/s

50- $x(t) = 10 + t^2$

$v = 2t$

$\boxed{a = 2}$

51- free fall acceleration $= -9.8$ m/s²

تسارع السقوط الحر ← 9.8-

تابع CH2

52- A) $v = 3$

B) $v = 4t$ — أي المعادلات لو فاضلنا السرعة بتكون

C) $v = -6t^2$ — ثابتة [عدد بس].

D) $v = 10t$

53- $v_0 = 0$, $\Delta x = 500$, $v = 50$, $a = ??$

$v^2 = v_0^2 + 2a\Delta x$

$(50)^2 = 0 + 2a(500)$

$\frac{2500}{1000} = \frac{1000\,a}{1000}$

$a = 2.5$

* $v_0=0$ يعني start the rest

54- صح C كلها خطأ ما عدا فقرة

* مهم حفظ معادلات الحركة كلها ☺

55- السرعة في اتجاه الأعلى في حالة الصعود ↑

والتسارع دايمًا اتجاهه نفسو في اتجاه الأسفل ↓

56- لا السرعة هي مقدار أو القيمة المطلقة

للسرعة اللحظية " صح

57- " التسارع المتوسط هو النسبة بين التغير في السرعة في فترة زمنية "

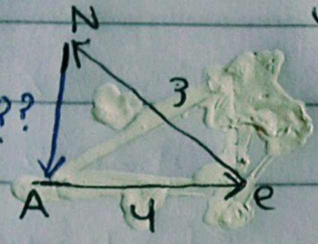
$a_{avg} = \frac{\Delta v}{\Delta t}$ صح

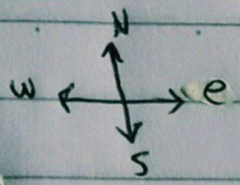
58- " السقوط الحر هو مثال على الحركة في خط مستقيم بتسارع ثابت "

صح ، لأن التسارع فيه دايمًا 9.8-

تابع CH2

42-



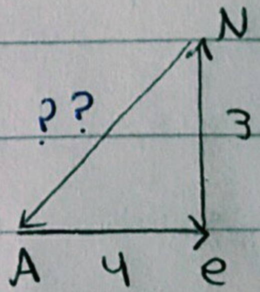


* نظرية فيثاغورس *

$3^2 = 4^2 + x^2$

$\sqrt{x^2} = \sqrt{25}$

$\boxed{x = 5}$



$x^2 = 3^2 + 4^2$

$\sqrt{x^2} = \sqrt{25}$

$\boxed{x = 5}$

تعديل سؤال ٤٢ و ٤٦ ؛ شابتر ٢ ✨:

46- $\Delta x = 12 - 5 = +8$ [موجبة]

$\Delta x = 12 - 5 = 7$

CH 3

1- $|a| = \sqrt{a_x^2 + a_y^2}$
$= \sqrt{9+16} = \sqrt{25} = 5$

2- $\theta = \tan^{-1} \frac{a_y}{a_x} = \tan^{-1} \frac{-4}{3} = -53.1^\circ$

ملاحظة / إشارة a_x و a_y تنكتب زي ماهي في القانون.

3- $\vec{a} = 2i + 3j + 4k$
$+ b = i - 2j + 3k$
$3i + j + 7k$

* في الجمع نرجع نكتب i, j, k زي ماهيا مانشيلها *

4- $2i + 3j + 4k$
$\times$ $i - 2j + 3k$
$2 - 6 + 12 = 8$

* في الضرب ا $(a \cdot b)$ لازم يطلع النا تج scaler بدون الحروف

5- $C \times D = CD \sin\theta$
$\theta = \sin^{-1} \frac{C \times D}{CD} = \sin^{-1} \frac{12}{(3)(4)} = 90^\circ$

6- $\theta = \tan^{-1} \frac{a_y}{a_x} = \tan^{-1} \frac{-2.3}{2.6} = -41.49$

7- بما إنو المتجها ت في الربع الأول يعني محور X و y هو جبين
فَ حيكون المركبات حق المتجها ت ذي موجبة $(+, +)$.

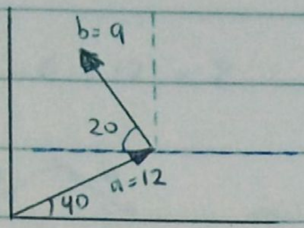
8- $\begin{vmatrix} i & j & k \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix} = (a_y b_z - b_y a_z) i + (a_z b_x - b_z a_x) j + (a_x b_y - b_x a_y) k$

* إحنا عارفين إنو الـ X مع i وَ y مع j وَ z مع k فَ نختار، الي مع j لأنو طلب y.

* طريقة ثانية ممكن تفيد : الشي اللي يبغاه مثلاً a_y و لا a_z و لا a_x نروح نختار الاختيار الي مافيه الحرف اللي يبغاه، يعني لو X نختار، الي مافيه حرف X، لو y نختار، الي مافيه y و هكذا ☺

CH3 تابع

9 -



$r = a + b$

$r_x = a_x + b_x$

$= 9.19 - 8.457$

$= 0.732$

* هنا يبغى المركبة x لحاصل جمع المتجهين ذولا،
فَ احنا لازم نجيب المركبة x لكل واحد فيهم عشان نطلع اللي يبغاه.

a_x عادي نقدر، نطلعها زي كأنها داخلها في الربع الأول.

$$a_x = a \cos\theta = 12 \cos 40 = 9.19$$

b_x دحين كأنها داخلة في محاور جديدة وربع جديد ماله صلاح
في الأول، زي كأنو، رسمة جوات، رسمة مصغرة * ان شاء الله وضحت ☺ *

لو بنا نجيب b_x وهيا في المحاور الجديدة ذي داخلة في الربع الثاني
يعني حتكون سالبة.

$$b_x = -b \cos\theta = -9 \cos 20 = -8.457$$

إذا جبنا المركبات كلها خلاص نجمع

---

10 - $|a| = \sqrt{a_x^2 + a_y^2} = \sqrt{(4)^2 + (3)^2} = 5$

11 -

$$\begin{array}{r} 4i - 3j \\ + \; 6i + 8j \\ \hline 10i + 5j \end{array}$$

12 - $24 - 24 = 0$

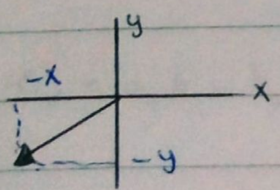
13 - $\frac{6i}{2} + \frac{8j}{2} = 3i + 4j$

14 - نفس سؤال 3.

15 - $A \times B = AB \sin\theta$

$= (6)(4) \sin 30 = 12$

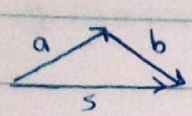
16 -



$(-, -)$

تابع CH3

17- $2-6+12=8$

18- 

المتجه المحصل يكون في عكس اتجاه الحركة.

19- $a_y = a \sin\theta = 15 \sin 30 = 7.5$

20- scaler → Length.

21- $\theta = \tan^{-1} \frac{a_y}{a_x} = \tan^{-1} \frac{40}{-25} = -57.99$

22- x مع i , y مع j ⇒ $2.6i - 2.3j$

23- $\frac{36}{4} - 9 = 9 - 9 = 0$

24- (a) → المتجه وعكسه لازم يكونو نفس المقدار، بس عكس الاتجاه.

25- $a - b = -2i - 11j - 3k$

$-2i - 11j - 3k + C = 0$

$C = 2i + 11j + 3k$

26- $|A \times B| = AB \sin\theta = (5)(6) \sin 60 = 25.98$

27- $A \cdot B = -6 + 12 - 8 = -2$

28- $|A| = \sqrt{(2)^2 + (3)^2 + (4)^2} = 5.38$

29- $c_x = a_y b_z - b_y a_z$ → نختار الي ما فيها x

Scanned by CamScanner

تابع CH3

30- y-component = 0 ⟶ لما يكون المتجه على محور x

31- $\theta = \cos^{-1} \frac{C \cdot D}{CD} = \cos^{-1} \frac{12}{(3)(4)} = 0$

32- نفس هرجة سؤال 9 بس هنا بدل ما يقول إنو الزاوية حطو 20 في الربع الثاني ، أخذ (180 - الزاوية) عشان يطلع الزاوية من الربع الأول وتكون cos موجبة .

$a \cos 40 - b \cos 20$

$a \cos 40 + b \cos 160$

هي نفسها

33- $B = i - 2j \Rightarrow 2B = 2i - 4j$

$A - 2B = (3i - 3j) - (2i - 4j) = i + j$

34- $C = A + B$

$B = C - A$

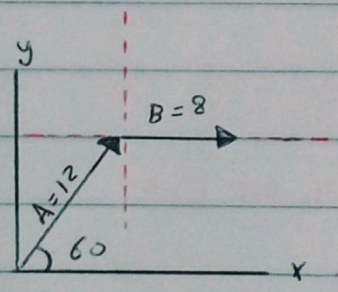
* إحنا عارفين إنو المتجه المحصل يكون في اتجاه الحركة ، يعني هنا C ⟵

* بدنا نجيب B فَ نودّي A للطرف الثاني بإشارة سالبة .

35- $D = a + b$

$D_x = a_x + b_x$

$= 12 \cos 60 + 8 \cos 0$



* نفس هرجة سؤال 9 ☺ *

36- $A \cdot B = AB \cos 30$

$= (4)(4) \cos 30 = 13.85$

37- $\vec{C} = \vec{A} \times \vec{B}$

$-\vec{C} = \vec{B} \times \vec{A}$

* ملاحظة مهمة جدًا :

- في الضرب ذا $(a \cdot b)$ عادي نقدر نقول إنو $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{a}$

- أما في الضرب ذا $(a \times b)$ مانقدر نقول إنهم بيساووا بعض إلا لو حطينا إشارة سالب يعني عكس الإشارة .

CH3 تابع

38- $a \times b = ab \sin\theta$

$\theta = \sin^{-1} \frac{a \times b}{ab} = \sin^{-1} \frac{5}{(5)(2)} = 30°$

39- $A = 6i - 8j \Rightarrow 4A = 24i - 32j$

$|4A| = \sqrt{(24)^2 + (-32)^2} = 40$

40- $a_x = a \cos\theta$

$\theta = \cos^{-1} \frac{a_x}{a} = \cos^{-1} \frac{12}{25} = 61.3$

41- $A = 2i + 6j - 3k$

$+ \; B = 4i + 2j + k$

$6i + 8j - 2k$

42- $A \cdot B = 8 + 12 - 3 = 17$ * في الضرب ذا ($a \cdot b$) ما نحط الحروف على طول نجمع الناتج بس

43- $A \times B = AB \sin\theta$

$= (L)(L) \sin 60 = 0.866\, L^2$

44- x - component = 0 → لا يكون المتجه على محور y . *عكس سؤال 30 ☺ *

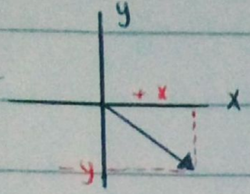
45- $\theta = \tan^{-1} \frac{a_y}{a_x} = \tan^{-1} \frac{45}{-25} = -60.9$

46- $|v| = \sqrt{4 + 36 + 9} = 7$

47- $r_y = r \sin\theta$

$= 15 \sin 30$

$= 7.5$

48- 

$(+ , -)$

49- $a - b = (4i - 3j + k) - (6i + 8j + 4k) = -2i - 11j - 3k$

$-2i - 11j - 3k + C = 0$

$C = 2i + 11j + 3k$

50- $A \cdot B = -6 + 12 - 8 = -2$

51- $|a| = \sqrt{(10)^2 + (10)^2 + (5)^2} = 15$

52- $A - B = (2i + 6j - 3k) - (4i + 2j + k)$

$= -2i + 4j - 4k$

53- $C \cdot D = CD \cos\theta$

$\theta = \cos^{-1} \frac{C \cdot D}{CD} = \cos^{-1} \frac{12}{(3)(4)} = 0$

54- المتجه $-b$ له نفس مقدار المتجه b لكن بعكس الاتجاه .

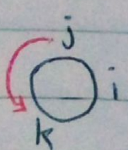
55- $b_x = b \cos\theta$

$\theta = \cos^{-1} \frac{b_x}{b} = \cos^{-1} \frac{8.7}{10} = 29.5 \approx 30$ * نطلع الزاوية عشان نختار الرسمة الصح *

56- $\theta = \tan^{-1} \frac{a_y}{a_x} = \tan^{-1} \frac{4}{3} = 53.13$

57- $|a| = \sqrt{9 + 16} = 5$

58- نفس سؤال 48 .

59- عكس عقارب الساعة ← موجب الحرف الناقص 

$j \times k = +i$

تابع CH3

60- $b - a = (6i + 8j) - (4i - 3j) = 2i + 11j$

61- $|A \times B| = AB \sin\theta$

$= (4)(6) \sin 60 = 20.78$

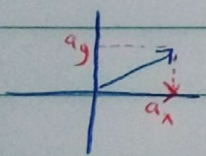
62- $A \cdot B = -6 + 6 - 8 = -8$

63- $C \cdot D = CD \cos\theta$

$\theta = \cos^{-1} \frac{C \cdot D}{CD} = \cos^{-1} \frac{-12}{(3)(4)} = 180$

64- $\frac{D}{5} = \frac{5i}{5} + \frac{25j}{5} = i + 5j$

65- نفس سؤال 32 .

66- 

* مركبة المتجه هي مسقط المتجه على المحور [صح]

67- * A.B بتكون ماكسيموم لما الزاوية = 0 [حفظ ذا الشي ☺]

68- ① نفتح الي جوا القوس: i ◯ j k عكس عقارب الساعة

↓

موجب الحرف الناقص

يعني $j \times k = i$

② نضرب $i \cdot (i)$ ← تساوي واحد .

69- * المركبات a_x وَ a_y هي vector [غلط] ← هي scaler

70- * قيمة متجه الوحدة تساوي واحد (حفظ)

CH 4

1- y مع j , x مع i

$\hookrightarrow$ $2.6i - 2.3j$

2- $\Delta r = r_2 - r_1$

$= (-2-5)i + (6+6)j + (2-2)k$

$= -7i + 12j$

3- $(3+2)i + (-1-3)j + (4-1)k$

$= 5i - 4j + 3k$

4- فيه تعديل بالسؤال $x = -5t^2 + 16$. الإشارة السالبة ما كانت موجودة !!

$x = -5(2)^2 + 16 = -4$

$y = -(2)^3 + 5 = -3$

$r = -4i - 3j$

$|r| = \sqrt{16+9} = \sqrt{25} = 5$

5- at $t = 1$: $v_x = 2(1) + 3 = 5$

$v_y = 4(1) - 1 = 3$

$v = v_x i + v_y j$

$= 5i + 3j$

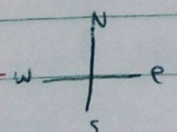
6- a. rate of change of position with time

السرعة / معدل تغير الموضع مع الزمن .

7- $x_1 = 1^2 + 2 = 3$, $t_1 = 1$

$x_2 = 2^2 + 2 = 6$, $t_2 = 2$

$$v_{avg} = \frac{6-3}{2-1} = 3 \text{ m/s}$$

8- 

$v_1 \xrightarrow{200} e$

$w \xleftarrow{-200} v_2$

$\Delta v = v_2 - v_1$

$= -200 - 200 = -400$ علامة السالب يعني جهة الغرب

$w \leftarrow$

CH 4 تابع

9- $r = i + 4t^2 j + t k$

$v = 8t j + k$ — نشتق أول مرة ← بجيب السرعة

$a = 8j$ — نشتق ثاني مرة ← بجيب التسارع.

10- C

الجواب فقرة C ، لأن لو فاضلنا y و x تبين حتطلع كلها ثابتة .

11- $v_x = 6t^2 - 5$, $v_y = -3t^3$

↳ $a_x = 12t$ ↳ $a_y = -9t^2$

12- $v = v_0 + at$

$v_x = v_{0x} + a_x t$ — * احنا بنعى مركبة x للسرعة فقط فنا خذ بس x

$= -2 + (-5 \times 1)$ — * ناخذها من معادلة a و v

$= -7$

13- C- rate of change of velocity with time.

التسارع/ معدل التغير في السرعة مع الزمن .

14- $v_1 = +18$, $v_2 = -30$

$a_{avg} = \frac{-30 - 18}{2.4}$

15- $v = v_0 + at$

$= (2i + 5j) + (5j)(2)$

$= 2i + 5j + 10j = 2i + 15j$ — الجواب ز ا صح إلين هنا ، بس لو في الكتاب انه ما اعطانا ياه

$|v| = \sqrt{2^2 + 15^2}$ ← لازم بجيب مقدار السرعة بالجذر

$= 15.1$

16- $v = v_0 + at$

$= (8i + 12j) + (4i - 2j)(6)$

$= 8i + 12j + 24i - 12j$

$= 32i$

17- $a = \frac{dv}{dt}$ حفظ ‼

تابع CH4

18- $R = \frac{v_0^2 \sin 2\theta}{g} = \frac{(50)^2 \sin 60}{9.8} = 220.9$

19- Max range → $\theta = 45°$ حفظ :)

20- B- zero * في حركة المقذوفات المركبة الأفقية للتسارع دايمًا تساوي صفر.

21- نفس سؤال 18

22- $R = \frac{(980)^2 \sin 60}{9.8} = 84870$ m نفس قانون سؤال 18 ←

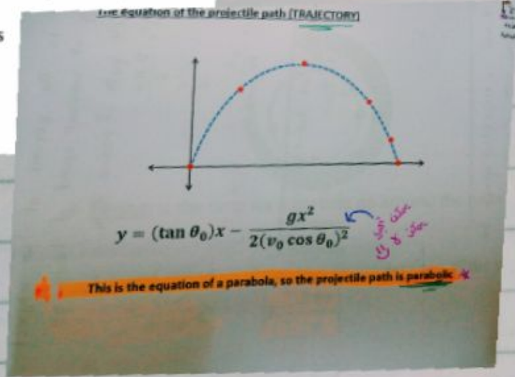
84.8 km (÷ 1000)

23- نسيت اسأل استاذتي ع السؤال ذا بس اساساً ما لقيت ڤ السلايدات الا انو مسار المقذوفات حيكون parabolic، وبحثت بالنت لقيت موقعين اجنبية منزلة السؤال ونفس الاجابة ڤ ان شاءالله يكون الجواب صح 🙏💓.

11. A stone thrown from the top of a tall building follows a path that is:

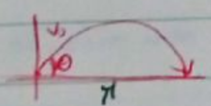
A. circular
B. made of two straight line segments
C. hyperbolic
D. parabolic
E. a straight line

ans: D



24- d- zero أستاذي قال لما يكونو طيارتين جنب بعض بنفس المسار، تسارع بالنسبة للثانية يكون صفر.

25- b الكرة تقذف بسرعة ابتدائية وتكوّن زاوية ثم بعدين ترجع لنفس الارتفاع الي كانت عليه، إيش نوع المسار حقها ؟؟ لو رسمنا نعرف :)



Trajectory.

26- a * السرعة دائمًا ثابتة لا تتغير والتسارع الأفقي يكون صفر $a_x = 0$

27- Max height → v_y = zero عند أقصى ارتفاع المركبة الرأسية للسرعة دائمًا صفر.

28- $v_{0x} = 120 \cos 60 = 60$

$v_{0y} = 120 \sin 60 = 103.9$

$v_0 = 60 i + 104 j$

29_ c_zero

* التسارع في الاتجاه الأفقي a_x دائمًا صفر لو إيش ما جاب عوطيان بس يبا يتوهنا ☺..

30_ $R = \frac{V_0^2 \sin 2\theta}{g} = \frac{(120)^2 \sin(2\times45)}{9.8} = 1469.38$

31_ d

32_ d. لو طلعنا مقدار السرعة بالجذر بتطلع كلها متساوية في جميع الحالات

مثلاً: 1. $|v| = \sqrt{(20)^2+(70)^2} = 72.8$

2. $|v| = \sqrt{(-20)^2+(70)^2} = 72.8$

33_ a. المركبة الأفقية V_x ثابتة أما المركبة الرأسية V_y تتغير باستمرار.

34_ Max range → $\theta = 45$

35_ $a_x = 0$ [دائمًا]

36_ نفس سؤال 18

37_ نفس سؤال 22

38_ a. $a_x = 0$

39_ نفس سؤال 25 (b)

40_ نفس سؤال 26 (a)

41_ نفس سؤال 27 (c)

42_ $T = \frac{2\pi r}{v} = \frac{2\pi 2}{4} = \frac{4\pi}{4} = \pi$

43_ نفس سؤال 42 (A)

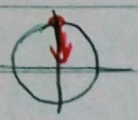
44_ (c) في الحركة الدائرية السرعة والتسارع متعامدين على بعض * حفظ :) *

45_ $a = \frac{v^2}{r} \Rightarrow v^2 = ar$

$= (25g)(1) = (25 \times 9.8)(1) = 245$

نعوض بـ 9.8

$v = \sqrt{245} = 15.6 \approx 16$

46_ 

هو قال بالسؤال top واتجاه التسارع دائمًا للمركز
يعني على تحت حيكون الاتجاه .

$a = \frac{v^2}{r} = \frac{4^2}{0.50} = 32 \ m/s^2$, down.

47_ 

هنا قال إنو at the bottom يعني كان تحت واتجاهه
ناحية المركز يعني لفوق حيكون .

$a = \frac{4^2}{0.50} = 32 \ m/s^2$, up

* عدلوا السؤال هو 40 ، 4 الصح .

48_ $a = \frac{v^2}{r} = \frac{100}{20} = 5 \ m/s^2$

49_ $a = \frac{v^2}{r} \Longrightarrow v = \sqrt{ar} = \sqrt{20 \times 5} = \sqrt{100} = 10$

50_ (c) * بما إنه رجع لنفس نقطة السرعة الابتدائية وبنفس الإشارات
يعني الزمن كان لفة كاملة :)

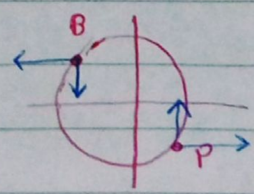
51_ نفس سؤال 42 .

52_ $a = \frac{v^2}{r} = \frac{16}{2} = 8 \ m/s^2$

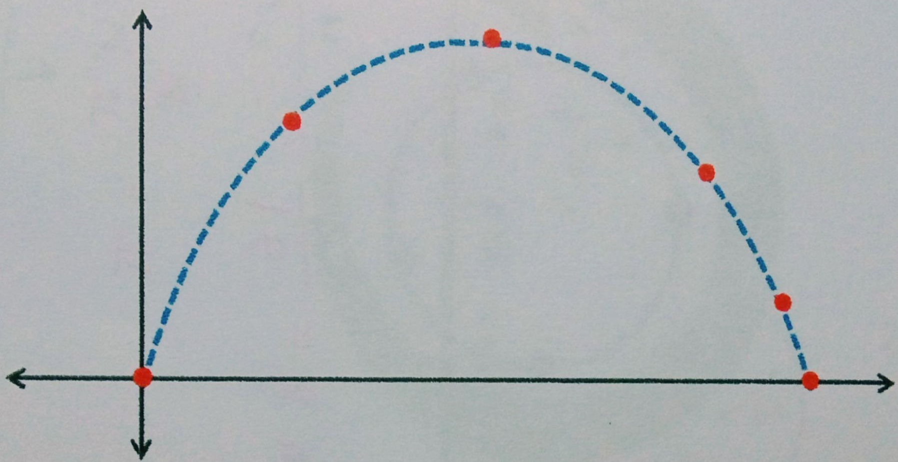
53_ $-3i$ $-4j$

يعني على محور x جهة اليسار — يعني على محور y لتحت

- اتجاه السرعة ناحية المماس يعني النقطة B .



The equation of the projectile path (TRAJECTORY)



$$y = (\tan\theta_0)x - \frac{gx^2}{2(v_0\cos\theta_0)^2}$$

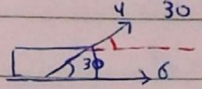
This is the equation of a parabola, so the projectile path is parabolic

CH 5

1- نجمع الأرقام ونشوف مين أكبر، لو الرقم يمين حيكون موجب ولو يسار سالب

a- $6+4=10$

b- هنا 4 مايلة فَ أكيد بيقالها تحليل ونفترض لو أعطانا زاوية ما كانت فَ حتضرب $4\sin\theta$ أو $4\cos\theta$، المهم يعني الساين والكوزاين محصورين بين [1,-1] يعني ممكن نضرب الأربعة في عدد كسري وذا الشي حيقللها، مثال عشان توضح المعلومة لو أخذنا الزاوية 30



$4\cos 30 = 3.5$

$6 + 3.5 = 9.5$ ← أكبر من فقرة a

c- $4 - 6 = -2$

عشانه جهة اليسار

d- $6 - 4 = 2$

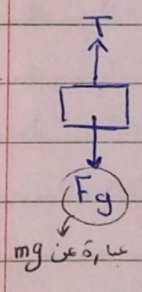
- الجواب (a) -

2- $F = 0.2\,N$, $m = 100\,g$ —لازم نحولها kg→ $100 \div 1000 = 0.1\,kg$

$F = ma \Rightarrow a = \frac{F}{m}$

$= \frac{0.2}{0.1} = 2\ m/s^2$

3-



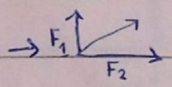
$F_{Net} = ma$

$T - F_g = m a$

$a = \frac{T - F_g}{m}$

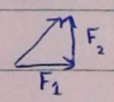
$= \frac{T - mg}{m}$

4- (b)

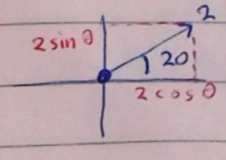


كلهم برا F_1, F_2 فَ الي بالذهن حيكون برا

أو كلهم ورا بعض بشكل مثلث F_1, F_2 حيكون كذا



5-



$F = m a_x i + m a_y j$

$= (1)(2\cos 20) i + (1)(2\sin 20) j$

$= 1.88 i + 0.68 j$

هنا يبغى معادلة القوة في أول ، والكتلة m هي خاصية ذاتية للجسم يعني ثابتة سواءً أفقي أو رأسي، التسارع a هو الي نقدر نحلله ونجيب المركبة الأفقية i والرأسية j ونعوض فيه لـ F

تابع CH5

6- قال constant velocity $\xrightarrow{\text{يعني}}$ $\boxed{a=0}$

$$\Sigma F = ma$$

$$F_1 + F_2 = 0$$

$$(2i - 6j) + F_2 = 0$$

نعكس الإشارة

$$F_2 = -2i + 6j$$

7- أعطانا في السؤال إنه الوزن $w = 22$ ، و إحنا عارفين إنه $w = |mg|$ فلو نبغى الكتلة نعوض في القانون ونجيبها.

$$w = mg \Rightarrow m = \frac{w}{g} = \frac{22}{9.8} = 2.2\ kg$$

الكتلة ما تتأثر بالجاذبية الأرضية أيًا كانت g اللي يعطينا هي ثابتة، أما الوزن عشان أصلاً قانونه mg فَـ حيتأثر، لو عوضنا g بصفر زي ما أعطانا في نهاية السؤال:

$$w = mg = (2.2)(0) = 0$$

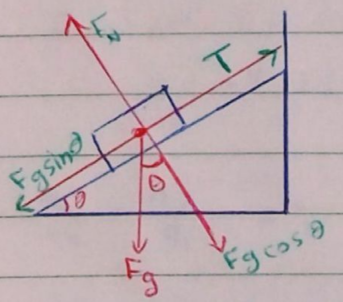
8- نجمع اللي على y عشان نشوف مين يساوي صفر، إذا كان على فوق يعني موجب و تحت يعني سالب.

a- $7 - 4 = 3$

b- $6 - 4 - 2 = 0$ ✓ — الجواب b —

c- $6 - 5 - 4 = -3$

d- $3 + 2 - 5 - 4 = -4$

9- 

$F_{Net} = ma$ / "stationary" حالة سكون يعني $a = 0$

$$T - F_g \sin\theta = 0$$

$$T = F_g \sin\theta$$

$F_g = mg$

$$= (8.5)(9.8)\sin 30$$

$$= 41.65\ N$$

10- بما إن الجسم في حالة سكون فَـ أكيد القوة العمودية F_N تساوي اللي تحتها $F_N = F_g \cos\theta$

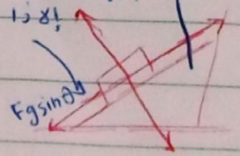
11- $F_{net} = ma$

$$-F_g \sin\theta = ma$$

$$a = \frac{-F_g \sin\theta}{m}$$

$$= \frac{-8.5 \times 9.8 \times \sin 30}{8.5} = -4.9$$

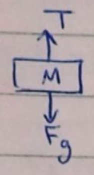
لو قطعنا الجسم من هنا ما حيبقى عندنا إلا ذا وفي الاتجاه السالب



12- هذا السؤال مسوّيلنا شغلانة طويلة عريضة ع الفاضي 🙂

احنا عارفين إنو لما يكون الجسم معلق قوة الجاذبية الأرضية تأثر فيه من تحت و T من فوق.

لو رسمنا كذا حيطلع معانا إنو $T = F_g$



$T = F_g$

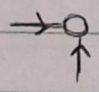
$= mg = (20 \times 9.8) = 196\ N$

13- $F = ma$

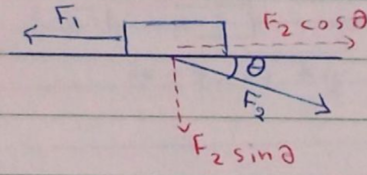
$= (48)(6) = 288\ N$

14- الجواب (c)

اتجاه T دايمًا راح للبكرة



15-



ملاحظة / دايمًا نبدأ بالمحور الموجب في الحل أفضل

يعني يمين بعدين يسار، أو فوق بعدين تحت.

$F_{Net} = ma$

$(F_2 \cos\theta) - F_1 = ma$

$(1 \cos 30) - 3 = 0.5\, a$

$a = -4.26\ m/s^2$

16- $\frac{m_1}{m_2} = \frac{a_2}{a_1}$, $m_1 = 2$, $m_2 = 4$

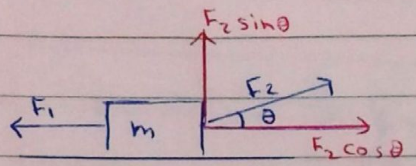
$\frac{a_2}{a_1} = \frac{1}{2}$

17- $\frac{m_o}{m_x} \times \frac{a_x}{a_o}$

$m_x \frac{a_x}{a_x} = m_o \frac{a_o}{a_x}$

$m_x = m_o \frac{a_o}{a_x}$

CH5 تابع

18 

$$F_{Net} = ma$$

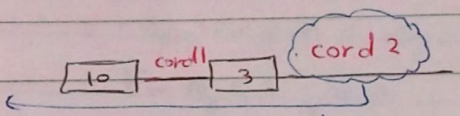
$$\frac{F_2 \cos\theta - F_1}{m} = \frac{ma}{m}$$

$$a_x = \frac{F_2 \cos\theta - F_1}{m}$$

19 $F = m\frac{v^2}{R}$ [من شابتر 6 بس خربطوا شكلهم !!]

1 $F_g = mg$

20 نفس سؤال 6

21 

$10 + 3 = 13$ kg

ناخذ الثني والي قبله !!

22 نفس سؤال 7

23 نفس سؤال 8

24 $10 + 3 + 5 + 2 = 20$ kg F موجودة بالأخير فناخذ كل الي قبلها ونجمعهم

الجواب مو موجود في الخيارات حطوه انتو (!!)

25 unchanging velocity $\rightarrow$ $\boxed{a = 0}$

$$F_{Net} = ma$$

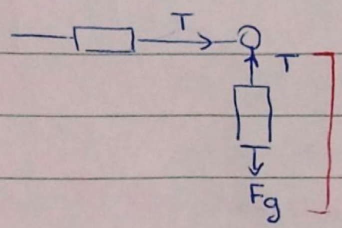
$$F_1 + F_2 + F_3 = 0$$

$$(2i + 3j - 2k) + (-5i + 8j - 2k) + F_3 = 0$$

$$(-3i + 11j - 4k) + F_3 = 0$$

$$F_3 = 3i - 11j + 4k$$

تابع CH5

26- 

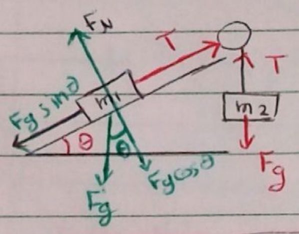
T هوا نفسو يعني ما نحسب أي واحد فيهم ما يفرق نفس الناتج، طبعًا الأسهل إننا ناخذ

$T = F_g$

$= mg$

$= (11)(9.8) = 107.8$

27- هنا هو نفس سؤال 26، لأن عندنا جسم معلق بس كمان على سطح مائل يعني أكبر فيه زاوية.
وزي ما قلنا إنو لو جبنا أي T حتكون نفسها، بكتب الطريقتين وإنتو خذو الأسهل لكم (ツ)



باستخدام الجسم الأول m_1 :

$T - F_g \sin\theta = ma$

$T - mg\sin\theta = ma$

$T = mg\sin\theta + ma$

$= m_1(g\sin\theta + a)$

$= 3.7(9.8\sin 30 + 0.735)$

$= 20.8\ N$

باستخدام الجسم الثاني m_2 :

$T - m_2 g = -m_2 a$

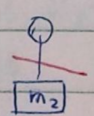
عشان الجسم نازل.

$T = -m_2 a + m_2 g$

$= (-2.3 \times 0.735) + (2.3 \times 9.8)$

$= 20.8\ N$

28- $F_N = F_g \cos\theta \longrightarrow$ من الرسم التحليلي.

29- لو الخيط انقطع فذي الحالة  يصير كأنو سقوط حر يعني تسارعه

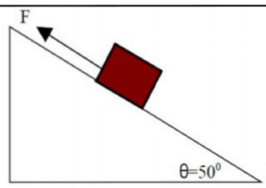
$a = -g$

$= -9.8\ m/s^2$

ملاحظة مهمة/ يختلف عن سؤال 11 لأن لما تقطع هنا بشكل رأسي غير لما تقطع بشكل مائل.

30- نفس سؤال 5

Exp. (14): As shown in the figure (1), a force of 45 N is applied to move a 4 kg box up an inclined plane. If the box starts from rest, find its speed after 2 s. Calculate the normal force, F_N.



الشكل (1)

Solution:

F=45N, m=4kg, v_0 =0, t=2s (a) v=?? (b) F_N=??

نحسب السرعة من معالات الحركة

$v = v_0 + at$ ➔1

ولإيجاد قيمة التسارع نستخدم قوانين نيوتن للحركة كالتالي:

1- تمثيل القوى الظاهرة(قوة الدفع) والغير ظاهرة (قوة الجذب –القوة العمودية)(كما في الشكل (2))

2- نحدد المحاور واتجاه الحركة

3- نحلل القوى المائله (قوة الجذب) إلى مركباتها (كما في الشكل (3))

4- نكتب معادلات الحركة بإستخدام قوانين نيوتن

(x-axis)➔ $mg \sin\theta - F = -ma$ ➔2

(y-axis)➔ $F_N - mg \cos\theta = 0$ ➔3

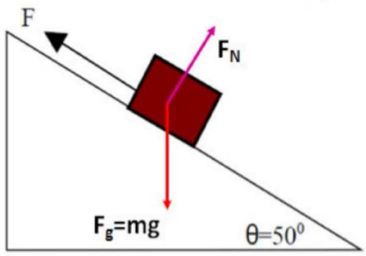
حساب قيمة التسارع من المعادلة الثانية

From (2) $4 \times 9.8 \sin(50) - 45 = -4 \times a$ ➔ $a = 3.74\ m/s^2$

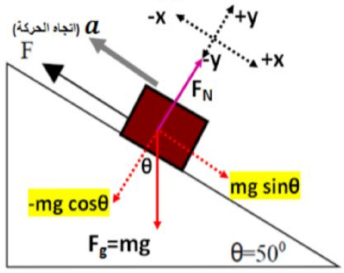
التعويض في المعادلة رقم 1 لحساب السرعة

$v = 3.74 \times 2 = 7.5\ m/s$

(b) from (3) $F_N = mg \cos\theta = 4 \times 9.8 \cos(50) = 25.2N$



الشكل (2)



الشكل (3)

Exp.14

نشوف أول شي إش أعطانا وإيش المطلوب :

$F = 45$, $m = 4$, starts from rest $\rightarrow v_0 = 0$

$t = 2$, $v = ??$, $F_N = ??$

طيب لو حللنا ورسمنا زي الشكل الي راسمته دكتورة هناء ، حنقدر نطلع F_N

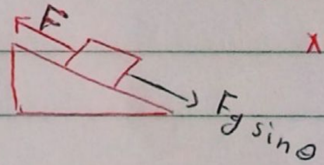
عادي زي ما تعودنا : $F_N = mg\cos\theta$

$= (4)(9.8)\cos 50 = 25.19\ N$

أما دحين نبغى نطلع السرعة v ، من المعطيات نعرف إننا نستخدم واحد من قوانين الحركة ، والأنسب ذا : $v = v_0 + at$

طيب v مجهولة ونبغاها ، t عندنا و v_0 قيمتها صفر ، يبقى بس التسارع ما نعرفه بس نقدر نجيبو !

عارفين إنو $F = ma$ و F اللي أعطانا زي ما هو باين من الشكل إنها على محور x يعني مالنا علاقة إلا بالقوى الموجودة على x



$F_{Net} = ma$

$(F_g \sin\theta) - F = -ma$

$(4 \times 9.8 \times \sin 50) - 45 = -4a$

$a = 3.74$

ما ني عارفة ليه هنا سالب والله ☹

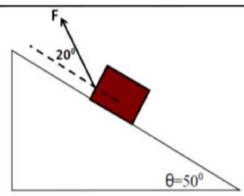
دحين نقدر نعوض بمعادلة الحركة حقتنا :

$v = v_0 + at$

$= 0 + (3.74 \times 2) = 7.48\ m/s$

Scanned by CamScanner

Exp. (15): As shown in the figure (1), a force F (makes an angle of 20) is applied to move a 4 kg box up an inclined plane. If the box moves with constant velocity, find the normal force, F_N.



الشكل (1)

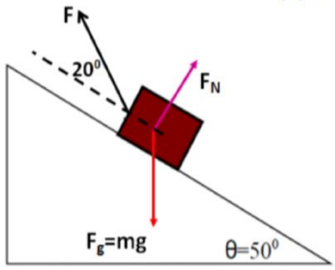
Solution:

$F=??,\ \ \phi=20^0$, $m=4kg,$ $F_N=??$

V= constant ➔ a=0

ولإيجاد قيمة القوةالعموديه نستخدم قوانين نيوتن للحركة كالتالي:

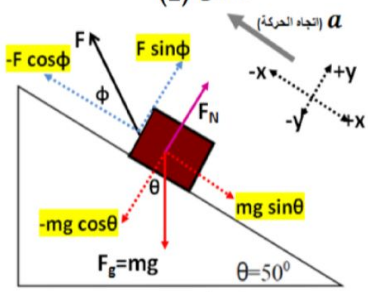
1- تمثيل القوى الظاهرة(قوة الدفع) والغير ظاهرة (قوة الجذب –القوة العمودية)(كما في الشكل (2))



الشكل (2)

2- نحدد المحاور واتجاه الحركة

3- نحلل القوى المائله (قوة الجذب – قوة الدفع) إلى مركباتها (كما في الشكل (3))



الشكل (3)

4- نكتب معادلات الحركة بإستخدام قانون نيوتن الأول

(x-axis)➔ $mg \sin\theta - F\cos\phi = 0$ ➔1

(y-axis)➔ $F\sin\phi + F_N - mg\cos\theta = 0$ ➔2

لحساب قيمة القوة العموديه نحتاج حساب قيمة قوة الدفع وذلك بالتعويض في المعادلة رقم (1)

From (1)

$4\times9.8\times \sin(50) - F\cos(20) = 0$ ➔ $F=32N$

التعويض في المعادلة رقم 2 لحساب القوة العمودية

From (2)

$32 \times \sin(20) + F_N - 4\times9.8\times\cos(50) = 0$ ➔ $F_N = 14.3N$

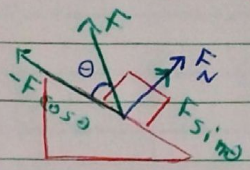
Exp. 15

constant velocity → $a = 0$

$m = 4$, $\theta = 20$, $F_N = ?$

طيب هنا يبغى القوة العمودية F_N ، ممكن تفكروا إنو ليه دخلو أشياء ثانية كمان زي الحوسة المكتوبة لأنو جاءني بالي كذا في البداية ، لكن شوفوا الرسمة :

فيه عندنا قوة ثانية كمان ما ينفع نهملها ، لأن لو حللنا F هذي المركبة الرأسية حقها حتنطبق على محور F_N



[يشبه فكرة سامبل بروبلم 2-6 في شابتر 6].

$$F_{Net} = ma$$

$$F_N + F\sin\theta - F_g\cos\theta = 0$$

هذي من تحليل الرسمة اللي فوق .

وهذي من التحليل اللي تحت ويكون دايمًا موجود عشان الجاذبية الأرضية .

احنا نبغى F_N وهي على y يعني شغلنا كلو على القوى الموجودة على محور y ، إذا فوق موجبة وإذا تحت أكيد سالبة .

ملاحظة / كل واحد زاوية كاله مالو شغل بالثاني !!

طيب هوا هنا نبغى نعوض $F\sin\theta$ لكن ما أعطانا في السؤال قيمة F أعطانا θ بس .

في هنا مضطر نجيبها بطرق ثانية ، لو لاحظتوا الرسمة الثالثة بعد التحليل الكامل على y و x

حتشوفوا إنو $F\cos\theta$ - على x تساوي $mg\sin\theta$ ، يعني صح كل جهة جات من تحليل شي لكن المهم عندنا التحليل كامل ونقدر نستخدم اللي نبغاه عشان نوجد المطلوب .

$$mg\sin\theta - F\cos\theta = 0$$

$$(4)(9.8)\sin 50 - F\cos 20 = 0$$

$$\frac{30}{\cos 20} = \frac{F\cos 20}{\cos 20}$$

$$\boxed{F = 31.9}$$

خلاص دحين كل شي موجود نقدر نعوض في المعادلة اللي فوق .

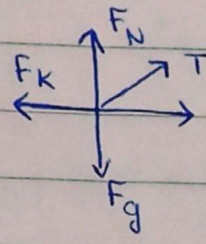
$$F_N + (31.9\sin 20) - (4 \times 9.8 \times \cos 50) =$$

$$F_N - 14.28 = 0$$

$$\boxed{F_N = 14.28\ N}$$

CH 6

1- الاحتكاك موازي للسطح ومعاكس لاتجاه الحركة " هنا الحركة كانت ماشية لليمين " .



في السؤال أعطانا μ_k أساسًا يعني الاحتكاك حركي .

فَ انتبهوا وما تختاروا a لأنه احتكاك سكوني .

- الإجابة c -

2- في سؤال 1 قال constant velocity يعني a = 0 ، وبما إنو a = 0 يعني $F_{Net} = 0$

فَ بصير عندنا الاختيار a, b وعرفنا إنه الاحتكاك حركي من سؤال واحد يعني

الاختيار الصح فقرة (a) .

3- $F_{Net} = ma$

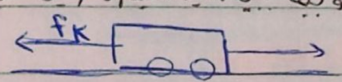
$F - \mu_k F_N = 0 \Rightarrow 12 - \mu_k mg = 0$

$12 - \mu_k 5 = 0$

$\mu_k = \frac{12}{5} = 2.4$

انتبهوا هنا أعطانا الوزن إنو 5 يعني خلاص كانو mg جاهزة .

4- أعطانا a موجبة يعني أكيد السيارة رايحة لليمين



والاحتكاك حيكون عكس اتجاهها يعني يسار "سالب" .

$w = mg = 1.1$

$m = \frac{1.1}{9.8} = 0.1122$

$F_{Net} = ma$

$-f_k = ma$

$= -(0.1122 \times 1.24) = -0.139 N$

5- نفس سؤال 3

CH6 تابع

6- طيب هنا مهم إنو تعرفوا $f_{s_{max}}$ الاحتكاك السكوني هو أقصى قوة يعني والجسم حيتحرك بعدها، يعني من سؤال لسؤال يختلف الوضع عندنا ودحين بوضح :

f_s يعني الجسم ساكن فَـ أكيد $f_s = F$

[1] يعني لو أعطانا إنو القوة تساوي 5 مثلاً وقال f_s تساوي كم نقول إنها 5 أو العكس حتى لو أعطانا f_s وسأل عن القوة.

[2] لو شفنا كلمة $f_{s,max}$ على طول نعرف إنو الجسم بيتحرك بعدها لكن القوة لما هوا ساكن بتكون أقل ودحين بوريكم مثالين إن شاء الله توضح الفكرة :

①

$f_{s\,max} = 10\ N$

$F = 8\ N$

إحنا قلنا $f_{s\,max}$ هي أقصى قوة يعني خلاص ذكة ويتحرك الجسم، فلما نشوف F اللي أعطانا إنها 8 [بما إنها أقل من الماكس يعني ساكن أكيد] و يبغى قوة الاحتكاك كم ؟؟

بما إنه ساكن يعني $f_s = F$

$f_s = 8\ N$

سؤال 6

②

$f_{s\,max} = 10\ N$

$F = 12\ N$

طيب هنا مو قلنا إنو الماكس هي أعلى شي فَـ لو كانت القوة اللي أعطانا أكبر من الماكس يعني أكيد خلاص الجسم تحرك، يعني الماكس هي الأقصى و F اللي أعطانا كبيرة كمان، فلازم نختار الاختيار اللي تكون فيه القوة أصغر من الماكس

سؤال 8 | أصغر شي في الخيارات [أقل من $f_{s\,max}$] هو 2.

7-

$F_{Net} = ma$

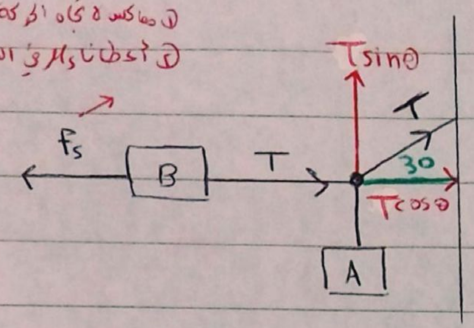
$F - \mu_k F_N = 0$

$470 - \mu_k (79 \times 9.8) = 0$

$\mu_k = 0.607$

تابع CH6

9-



طيب هنا بنفس T وهوا رايح لليمين بس بشكل مائل و الاحتكاك في الجهة اليسار،

فلازم نحلل T المائلة عشان يكونو كلهم على محور واحد.

$$F_{Net} = ma$$

$$(T\cos\theta) - f_s = 0$$

$$f_s \rightarrow \mu_s F_N \rightarrow (0.25)(mg) \rightarrow (0.25)(711)$$

أعطانا الوزن في السؤال

$$T\cos\theta - 177.5 = 0$$

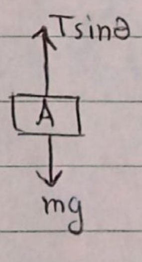
$$\frac{T\cos 30}{\cos 30} = \frac{177.5}{\cos 30}$$

$$\boxed{T = 205.2}$$

10- هنا بنفس وزن w الجسم A والوزن عارفين إنو mg=w ، w=mg طيب ماعطانا

الـ m عشان ممكن نعوض لكن لما حللنا الرسمة

طلع عندنا إنو الوزن mg يساوي اللي فوق



$$T\sin\theta$$

- الجواب b -

بالنسبة لشابتر 7و 9ماكان لهم تيست بانك لسهولتهم ولا حتلقولهم في مكان غير هنا ، بس في دفعتنا 2017 انتشر pdfفيه تيست بانك لهم و كان يشبه كثير لأسئلة الفاينل و انا حليتهم و متأكدة باذن الله من الحل ، يعتبروا اسهل فصلين من الكورس كامل و حرااااام تغلطوا فيهم من سهولتهم ،نزلتلكم pdf عليه الأسئلة و بالنسبة للأجوبة انا مرقمة ...one two three etcامشوا مع الترقيم عشان تشوفوا الحلول للاسئلة مرتبة، انا كاتبه الحل بالتفصيل بس ممكن ترجعولي في حالة كان في شي مو مفهوم

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