مراجعة نهائية وفق الهيكل الوزاري منهج بريدج الخطة A-M101

تاريخ إضافة الملف على موقع المناهج: 2024-11-23 17:54:46

المزيد من مادة فيزياء:	ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس

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التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم

صفحة المناهج الإماراتية على فيسبوك					
المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة فيزياء في الفصل الأول

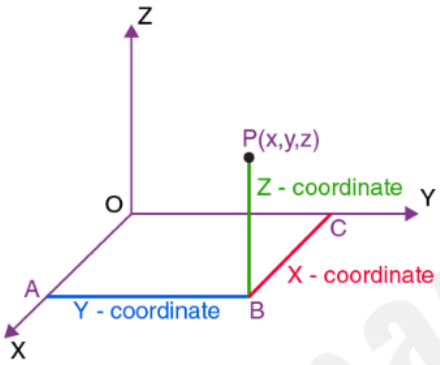
1	حل أسئلة الامتحان النهائي منهج بريدج القسم الالكتروني العام 2023-2024
2	أسئلة الامتحان النهائي منهج بريدج القسم الالكتروني العام 2023-2024
3	حل مسائل الوحدة الثانية الحركة في بعد واحد
4	ملخص قوانين الوحدة الرابعة الحركة في بعدين وثلاثة أبعاد
5	تجميعة أسئلة مراجعة وفق الهيكل الوزاري منهج بريدج الخطة C

EoT1 Grade 11 Advanced M101A- Physics revision – 2024-2025

Al Zayediyyah School for Girls

1	↳ Represent a point in one, two and three dimensional space in terms of its Cartesian coordinates. ↳ Represent a vector in terms of its components in Cartesian coordinates- in two, and three-dimensional space.	STUDENT TEXTBOOK	18
		FIGURE 1.15 FIGURE 1.25	18 22

Any point in space can be represented using 3 dimensional cartesian coordinate system.



- The point in space can be represented by ordered pair

$$\vec{P} = P\ (x, y, z)$$

- Unit vector representation as $\vec{P} = x\,\hat{x} + y\,\hat{y} + z\,\hat{z}$
- A vector drawn from the origin of coordinate system is called a position vector.

Practice questions:

1. Represent the given point P in terms of cartesian coordinates.

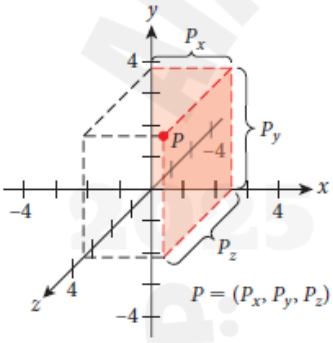


FIGURE 1.15 Representation of a point *P* in a three-dimensional space in terms of its Cartesian coordinates.

A. $1\,\hat{x} + 2\,\hat{y} + 3\,\hat{z}$
B. $2\,\hat{x} + 4\,\hat{y} + 3.5\,\hat{z}$
C. $2.5\,\hat{x} + 3.8\,\hat{y} + 3.2\,\hat{z}$
D. $4\hat{x} + 2.5\hat{y} + 3.2\,\hat{z}$

2. Which of the following is the unit vector representation of A and B.

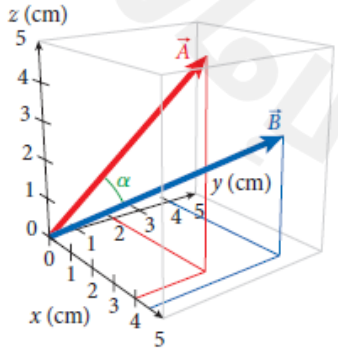
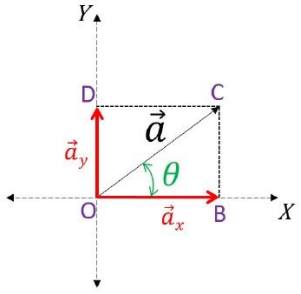


FIGURE 1.25 Calculating the angle

A. A(3,2,5) , B(4.5, 4, 3)
B. A(1,2,5) , B(4, 4, 3)
C. A(3,3,5) , B(4.5, 4, 3)
D. A(3,2,5) , B(4, 2, 3)

2	Find the length and direction of a two-dimensional vector from its Cartesian components.	STUDENT TEXTBOOK	21
		Q. [1.99/1.100/1.102/1.104]	30



If the components of the vector $\vec{a}$ are a_x, a_y then

$$length\ of\ |a| = \sqrt{a_x^2 + a_y^2}$$

$$direction\ of\ \vec{a}, \theta = \tan^{-1}\left(\frac{a_y}{a_x}\right)$$

Practice Questions:

1. Which of the following represents length and direction of vector $\vec{A}$(30 m, -50 m) from positive X-axis.
   a. 58.31 m , $\theta = -59^0$
   b. 58.31 m , $\theta = 121^0$
   c. 40 m , $\theta = -59^0$
   d. 80 m , $\theta = -59^0$

2. What angle does A = (Ax,Ay) = (30.0 m,–50.0 m) make with the negative y-axis?
   a. 31°
   b. 59 °
   c. - 31°
   d. - 59 °

3. What does the vector B(30,50) makes with X-axis?
   a. 31°
   b. 59 °
   c. - 31°
   d. - 59 °

4. Find the magnitude and direction of 3A –B , where A = (23.0,59.0), B (90.0,150.0).
   a. -21, 27°
   b. 27, -21°
   c. 34.2, - 52.1°
   d. 34.2, 37.9°

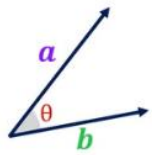
5. Find the magnitude and direction of C=A−B, where: $\vec{A}$=(35.0, 42.0), $\vec{B}$=(80.0,−60.0)

A) Magnitude: 85.7, Direction: 25.6° above the positive x-axis
B) Magnitude: 75.4, Direction: 40.2° above the positive x-axis
C) Magnitude: 111.5, Direction: 66.2° above the negative x-axis
D) Magnitude: 95.2, Direction: 15.5° below the positive x-axis

6. Given a vector $\vec{v}$=(x,y), where x and y are its Cartesian components, how do you find the length $|\vec{v}|$ and the direction θ of the vector?
   a. The length is $\sqrt{x^2+y^2}$ *and direction θ is given by* $\tan^{-1}\frac{y}{\sqrt{x^2+y^2}}$
   b. The length is $\sqrt{x^2-y^2}$ *and direction θ is given by* $\tan^{-1}\frac{y}{\sqrt{x^2+y^2}}$
   c. The length is $\sqrt{x^2+y^2}$ *and direction θ is given by* $\tan^{-1}\frac{y}{x}$
   d. The length is $\sqrt{x^2-y^2}$ *and direction θ is given by* $\tan^{-1}\frac{y}{x}$

3	Find the angle between two position vectors in the cartesian coordinates.	STUDENT TEXTBOOK	21,23
		EXAMPLE 1.5 / Q.1.80/Q1.103	22 / 29 /30

The angle between two vectors, a and b is given by



$$\cos\theta = \frac{a \cdot b}{|a||b|}$$

Where

$$a \cdot b = a_x b_x + a_y b_y$$

$$|a| = \sqrt{a_x{}^2 + a_y{}^2}$$

$$|b| = \sqrt{b_x{}^2 + b_y{}^2}$$

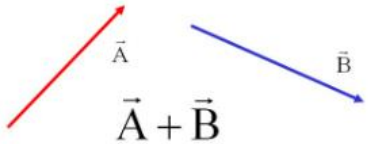
Practice questions:

1. Find the measure of the angle between the two vectors u = 9i – j and v = -3i + j.
   a. 167.91°
   b. 83.65°
   c. 154.2°
   d. 75.96°
2. Find the measure of the angle between the two vectors u = (5,2) and v = (-1, -7).
   a. 25.34°
   b. 120°
   c. 60°
   d. 65°
3. Find the measure of the angle between the two vectors u = -5i + j and v = -4i – j
   a. 25.34°
   b. 120°
   c. 60°
   d. 65°
4. Find the measure of the angle between the two vectors u = – j and v = -3i .
   a. 90°
   b. 120°
   c. 0°
   d. 180°

5. Find the measure of the angle between the two vectors u = (3, -3) and v = (9,0).
   a. 0^0
   b. 45^0
   c. 90^0
   d. 180^0

4	Multiply a vector with a scalar. Add or subtract vectors using Cartesian components.	STUDENT TEXTBOOK Q. [1.76/1.79/1.105/1.106]	20 29

Vector Addition using components

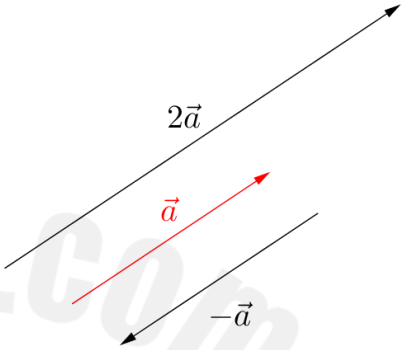


$\vec{A}+\vec{B}$

$\vec{A}=A_x\hat{i}+A_y\hat{j}$ $\quad \vec{B}=B_x\hat{i}+B_y\hat{j}$

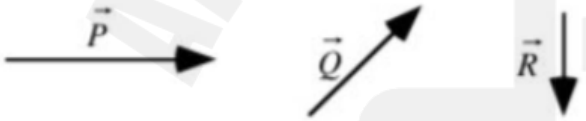
$\vec{A}+\vec{B}=(A_x+B_x)\hat{i}+(A_y+B_y)\hat{j}$

Multiplying a vector using a scalar

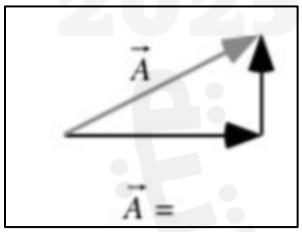


Practice questions:

1. Three vectors labelled as P,Q, R are shown as below.

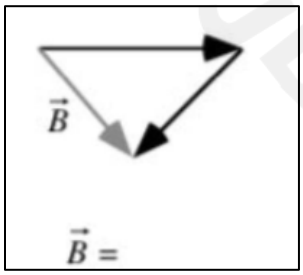


I. Which of the following is a representation for A in terms of P, Q, R.



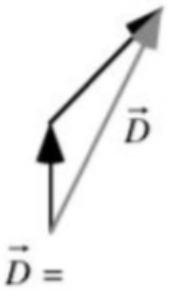
A. A = P + Q
B. A = P – R
C. A = Q + R
D. A = Q – P

II. Which of the following is a representation for B in terms of P, Q, R.



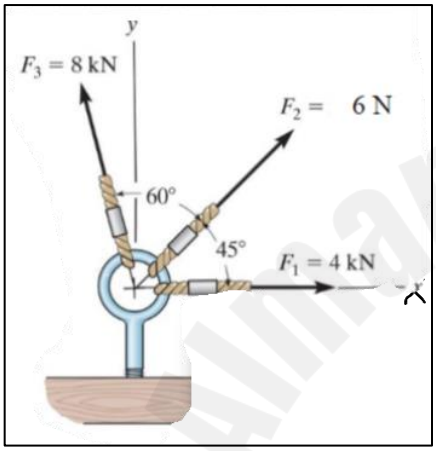
A. B = P + Q
B. B = P – Q
C. B = Q – P
D. B = P + R

III. Which of the following is a representation for D in terms of P, Q, R



A. D = P + Q
B. D = Q + R
C. D = R – P
D. D = Q – R

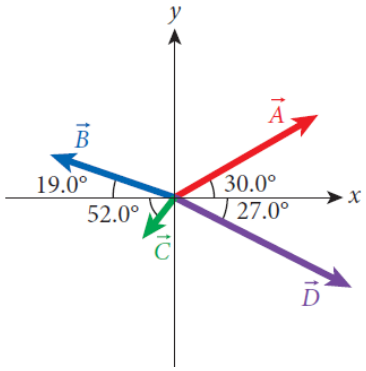
2. Three forces are acting on a ring as shown in diagram. Which of the following represents Fx ?



a. Fx = 4000 cos (90) + 6 cos (45) + 8000 cos (60)
b. Fx = 4000 + 6 cos (45) + 8000 cos (105)
c. Fx = 4+ 6 cos (45) + 8 cos (60)
d. Fx = 4000 + 6 sin (45) + 8000 sin (105)

3. Find the vector C satisfies the equation $2\hat{x} - 5\hat{y} + 3\hat{z} + \vec{C} = 12\hat{x} - 5\hat{z}$
   a. $\vec{C} = 12\hat{x} - 5\hat{z}$
   b. $\vec{C} = 12\hat{x} - 5\hat{y} - 5\hat{z}$
   c. $\vec{C} = 10\hat{x} + 5\hat{y} - 8\hat{z}$
   d. $\vec{C} = 10\hat{x} - 5\hat{y} - 2\hat{z}$
4. Find the magnitude (in meter) of $\vec{C}$ =3A + 9B , if $\vec{A} = \hat{x} + 5\hat{y} - 2\hat{z}$ and $\vec{B} = -\hat{x} + \hat{y} - 2\hat{z}$.
   a. 34.5 m
   b. 6.0 m
   c. - 6.0 m
   d. 30 m
5. Find the direction of $\vec{C} = -7P + 3Q$ where P (2,4) and Q(5,1) from X axis.
   a. -87.7 °
   b. -2.29 °
   c. 87. 7°
   d. 2.29°

6. Use the components of the vectors from diagram to find the sum A+B +C+D in terms of its components. Where length of A = 75, B= 60, C= 25, D=90.



a. $73.01\hat{x} - 3.52\,\hat{y}$

b. $37.1\hat{x} - 19.5\,\hat{y}$

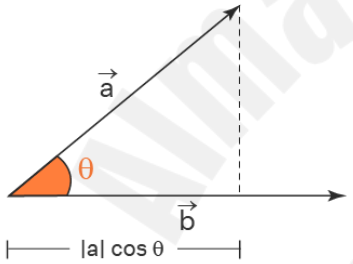
c. $37.5\hat{x} - 3.6\,\hat{y}$

d. $-40.8\,\hat{x} + 19.3\,\hat{y}$

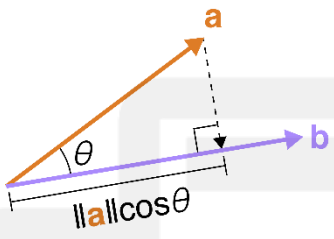
5	Find the scalar & vector product of unit vectors. Calculate the scalar & vector product of vectors.	STUDENT TEXTBOOK	21-24
		MCQ. (1.15/1.16)	27

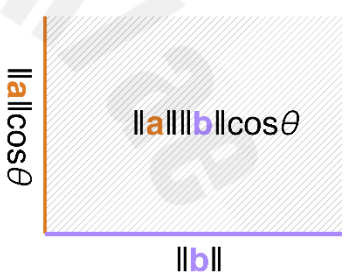
Dot Product of Vectors

A . B means the area of a rectangle formed by length of B with component of A (A cos θ)) along B.



$\vec{a} \cdot \vec{b} = |a|\,|b| \cos\theta$





- In terms of vector components & unit vectors **i,j,k** are along the **x,y,z** axes:

$$\mathbf{A} = A_x\mathbf{i} + A_y\mathbf{j} + A_z\mathbf{k} \qquad \mathbf{B} = B_x\mathbf{i} + B_y\mathbf{j} + B_z\mathbf{k}$$

- Using $\mathbf{i}\bullet\mathbf{i} = \mathbf{j}\bullet\mathbf{j} = \mathbf{k}\bullet\mathbf{k} = 1,\ \mathbf{i}\bullet\mathbf{j} = \mathbf{i}\bullet\mathbf{k} = \mathbf{j}\bullet\mathbf{k} = 0$ gives

$$\mathbf{A}\bullet\mathbf{B} = A_xB_x + A_yB_y + A_zB_z$$

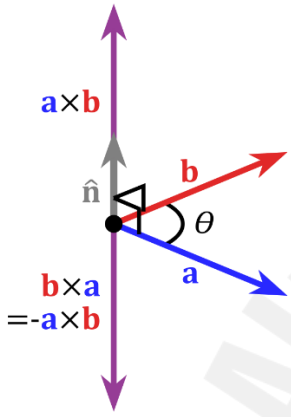
- **Dot Product** clearly a **SCALAR**.

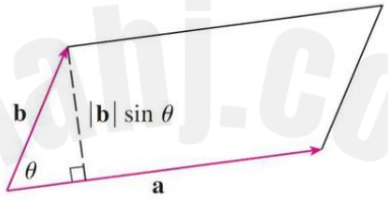
Vector Product

The **vector product** (or cross product) between two vectors $\vec{A} = (A_x, A_y, A_z)$ and $\vec{B} = (B_x, B_y, B_z)$ is defined as

$$\begin{aligned} \vec{C} &= \vec{A} \times \vec{B} \\ C_x &= A_y B_z - A_z B_y \\ C_y &= A_z B_x - A_x B_z \\ C_z &= A_x B_y - A_y B_x . \end{aligned} \qquad (1.32)$$

$A = |\mathbf{a}|\,|\mathbf{b}| \sin\theta = |\mathbf{a} \times \mathbf{b}|$





The length of the cross product **a** × **b** is equal to the area of the parallelogram determined by **a** and **b**.

Practice Questions:

1.15 For the two vectors $\vec{A}$ = (2,1,0) and $\vec{B}$ = (0,1,2), what is their scalar product, $\vec{A} \bullet \vec{B}$?

a) 3 b) 6 c) 2 d) 0 e) 1

1.16 For the two vectors $\vec{A}$ = (2,1,0) and $\vec{B}$ = (0,1,2), what is their vector product, $\vec{A} \times \vec{B}$?

a) (2, –4, 2) c) (2, 0, 2) e) (0, 0, 0)
b) (1, 0, 1) d) (3, –2, 1)

3. Consider two vectors.

$$\vec{A} = 4\hat{i} + 6\hat{j} - 2\hat{k}$$
$$\vec{B} = 2\hat{i} + 7\hat{j} - 1\hat{k}$$

Which of the following represents the scalar product of them?

a. 48 b. 52 c. 50 d. 16

4. What is the magnitude of resultant of cross product of two parallel vectors a and b?
   a) |a|.|b|
   b) |a|.|b| cos(180)
   c) |a|.|b| sin(180)
   d) 1

5. Two vectors are perpendicular to each other: 2i^+3j^+8k^ and 4i^-4j^+ak^. What is the value of a?
   (a) -½
   (b) ½
   (c) 1
   (d) -1

6. If A . B = A x B, the angle between A and B will be-
   a. 0
   b. 30
   c. 45
   d. 90

7. What is the area of the parallelogram whose vectors P =2i+3j and Q =i+4j represent?
   (a) 5 Units
   (b) 10 Units
   (c) 15 Units
   (d) 20 Units

8. What is the angle formed by the vectors A x B and B x A?
   a. 0
   b. 90
   c. 45
   d. 180

9. If P x Q =R, then which of the following statement is NOT TRUE?
   a. $\vec{R} \perp \vec{P}$
   b. $\vec{R} \perp \vec{Q}$
   c. $\vec{R} \perp (\vec{P} + \vec{Q})$
   d. $\vec{R} \perp (\vec{P} \times \vec{Q})$

   What is the value of $\left|\vec{P} \times \vec{Q}\right|$ *if* $\vec{P} = 3\hat{i} + \hat{j} + 2\hat{k}$ *and* $\vec{Q} = 2\hat{i} - 2\hat{j} + 4\hat{k}$?
   a. $8\sqrt{3}$
   b. $3\sqrt{8}$
   c. $4\sqrt{3}$
   d. $3\sqrt{4}$

10.

11. A vector $(\vec{A} = 4\hat{x} - 3\hat{y} + 5\hat{z})\ m$, and the vector $(\vec{B} = B_y\hat{y})m$, with an angle $115.10°$ between them. If a vector $\vec{C} = \vec{A} \times \vec{B}$, where the unit vector representation of $\vec{C}$ is $(\vec{C} = -30\hat{x} + 24\hat{z})m^2$, which of the following correctly represents vector $\vec{B}$?

a) $\vec{B} = 6\hat{y}$

b) $\vec{B} = -12.9\hat{y}$

c) $\vec{B} = -2.5\hat{y}$

d) $\vec{B} = 10\hat{y}$

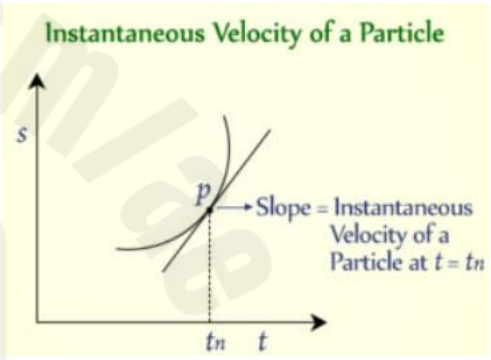
6	Calculate the speed as the magnitude of instantaneous velocity. Calculate the average speed & average velocity . Given a graph of a particle's position versus time, determine the instantaneous velocity for any particular time.	STUDENT TEXTBOOK EXAMPLE (2.1, 2.2) Q. [2.31/2.32/2.33]	36-39 38,39 61

Average velocity:

$$\overline{v}_x = \frac{\Delta x}{\Delta t}.$$

Instantaneous velocity:

$$\vec{v} = \frac{d\vec{r}}{dt},$$



Average speed:

$$\overline{v} = \frac{\ell}{\Delta t}.$$

Instantaneous speed:

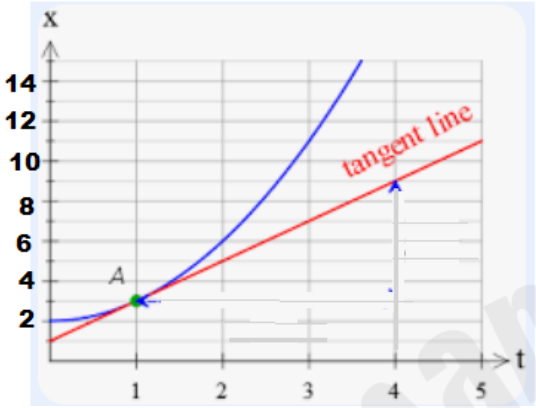
$$\vec{v} = \frac{d\vec{r}}{dt},$$

Practice Questions:

1. During the time interval from 0.0 to 10.0 s, the position vector of a car on a road is given by $\boldsymbol{x(t) = 10 + -5.0t + 1.2t^2}$. What is the car's velocity as a function of time?
   a. 2.4(m/s²) t – 5 (m/s)
   b. 1.2 (m/s²) t – 5 (m/s)
   c. 2.4 (m/s²)
   d. 2.4(m/s) t – 5 (m/s)
2. During the time interval from 0.0 to 10.0 s, the position vector of a car on a road is given by $\boldsymbol{x(t) = 10 + -5.0t + 1.2t^2}$. What is the car's average velocity?
   a. 7 m/s
   b. 19 m/s
   c. 8 m/s
   d. 0 m/s

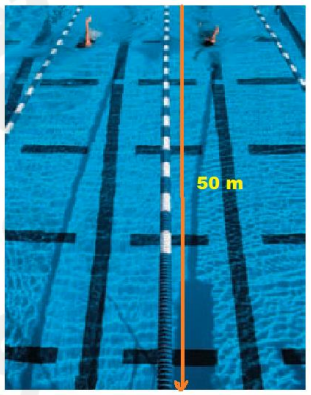
3. An object moves along a straight path, and its position as a function of time is given by $x(t) = 4t^2 + 2t$. What is the instantaneous velocity at t=2 s?
   a. 8 m/s
   b. 10 m/s
   c. 18 m/s
   d. 20 m/s

4. A car's position at various times is recorded as shown below. What is the car's instantaneous velocity at t=1 s?



   A. 2 m/s
   B. 3 m/s
   C. 4 m/s
   D. 1 m/s

5. A swimmer completes the first 50 m of a 100-m freestyle race in 38.2 s. What is her average speed for the **first leg** of the race?
   a. 0.76 m/s
   b. 1.31 m/s
   c. 1.56 m/s
   d. 2.34 m/s



6. A swimmer returns back to the starting point of the pool (50 m) in 42.5 s. What is her average speed during the **return leg**?
   a. 0.98 m/s
   b. 1.18 m/s
   c. 1.25 m/s
   d. 1.47 m/s

7. A swimmer completes the first 50 m of a 100-m freestyle race in 38.2 s and returns back to the starting point of the pool in 42.5 s. What is the swimmer's average velocity for the entire 100-m lap?
   a. 0 m/s
   b. 1.14 m/s
   c. 1.64 m/s
   d. 2.05 m/s

8. A swimmer completes the first 50 m of a 100-m freestyle race in 38.2 s and returns back to the starting point of the pool in 42.5 s. What is the swimmer's average speed for the total lap (100 m)?
   a. 1.10 m/s
   b. 1.23 m/s
   c. 1.34 m/s
   d. 1.56 m/s

9. Running on a 50-m by 40-m rectangular track, you complete one lap in 100 s. What is your average velocity for the lap?
   a. 0.9 m/s
   b. 0.0 m/s
   c. 0.5 m/s
   d. 0.4 m/s

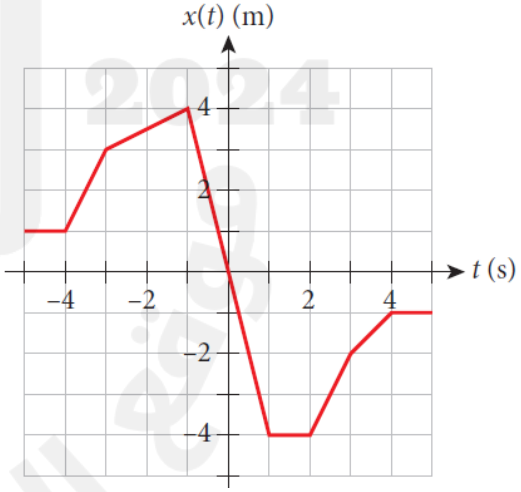
10. An electron moves in the positive *x*-direction a distance of 2.42 m in 2.91×10^{-8} s, bounces off a moving proton, and then moves in the opposite direction a distance of 1.69 m in 3.43×10^{-8} s. What is the average velocity of the electron over the entire time interval?
   a. 1.15×10^{7} m/s
   b. 6.48×10^{7} m/s
   c. $0 \frac{m}{s}$
   d. 2.61×10^{7}m/s

11. An electron moves in the positive *x*-direction a distance of 2.42 m in 2.91×10^{-8} s, bounces off a moving proton, and then moves in the opposite direction a distance of 1.69 m in 3.43×10^{-8} s. What is the average speed of the electron over the entire time interval?
   a. 1.15×10^{7} m/s
   b. 6.48×10^{7} m/s
   c. $0 \frac{m}{s}$
   d. 2.61×10^{7}m/s

Use the given graph to solve questions 12 - 14

12. The graph describes the position of a particle in one dimension as a function of time. a) In which time interval does the particle have its maximum speed? What is that speed?

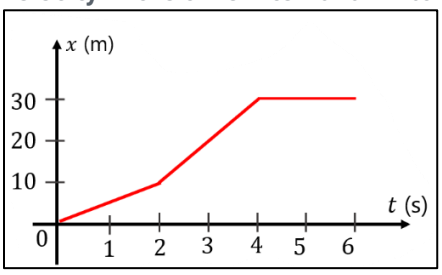
Option	Time interval	Speed
A	-4s to -3 s	2 m/s
B	-1s to +1s	-4 m/s
C	-1s to +1 s	4 m/s
D	3s to 4s	1 m/s



13. What is the ratio of the velocity in the interval between 2 s and 3 s to the velocity in the interval between 3 s and 4 s?
   a. 2:1
   b. 1:2
   c. 3:4
   d. 1:1

14. Which of the following time interval the speed in not zero?
    a. -5s to -4s
    b. 1s to 2 s
    c. 3s to 4s
    d. 4s to 5s

15. **The x - t (position time graph) of an object moving in a straight line is shown. Calculate the average velocity in the time interval** t = 2 to t = 4 s.



A. 7.5 m/s
B. 5 m/s
C. 10 m/s
D. 0 m/s

An object moves such that its position is given by the function $x(t) = 3t^2 - 4t + 1$. The unit of t is second, and the unit of x is meter. After 6 seconds, how fast and in what direction is this object moving if it started at t=0?

a. 32 m/s opposite direction of its initial velocity
b. 16 m/s opposite direction of its initial velocity
c. 32 m/s same direction of its initial velocity
d. 16 m/s same direction of its initial velocity

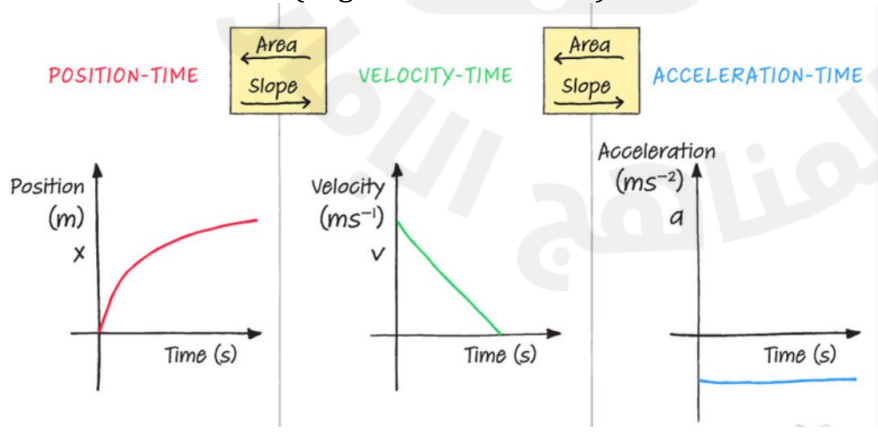
The position of an object is given by the equation $x = 3.0\ t^2 + 1.5\ t + 4.5$, where x is in meter and t is in second. What is the instantaneous acceleration of the object at t = 3.0 s?

1. 6.0 m/s^2
2. 8.0 m/s^2
3. 12 m/s^2
4. 4.5 m/s^2

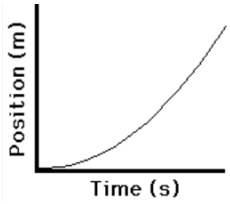
7	Interpret motion of an object from its position-time graph. Interpret the motion of an object from a velocity-time graph.	FIGURE (2.7 , 2.16) Q. [2.12/2.13/2.26/2.33/ 2.42/2.51]	(38 , 45) 59,60, 61,62

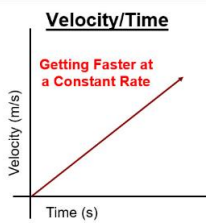
Graphs:

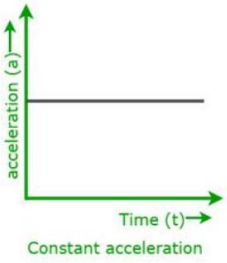
1. Decelerated motion: (negative acceleration)



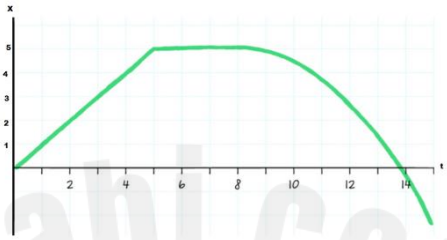
2. Accelerated motion: (positive acceleration)

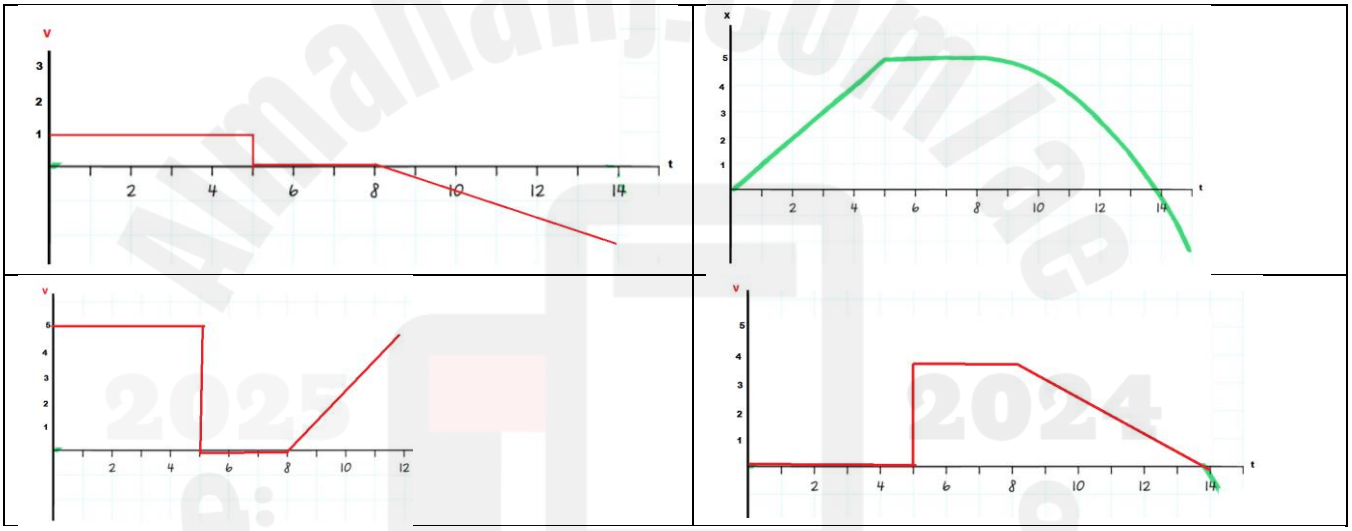






1. Which of the following V-t is equivalent to given X-t graph

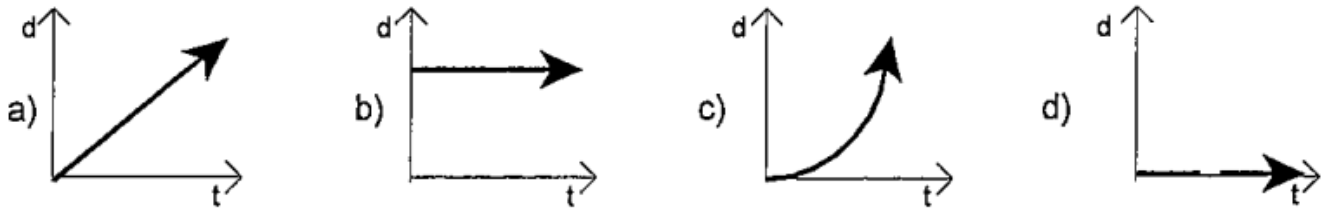




The table below gives distance and time data for a moving object. Pay attention to how the **time intervals** are changing as the distance rises in 20 m increments.

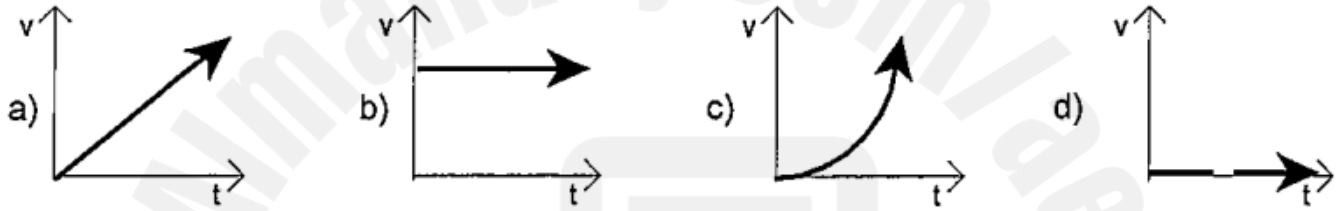
Distance (m)	Time (s)
0	0
20	4.5
40	6.3
60	7.7
80	8.9
100	10

2. Which of the following distance vs. time graphs corresponds to the table data?



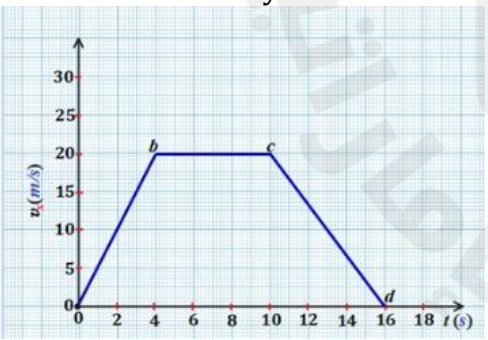
3. Which of the following descriptions matches the graph you selected in question 2?
   a) A motionless object.
   b) An object moving at a constant speed.
   c) An object undergoing constant, positive acceleration.
   d) An object undergoing constant, negative acceleration.

4. Which of the following speed vs. time graphs corresponds to the table data?



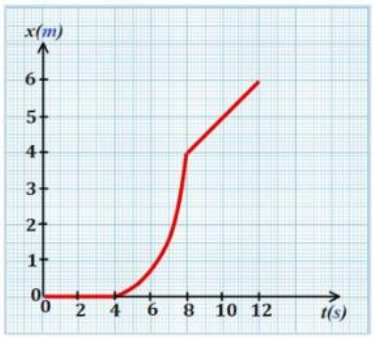
5. Which of the following descriptions matches the graph you selected in question 4?
   a) A motionless object.
   b) An object moving at a constant speed.
   c) An object undergoing constant, positive acceleration.
   d) An object undergoing constant, negative acceleration.

6. Performance data of a car's motion is represented by velocity time graph as follows. What is the distance travelled by the car from t = 0s to t = 10 s.

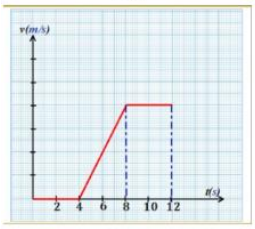


a. 140 m
b. 260 m
c. 160 m
d. 100m

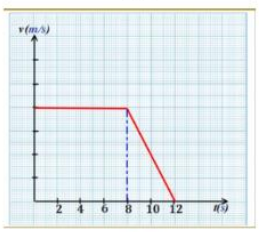
7. The position time graph for the motion of a car is given below. Which of the following represents the velocity- time graph of the car?



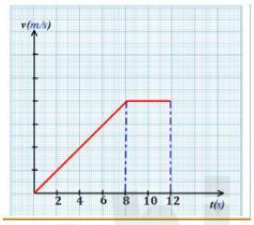
(a)



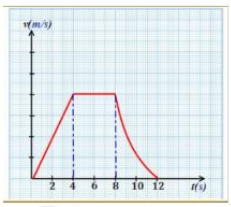
(b)



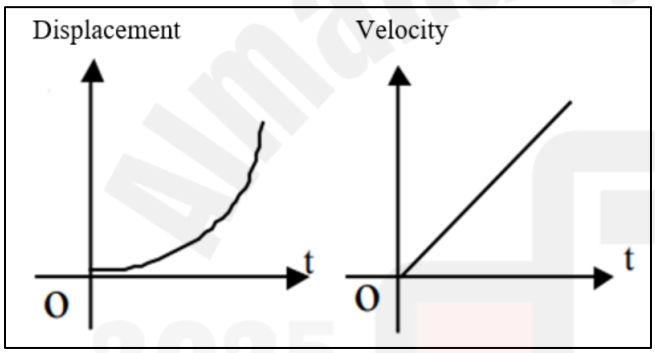
(c)

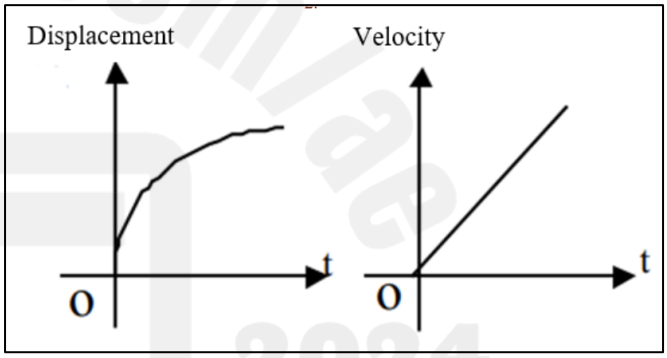


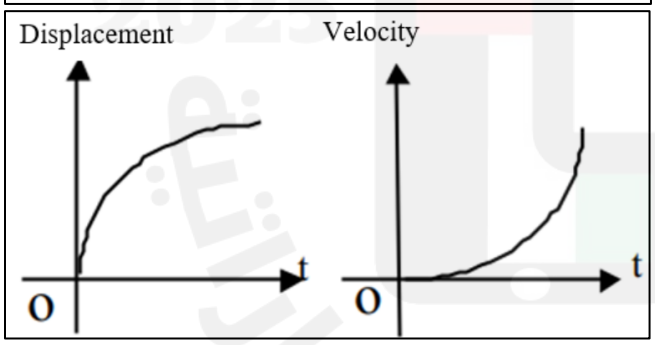
(d)

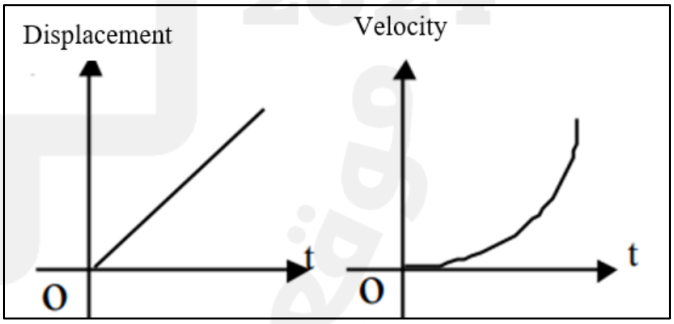


8. Which of the following pairs of graphs shows the (displacement -time) and the (velocity-time) for an object speeding up from rest?





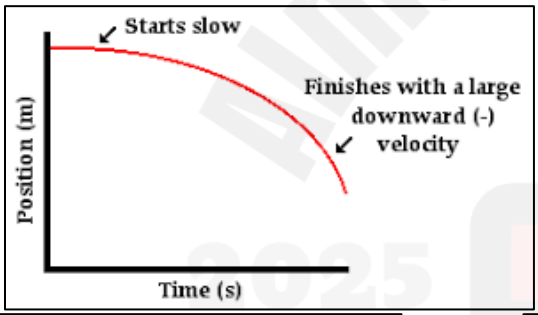


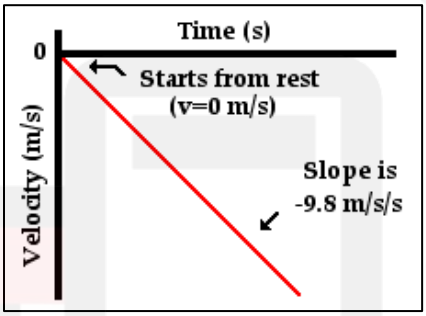


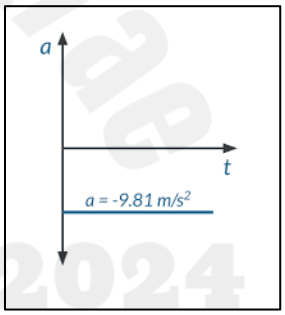
8	Interpret motion graphs for objects under free fall. Apply the constant-acceleration equations to free-fall motion.	STUDENT TEXTBOOK FIGURE (2.27 , 2.28) Q. [2.66/2.67/2.69]	50-54 54 63

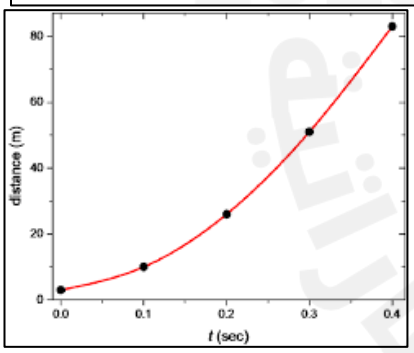
Representing a Dropped Object by Graphs

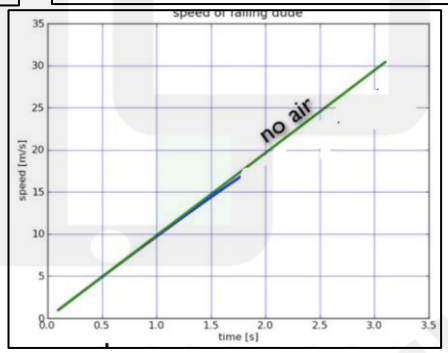
- **Velocity**:
  - Starts from zero and increases in the negative direction as the object falls downward.
  - The slope of the velocity-time graph is negative and constant, indicating a steady acceleration.
- **Displacement-Time (d-t) Graph**:
  - Starts from zero, with the curve bending downward, showing an increase in negative displacement over time.
- **Distance-Time Graph**:
  - Starts from zero and curves upward, showing an increasing distance over time.
- **Speed-Time Graph**:
  - Starts from zero and increases linearly, representing a constant acceleration in speed over time.
- **Key Points**:
  - **Acceleration**: Constant and negative, typically –9.81 m/s^2 (gravity).
  - **Slope in d-t graph**: Indicates the increasing negative displacement as time progresses.
  - **Slope in the velocity-time graph**: Negative and constant due to steady acceleration.

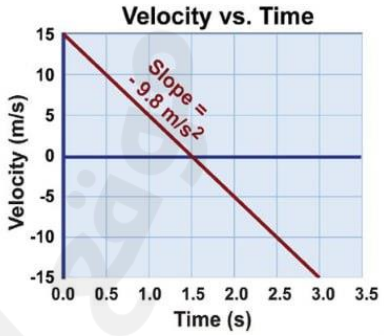












Distance – time graph | speed- time graph | object throwing upwords

Kinematic equations:

(i) $y = y_0 + v_{y0}t - \frac{1}{2}gt^2$

(ii) $y = y_0 + \overline{v}_y t$

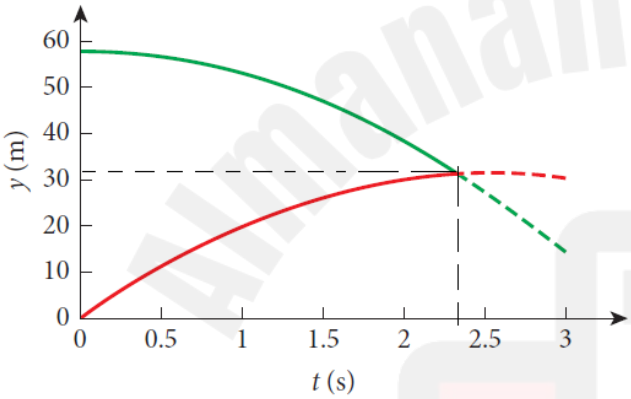
(iii) $v_y = v_{y0} - gt$

(iv) $\overline{v}_y = \frac{1}{2}(v_y + v_{y0})$

(v) $v_y^2 = v_{y0}^2 - 2g(y - y_0)$

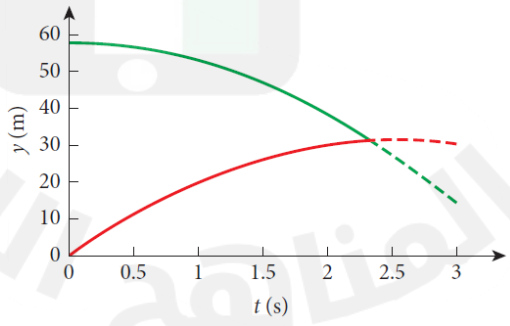
Practice questions:

1. The position time graph for the motion of a melon dropped from a height of 58.3 m in green color. An arrow shot towards it from the ground with an initial velocity is given in red color below. Calculate the initial velocity of the arrow

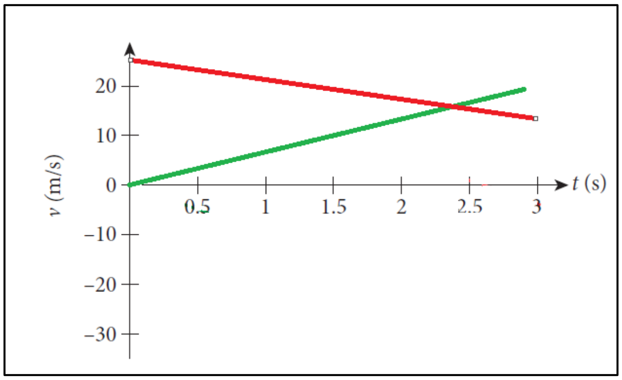


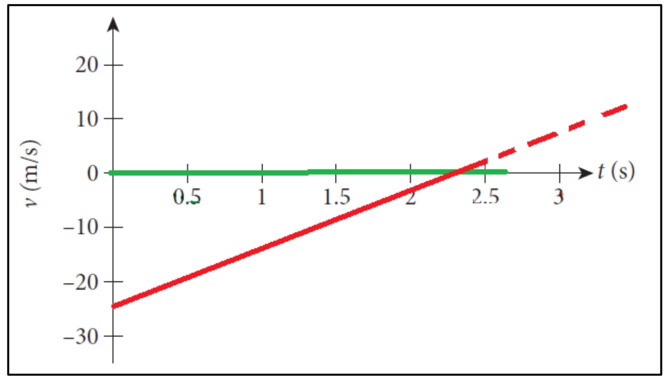
A. 2.3 m/s
B. 25.2 m/s
C. 2.6 m/s
D. – 2.6 m/s

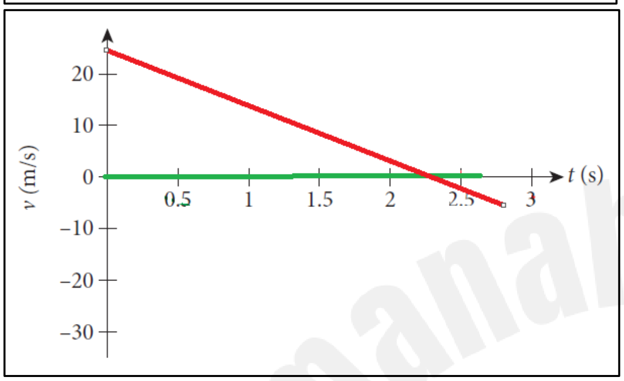
2. The position time graph for the motion of a melon dropped from a height of 58.3 m in green and an arrow shot towards it from the ground with an initial velocity is given red as below. Which of the following represents velocity time graph of their motion?

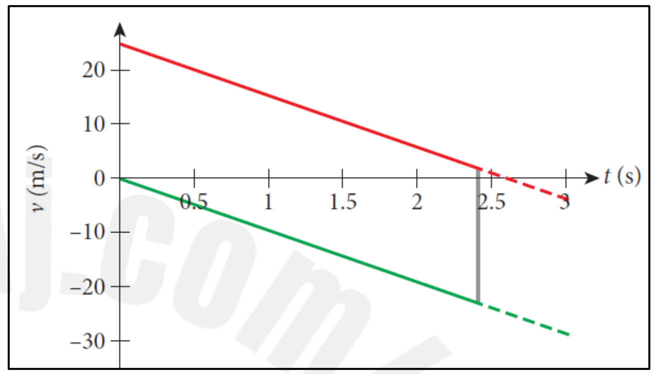


Which of the following represents the velocity time graph of the motion.









3. Graph showing a melon dropped from a height of 58.3 m and an arrow shot towards it with an initial velocity 25.1 m/s. Which of the following statement is TRUE about their velocities.

A. arrow always posses a velocity of 25.1 m/s
B. Velocity of the melon decreases as it comes down
C. Arrow and melon keep difference of 25.1 m/s in their velocities.
D. The melon and arrow never meet.

4. A ball is tossed vertically upward with an initial speed of 26.4 m/s. How long does it take before the ball is back on the ground?
   e. 2.69 s
   f. 5.38 s
   g. 10.0 s
   h. 7.00 s
5. A stone is thrown upward, from ground level, with an initial velocity of 10.0 m/s. What is the velocity of the stone after 0.50 s?
   a. 3.8 m/s
   b. 5.1 m/s
   c. 2.5 m/s
   d. 4.3 m/s

6. A stone is thrown upward, from ground level, with an initial velocity of 10.0 m/s. How high above ground level is the stone after 0.50 s?
   A. 3.8 m
   B. 5.1 m
   C. 2.5 m
   D. 4.3 m
7. A ball is thrown directly downward, with an initial speed of 10.0 m/s, from a height of 50.0 m. After what time interval does the ball strike the ground?
   A. 2.3 s
   B. -4.4s
   C. 5.1s
   D. 4.6 s

If you drop a ball from a 50 m-tall building, how far is the ball from the ground after 2 s? ($g = -9.8\ m/s^2$)

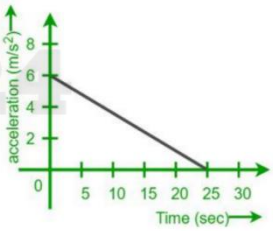
A. 30.4 m
B. 9.8 m
C. 40.3 m
D. 19.6 m

9	Determine an object's change in velocity by the area under the curve in an acceleration versus time graph.	STUDENT TEXTBOOK	42-43
		FIGURE (2.13) Q. [2.48/2.53]	43 62

- Area under acceleration time graph will give **change** in **velocity**.

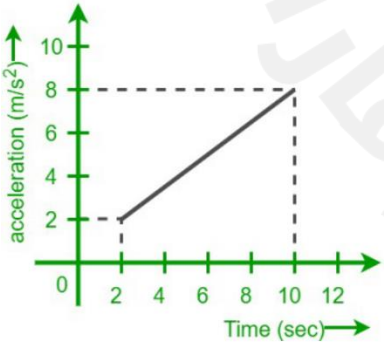
Practice Questions:

1. **From the acceleration vs time graph given below, determine the change in velocity.**



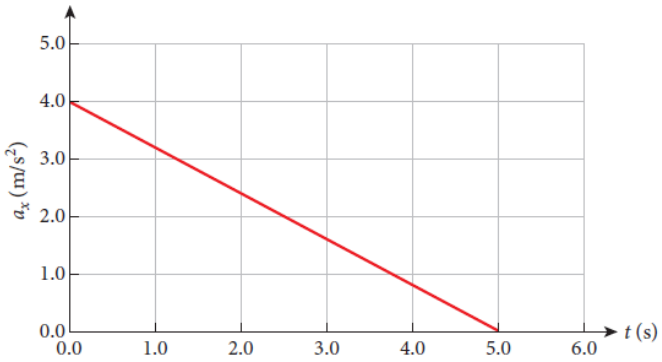
a. 6 m/s
b. 75 m/s
c. 150 m/s
d. 25 m/s

2. **From the acceleration vs time graph given below, find the initial velocity of a body if its final velocity is 55 m/sec.**



A. 160 m/s
B. 105 m/s
C. 13 m/s
D. 15 m/s

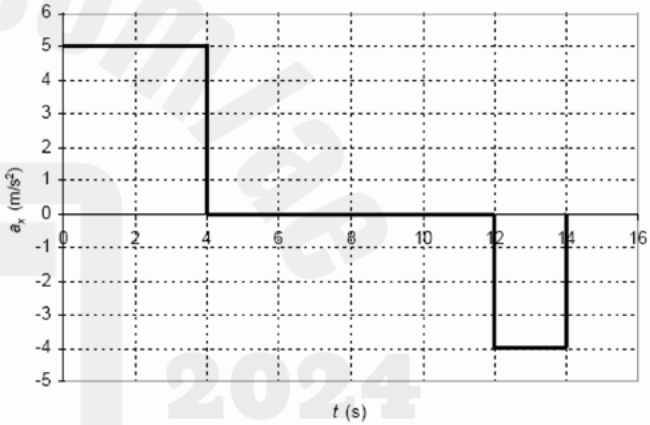
3. A car moving in the *x*-direction has an acceleration *ax* that varies with time as shown in the figure. At the moment $t = 0.0$ s, the car is located at $x = 12$ m and has a velocity of 6.0 m/s in the positive *x*-direction. What is the velocity of the car at $t = 5.0$ s?



a. 16 m/s
b. 20 m/s
c. 10 m/s
d. 6 m/s

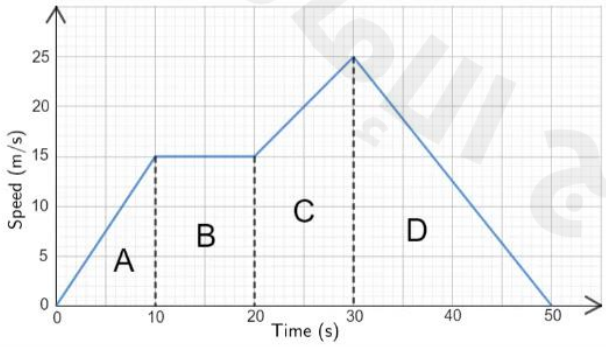
Refer the graph to solve questions from 4 - 6

4. A motorcycle starts from rest and accelerates as shown in the figure. Determine the motorcycle's speed at $t = 4.00$ s
   a. 0 m/s
   b. 20 m/s
   c. 10 m/s
   d. 5 m/s
5. Determine the motorcycle's speed at $t = 14.00$ s
   A. – 8 m/s
   B. 12 m/s
   C. 28 m/s
   D. 0 m/s



6. The distance traveled in the first 14.0 s.
   A. 232 m
   B. 248 m
   C. 49 m
   D. 882 m

7. The speed-time graph shows a 50-second car journey, Calculate the total distance travelled from 20 to 30seconds.



A. 150 m
B. 200 m
C. 675 m
D. 250 m

10	Calculate a particle's change in velocity by integrating its acceleration function with respect to time. Calculate a particle's change in position by integrating its velocity function with respect to time.	STUDENT TEXTBOOK Q. [2.49/2.50]	42 62

Instantaneous position from velocity:

$$x(t) = x_0 + \int_{t_0}^{t} v_x(t')dt'.$$

Instantaneous velocity from acceleration

$$\vec{v}(t) = \vec{v}_0 + \int_{t_0}^{t} \vec{a}(t')dt'.$$

Practice Questions:

1. The velocity as a function of time for a car on an amusement park ride is given as $\boldsymbol{v = At^2 + Bt}$ with constants $A = 2.0\ m/s^3 and\ B = 1.0\ m/s^2$. If the car starts at the origin, what is its position at t = 3.0 s?
   a. 22.5 m
   b. 18 m
   c. 21 m
   d. 19 m
2. An object starts from rest and has an acceleration given by $\boldsymbol{a = Bt^2 - \frac{1}{2}Ct}$, where B = 2.0 m/s^4. If the object's velocity after 5.0 s is 108 .3 m/s, find the value of C?
   a. $4\frac{m}{s}$
   b. $-4\frac{m}{s^3}$
   c. $8\frac{m}{s^2}$
   d. $-8\ m/s^3$
3. An object starts from rest and has an acceleration given by $\boldsymbol{a = Bt^2 - \frac{1}{2}Ct}$, where B = 2.0 m/s^4 and C = –4.0 m/s^3. How far has the object moved after t = 5.0 s?
   a. 145.8 m
   b. 60 m
   c. 110 m
   d. 0 m
4.

11	Realize that in two or three dimensions, an acceleration vector arises if an object's velocity vector changes in magnitude or direction. Calculate the average acceleration for objects whose velocity is either changing in magnitude or direction	STUDENT TEXTBOOK Q 3.27	68 86

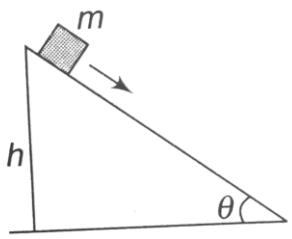
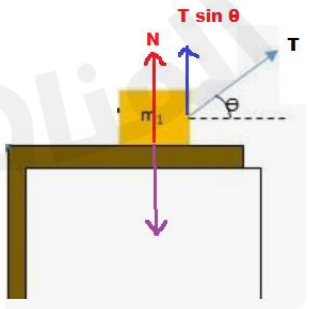
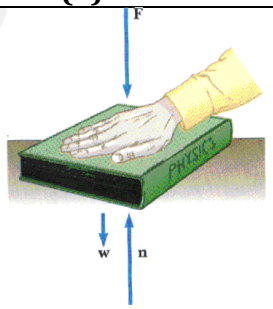
Practice Problems:

1. An object moves in the xy-plane. The x- and y-coordinates of the object as a function of time are given by the following equations: $\boldsymbol{x(t) = 4.9t^2 + 2t + 1}$ and $\boldsymbol{y(t) = 3t^2 + 2}$. What is the velocity vector of the object as a function of time?
   a. (9.8 t+2) $\hat{x}$+ 6t$\hat{y}$
   b. (4.5 t+2) $\hat{x}$+3t $\hat{y}$
   c. (1.6 t^3+t^2+t)$\hat{x}$+$(t^3 + 2t)\hat{y}$
   d. (15.8 t+2)

2. An object moves in the *xy*-plane. The *x*- and *y*-coordinates of the object as a function of time are given by the following equations: $x(t) = 5t^2 + 2t + 1$ and $y(t) = 3t + 2$. What is its acceleration vector at the time t = 2 s?
   a. 10 m/s².
   b. 20 m/s².
   c. 25 m/s².
   d. 22 m/s².
3. An object initially moving with a velocity of $\vec{v_1}$=(4 m/s, 3 m/s) changes its velocity to $\vec{v_2}$=(10 m/s, 6 m/s) over a time interval of 2 seconds. What is the average acceleration of the object?
   a. $(2\ m/s^2, 2.5\ m/s^2)$
   b. $(3\ m/s^2, 1.5\ m/s^2)$
   c. $(6\ m/s^2, 4\ m/s^2)$
   d. $(4\ m/s^2, 3\ m/s^2)$
4. A car initially traveling at 20 m/ s in the positive x-direction changes its velocity to 30 m/ s at an angle of 60° to the positive x-axis over a time interval of 5 seconds. What is the magnitude of the car's average acceleration?
   a. 2.0m/s²
   b. 3.0 m/ s²
   c. 2.6 m/ s²
   d. 5.3 m/s²
5. The position of an object is given by the equation $x = 3.0\ t^2 + 1.5\ t + 4.5$, where x is in meter and t is in second. What is the instantaneous acceleration of the object at $t = 3.0$ s?
   a. 6.0 m/s²
   b. 8.0 m/s²
   c. 12 m/s²
   d. 4.5 m/s²

12	↯ Identify the normal force acting on an object. ↯ Determine the magnitude and direction of the normal force on an object when the object is pressed or pulled onto a surface	STUDENT TEXTBOOK EXAMPLE 4.3 / FIGURE (4.23) Q.(4.26) / Q.(4.92.C)	96 103 / 115 122 / 126

Normal force: is a contact force acting perpendicular to the surface of contact.

Inclined plane	Horizontal surface ($\theta = 0$)	Horizontal surface with tension on a rope at an angle	Horizontal surface with an additional force (F)
			
N = mg cosθ	**N = mg**	**N = mg – T sinθ**	**N = mg + F**

1. A 10 kg block is pressed down onto a flat surface with an additional force of 30 N acting vertically downward. The acceleration due to gravity is 9.8 m/ s^2. What is the magnitude of the normal force exerted by the surface on the block?

   A) 98 N

   B) 68 N

   C) 128 N

   D) 30 N

2. An object weighing 50 N is being pulled upward at an angle of 30° above the horizontal with a force of 20 N. What is the magnitude of the normal force on the object if the surface is horizontal?

   A) 50 N

   B) 40 N

   C) 60 N

   D) 30 N

3. A 15 kg box rests on an inclined plane that makes a 20° angle with the horizontal. What is the magnitude of the normal force on the box? (Assume g=9.8 m/ s^2.)

   A) 147 N

   B) 138 N

   C) 139 N

   D) 121 N

4. An object is pressed against a vertical wall with a horizontal force of 50 N. The object has a mass of 2 kg and the coefficient of static friction between the object and the wall is 0.4. What is the magnitude of the normal force exerted by the wall on the object?

   A) 19.6 N

   B) 50 N

   C) 78.4 N

   D) 0 N

5. A 5 kg object is pulled on a horizontal surface with a force of 40 N at an angle of 45° above the horizontal. What is the magnitude of the normal force on the object? (Take g=9.8 m/s^2.)

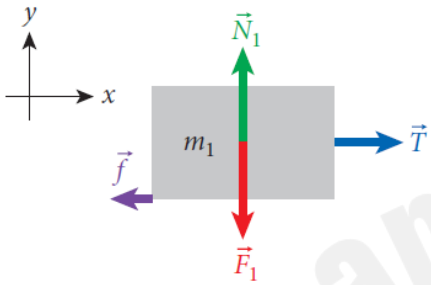
A) 49 N

B) 54 N

C) 21 N

D) 35 N

6. calculate the Normal force acting on the given block of mass 3kg if it rests on a horizontal table.



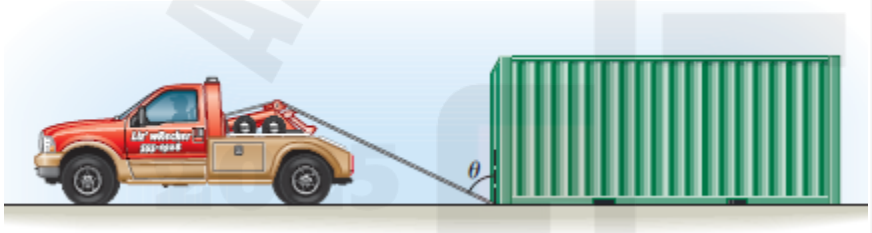
A. 35 N

B. 29.4 N

C. 3 N

D. 0 N

7. If the truck pulls the container at a constant speed, which of the following represents the formula to calculate tension T?



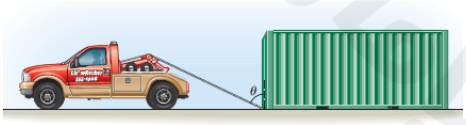
A. $T = \frac{\mu_k mg}{Sin\,\theta + \mu_k \cos\theta}$

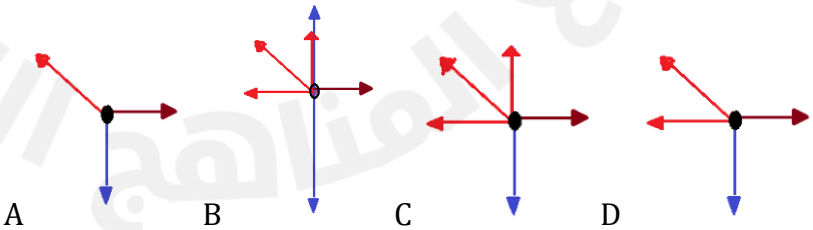
B. $T = \mu_k mg$

C. $T = \frac{\mu_k mg}{\cos\theta}$

D. $T = \frac{\mu_k mg}{Sin\,\theta}$

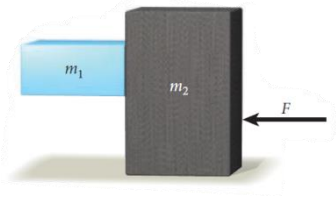
8. A tow truck of mass *M* is using a cable to pull a shipping container of mass *m* across a horizontal surface as shown in the figure. The cable is attached to the container at the front bottom corner and makes an angle $\theta$with the vertical as shown. The coefficient of kinetic friction between the surface and the crate is θ. Which of the following represents the free body diagram?



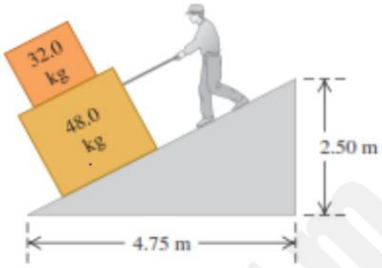


A B C D

9. A block of mass m_1 = 2.30 kg is placed in front of a block of mass m_2 = 5.20 kg, as shown in the figure. The coefficient of static friction between m_1 and m_2 is 0.65, and there is negligible friction between the larger block and the tabletop. What is the contact force between m_1 and m_2?
   A. 73.5 N
   B. 34.71 N
   C. 78.4 N
   D. 113 N



10. You are lowering two boxes down a ramp. Calculate the string tension in the situation where two boxes are stacked on a slope and moving with uniform velocity, given that the kinetic friction coefficient between the heavier (bottom) box and the slope is 0.444, whereas the static friction coefficient between boxes is 0.8.



   A. 57.7N
   B. 673.5 N
   C. 784 N
   D. 325 N

11. 1.0kg block is sitting on a horizontal incline plane. The plane is tilted into the block begins to slide. You notice that the plane is inclined at an angle of 32 degrees above the horizontal when the block begins to slide. Calculate the coefficient of static friction that acts between the block and the plane.
   A. 0.62
   B. 0.44
   C. 0.76
   D. 0.15

13	Describe an object in static equilibrium and dynamic equilibrium. State the conditions for an object to be in equilibrium. Calculate a force of unknown magnitude acting on an object in equilibrium.	STUDENT TEXTBOOK EXAMPLE 4.1 Q 4.34 / Q 4.81	97-99 100 122 /125

- An object at rest is said to be in **static equilibrium.**
- An object moving with constant velocity is said to be in **dynamic equilibrium.**
- Condition for equilibrium: $\vec{F}_{\text{net}} = 0$

$$F_{\text{net},x} = \sum_{i=1}^{n} F_{i,x} = F_{1,x} + F_{2,x} + \cdots + F_{n,x} = 0$$

$$F_{\text{net},y} = \sum_{i=1}^{n} F_{i,y} = F_{1,y} + F_{2,y} + \cdots + F_{n,y} = 0$$

$$F_{\text{net},z} = \sum_{i=1}^{n} F_{i,z} = F_{1,z} + F_{2,z} + \cdots + F_{n,z} = 0.$$

Practice Questions:

1. Which of the following best describes an object in *static equilibrium*?

A. The object is moving at a constant velocity.

B) The object is at rest with no net force acting on it.

C) The object is accelerating under the influence of a net force.

D) The object is at rest but has an unbalanced force acting on it.

2. An object is said to be in *dynamic equilibrium* if:

A) It is moving at a constant velocity with no net force acting on it.

B) It is moving in a circular path under the influence of a net force.

C) It is at rest but experiences multiple forces.

D) It is accelerating in a straight line.

3. An object is in static equilibrium with three forces acting on it: $\vec{F}_1 = (10\text{ N}, 0)$, $\vec{F}_2 = (-6\text{ N}, 8\text{ N})$, and an unknown force $\vec{F}_3$. What is $\vec{F}_3$ to keep the object in equilibrium?

A) (4 N,−8 N)

B) (−4 N,−8 N)

C) (−4 N,0 N)

D) (0 N,−8 N)

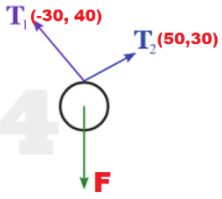
4. A hanging sign is held in place by two ropes that exert tension $T_1 = (-30\text{ N}, 40)$ and $T_2 = (50, 30\text{ N})$. What is the force $\vec{F}$ exerted by the weight of the sign to keep the system in equilibrium?

A) (−20 N,−70 N)

B) (20 N,−70 N)

C) (20 N,70 N)

D) (−80 N,−70 N)



5. Two ropes exert forces holding a suspended box having a mass of 100 N at rest. If one rope is at an angle of 30∘ to the horizontal and exerts a force of 40 N along the rope, what is the tension on the other rope and what is the angle between the rope and the horizontal?

a. 60 N , 30^0.

b. 40 N, 60^0.

c. 87 N, 67^0

d. 60 N, 60^0.

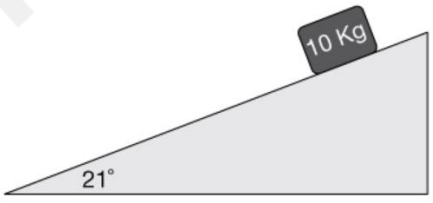
6. A 10 Kg object is at rest on a ramp inclined at 21° from the horizontal, as shown. Calculate the minimum coefficient of friction necessary for the block not to slide down the ramp.

a. 0.384

b. 0.657

c. 0.425

d. 2.874



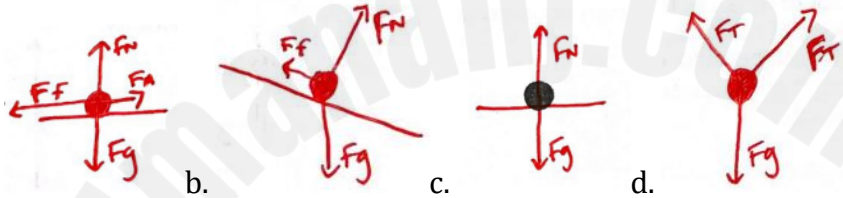
7. A mass sits on a ramp inclined at an adjustable angle θ to the horizontal. If the coefficient of friction between the mass and the ramp is μ, which of the following is the correct expression for the angle at which the mass will begin to slide down the ramp.

A. $\theta = \tan^{-1}\mu$
B. $\theta = \sin^{-1}\mu$
C. $\theta = \cos^{-1}\mu$
D. $\theta = \cot^{-1}\mu$

14	↳ Sketch a free-body diagram for an object, showing the object as a particle and drawing the forces acting on it as vectors with their tails anchored on the particle ↳ Draw free-body diagrams and apply Newton's second law for objects on horizontal, vertical, or inclined planes in situations involving friction	STUDENT TEXTBOOK	96-97
		SOLVED PROBLEM (4.1) EXAMPLE (4.8) SOLVED PROBLEM (4.4) EXAMPLE (4.9)	104 114 116 118

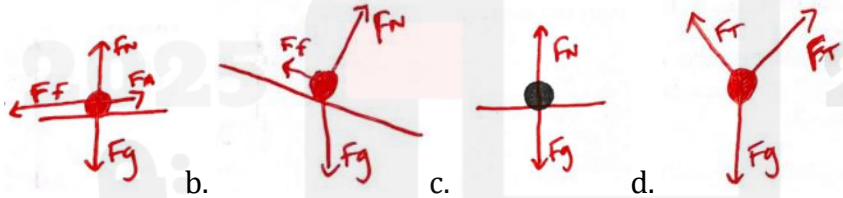
Circle correct free-body diagram for the given situations.

1. An object lies motionless on a surface



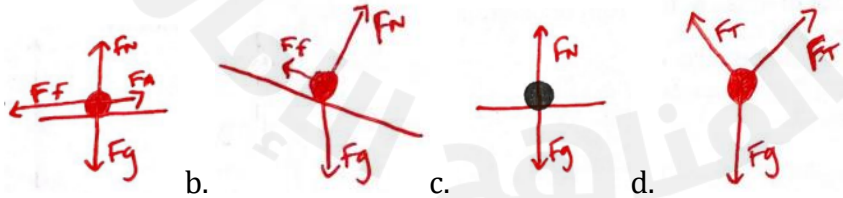
a. b. c. d.

2. Object slides at a constant speed on a smooth surface(frictionless surface).



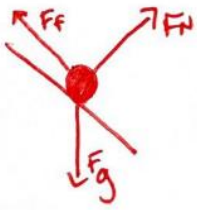
a. b. c. d.

3. Object slows due to friction.

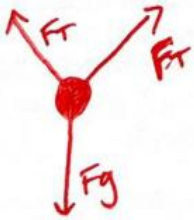


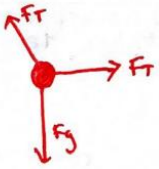
a. b. c. d.

4. Friction on an incline plane prevents sliding.

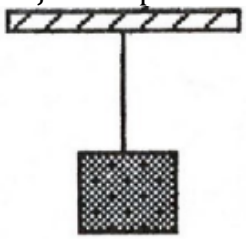
a. 

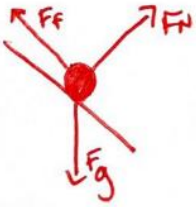
b. 

c. 

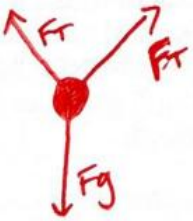
d. 

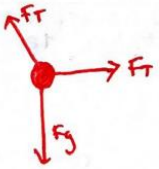
5. Object suspended from ceiling.



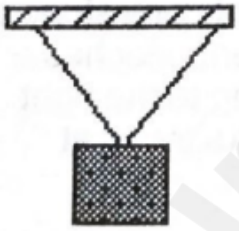
.a. 

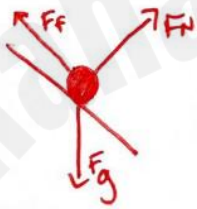
b. 

c. 

d. 

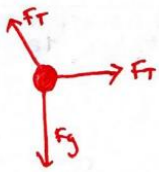
6. An object suspended from ceiling



a. 

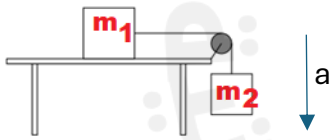
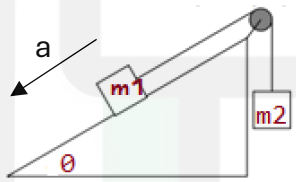
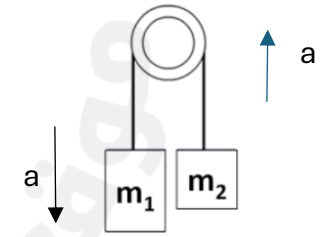
b. 

c. 

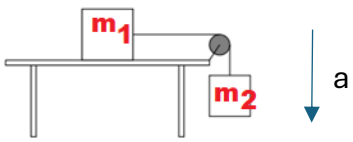
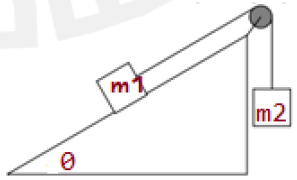
d. 

15	↳ Identify that the direction of the force due to the pull on the rope acts exactly in the direction along the rope. ↳ Describe how the force with which we pull on the massless rope is transmitted through the entire rope unchanged, even if the rope passes over a pulley.	SOLVED PROBLEM (4.2) EXAMPLE (4.4)	105 106
		Q. (4.35/4.48/4.96)	122,123,126

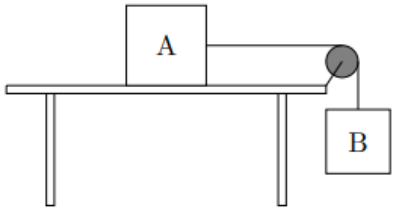
Frictionless:

Horizontal surface	Inclined plane	Atwood
		
$a = \frac{(m_2)}{(m_1+m_2)} g$	$a = \frac{(m_1 sin\theta - m_2)}{(m_1+m_2)} g$	$a = \frac{(m_1-m_2)}{(m_1+m_2)} g$

Surface with friction:

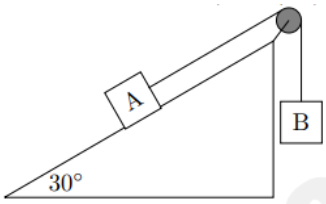
Horizontal surface with coefficient of friction μ_k	Inclined plane with coefficient of friction μ_k
	
$a = \frac{(m_2 - \mu_k m_1)}{(m_1+m_2)} g$	$a = \frac{(m_2 - m_1 \sin(\theta) - \mu_k m_1 \cos(\theta))}{(m_1+m_2)} g$

1. Two blocks are joined as in the diagram below. The mass of block A is 8.0 kg and the mass of block B is 2.0 kg. If block A is on a frictionless surface, calculate its acceleration. (use g= 10 m/s²)



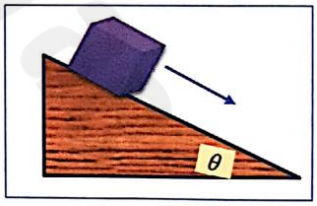
A. 1.5m/s²
2. 2 m/s²
3. 2.5 m/s²
4. 4 m/s²

2. Two blocks are joined as in the diagram. Block A has a mass of 4kg and block B has a mass of 2 kg. If the inclined plane is frictionless, find the acceleration of block A.



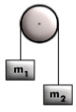
A. 1.5m/s²
B. 2 m/s²
C. 0 m/s²
D. 4 m/s²

1. In figure, a 5-kg block slides down on a rough slope surface at a constant velocity where μ_k = 0.70. What is the magnitude of angle θ?



A. 63°
B. 35°
C. 31°
D. 24°

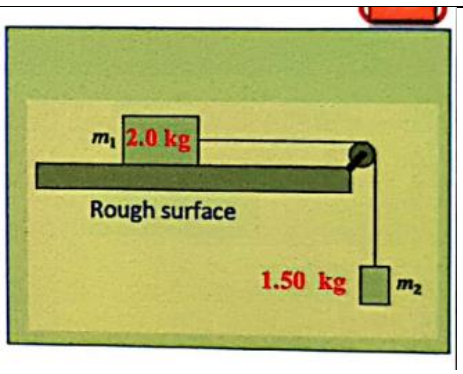
2. Two blocks of weights 400 N and 600 N are connected using massless ropes through a frictionless pulley. The acceleration of the light weight is …..



A. 1.96 m/s²
B. 10.2 m/s²
C. 3.68 m/s²
D. 5.73 m/s²

3. If you double both masses in an Atwood machine, the resulting acceleration will be
a) twice as large.
b) half as large.
c) the same.
d) one-quarter as large.
e) four times as large.

In the figure , a mass $\mathbf{m_1}$ is connected to another mass $\mathbf{m_2}$ by a massless string over a frictionless pulley, when $\mathbf{m_1}$ slides on a surface by effecting of m_2. If the kinetic friction coefficient between $\mathbf{m_1}$ and the surface is (0.35).



Answer the question (23 , 24)

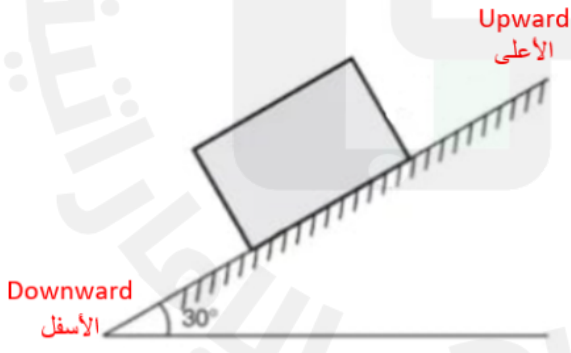
23- Draw the free – body diagram of the forces acting on the m_1.

24- Calculate the acceleration of (m_1) on the surface.

Past paper – 2022-23

A box of mass 2 kg is accelerating on an inclined plane of inclination 30°. The coefficient of kinetic friction between the surfaces of the box and the plane is 0.35. What is the magnitude and direction of the net force acting on the box? ($g = 9.8\ m/s^2$)

يتسارع صندوق كتلته 2 kg على سطح مائل بزاوية 30°. معامل الاحتكاك الحركي بين سطح الصندوق والسطح المائل 0.35. ما مقدار واتجاه محصلة القوى المؤثرة في الصندوق؟ ($g = 9.8\ m/s^2$)



1. 3.86 N downward
2. 3.86 N upward
3. 15.7 N downward
4. 15.7 N upward

Past paper 2022-23

An object of mass 36 kg is being pulled on a friction less horizontal surface by means of two strings. One of the strings is pulling forward, has a tension of 300 N and makes an angle of 40° with the positive x-axis. The other string is pulling backwards horizontally and has a tension of 12 N. What is the acceleration of the object? ($g = -9.8\ m/s^2$)

يُسحب جسم كتلته 36 kg على سطح أفقي عديم الاحتكاك بواسطة حبلين. يسحب الحبل الأول الجسم للأمام، بقوة شد مقدارها 300 N وتصنع زاوية 40° مع محور x الموجب. بينما يسحب الحبل الثاني الجسم افقيا للخلف بقوة شد مقدارها 12 N. ما تسارع الجسم؟ ($g = -9.8\ m/s^2$)

1. 6.05 m/s^2
2. 3.69 m/s^2
3. 0.761 m/s^2
4. 7.12 m/s^2

Past paper – 2023-24

ينزلق صندوق على سطح طاولة أفقي خشن بسرعة ابتدائية v_o ،يتسبب الاحتكاك بين الصندوق وسطح الطاولة الى توقف الصندوق عن الحركة بعد $t = 5.5\ Sec$ معامل الاحتكاك الحركي بين الصندوق وسطح الطاولة 0.52 ، ما مقدار سرعة الصندوق الابتدائية ؟

A box slides on a rough horizontal table surface with an initial speed v_o The friction between the box and the table surface causes the box to stop after $t = 5.5\ Sec$ .The coefficient of kinetic friction between the box and the table surface is 0.52 , what is the magnitude of initial velocity of the box?

a. 28.1 m/s
b. 54.0 m/s
c. 5.1 m/s
d. 10.4 m/s