شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية

حل مراجعة الوحدة الرابعة Dimension One in Forces القوى في بعد واحد

تاريخ نشر الملف على موقع المناهج: 2024-02-07 10:28:09

التواصل الاجتماعي بحسب الصف التاسع المتقدم

روابط مواد الصف التاسع المتقدم على تلغرام

التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات

المزيد من الملفات بحسب الصف التاسع المتقدم والمادة فيزياء في الفصل الثاني

1	الدروس المطلوبة للفصل الثاني
2	كتاب الطالب
3	أسئلة الامتحان النهائي - بريدج
4	حل أسئلة الامتحان النهائي
5	نموذج أسئلة وفق الهيكل الوزاري

ID Resources: Topic 4– Forces in One Dimension

Subtopic 4.1: Force and Motion

1. Which of the following forces always act perpendicular to the supporting surface?

A. Tension
B. Friction
C. Weight
√ D. Normal

2. Which of the following forces is not a contact force?

A. Drag
B. Normal
√ C. Weight
D. Tension

3. Inertia is the resistance of any physical object to any change in its ____.

A. Mass
B. Volume
C. Density
√ D. Velocity

4. Which of the following are true regarding Newton's first law of motion?

I. It is also called as law of inertia
II. An object accelerates only if it is acted upon by an unbalanced force
III. An object is at equilibrium if it is at rest
IV. An object is in equilibrium if it moves with constant velocity

A. I and II only
B. II and III only
C. II and IV only
√ D. I, II, III and IV

5. Which of the objects below have the greatest inertia?

	Object	Mass (kg)	Speed (m/s)
A.	P	2.0	6.0
B.	Q	4.0	5.0
C.	R	6.0	4.0
√ D.	S	8.0	2.0

6. Which object has the greatest inertia?

A. 5.00 kg mass moving at 10.0 m/s
B. 10.0 kg mass moving at 1.00 m/s
C. 15.0 kg mass moving at 10.0 m/s
√ D. 20.0 kg mass moving at 1.00 m/s

7. If a block is in equilibrium, the magnitude of the block's acceleration is _____.

√ A. zero
B. decreasing
C. increasing
D. constant, but not zero

8. Which of the following is the condition for a body to be in translational equilibrium?

√ A. The resultant force on the body in any direction is zero
B. The velocity of the body in any direction is zero
C. No external force is acting on the body
D. No work is done on the body

9. You are in a train traveling on a horizontal track and notice that a piece of luggage starts to slide directly toward the front of the train. From this observation, you can conclude that this train is ____.

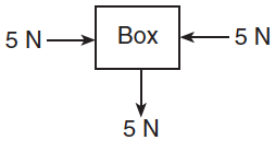
A. speeding up

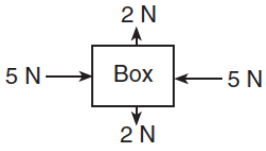
√ B. slowing down

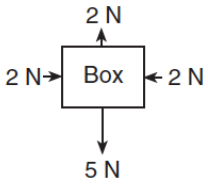
D. speeding up and changing direction

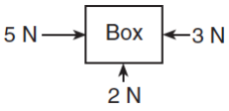
E. slowing down and changing direction

10. Which of the diagrams below represent a box in equilibrium?

A. 

√ B. 

C. 

D. 

11. A baseball bat exerts a force of magnitude F on a ball. If the mass of the bat is three times the mass of the ball, the magnitude of the force of the ball on the bat is ___.

A. $F/3$

√ B. F

C. $2F$

D. $3F$

12. A force of 25 N east and a force of 25 N west act concurrently on a 5.0 kg cart. What is the acceleration of the cart?

√ A. $0.0\ m/s^2$

B. $0.2\ m/s^2\ east$

C. $1.0\ m/s^2\ west$

D. $5.0\ m/s^2\ east$

13. A constant eastward horizontal force of 70 N is applied to a 20 kg crate moving toward the east on a level floor. If the frictional force on the crate has a magnitude of 10 N, what is the magnitude of the crate's acceleration?

A. $0.50\ m/s^2$

√ B. $3.0\ m/s^2$

C. $3.5\ m/s^2$

D. $4.0\ m/s^2$

14. A car moves in the positive direction with a velocity of 40 m/s. Brakes are applied to bring it to a complete stop in 10 s. Calculate its average acceleration.

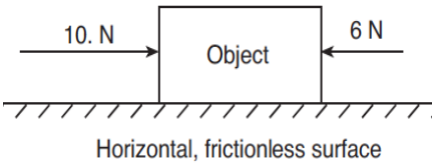
A. $-2.5\ m/s^2$

√ B. $-4\ m/s^2$

C. $2.5\ m/s^2$

D. $4\ m/s^2$

15. Two forces act concurrently on an object on a horizontal, frictionless surface, as shown in the diagram below.



What additional force, when applied to the object, will establish equilibrium?

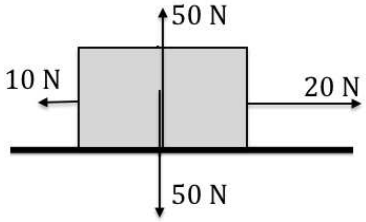
√ A. 4 N to the left

B. 4 N to the right

C. 16 N to the left

D. 16 N to the right

Questions 16 to 18.
The forces acting on a 5 kg box is shown below.



16. What is the net force on the box?

√ A. 10 N to the right
B. 20 N to the right
C. 10 N to the left
D. 20 N to the left

17. What is the acceleration of the box?

√ A. 2 m/s^2
B. 4 m/s^2
C. 10 m/s^2
D. 20 m/s^2

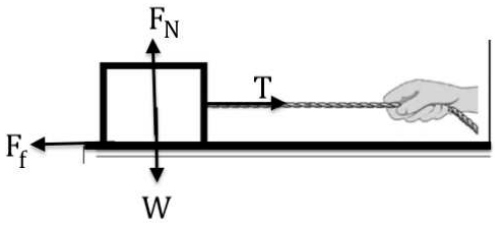
18. What is the equilibrant of the force?

A. 10 N to the right
B. 20 N to the right
√ C. 10 N to the left
D. 20 N to the left

19. What is the acceleration of a 17 kg box under the effect of multiple forces as shown in the figure below.

√ A. 1 m/s^2 Right
B. 7 m/s^2 Left
C. 17 m/s^2 Left
D. 17 m/s^2 Right

20. Which of the equations below is/are true for the box being pulled to accelerate horizontally on a rough surface?



I. $F_{net} = F_N$
II. $F_{net} = T - F_f$
III. $F_N = W$
IV. $T = F_f$

A. I and III
B. I and IV
√ C. II and III
D. I and IV

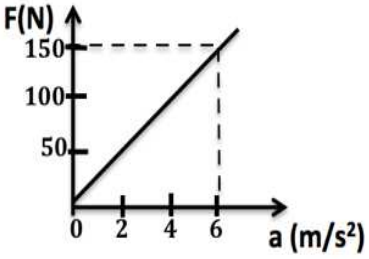
22. An object that weighs 75 N is pulled on a horizontal surface by a horizontal pull of 50 N to the right. The friction force on this object is 30 N to the left. What is the acceleration of the object?

A. 0.27 m/s²
B. 1.1 m/s²
√ C. 2.6 m/s²
D. 11 m/s²

23. A crate is sliding down an inclined ramp at a constant speed of 0.55 m/s. The vector sum of all the forces acting on this crate must ___.

A. point down the ramp
B. point up the ramp
C. point perpendicular to the ramp
√ D. be zero

24. Which of the following is the correct relationship between force and acceleration for the graph shown below?



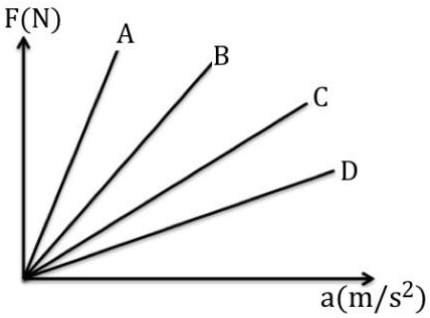
√ A. $F = 25a$

B. $a = 25F$

C. $F = 50a$

D. $a = \frac{1}{50}F$

25. The diagram below represents the force-acceleration graphs for four different objects A, B, C and D. Which of the following statements is/are correct?



I. Acceleration is directly proportional to the applied force for each of the objects

II. $mass_A < mass_B < mass_C < mass_D$

III. $mass_A > mass_B > mass_C > mass_D$

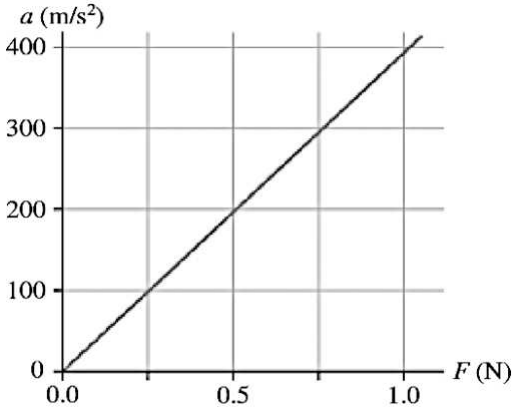
A. II only

B. III only

C. I and II only

√ D. I and III only

26. The figure shows an object's acceleration-versus-force graph. What is the mass of this object?



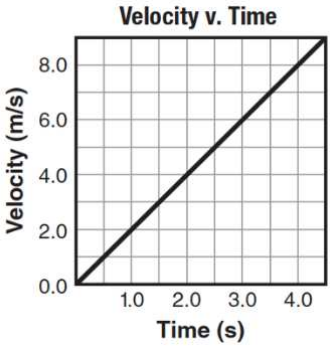
A. 1.6 g

√ B. 2.5 g

C. 630 g

D. 400000 g

27. In the graph below, what is the force being exerted on the 16 kg cart?



A. 4 N

B. 8 N

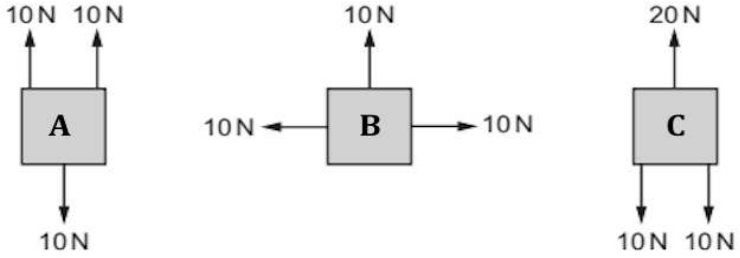
C. 16 N

√ D. 32 N

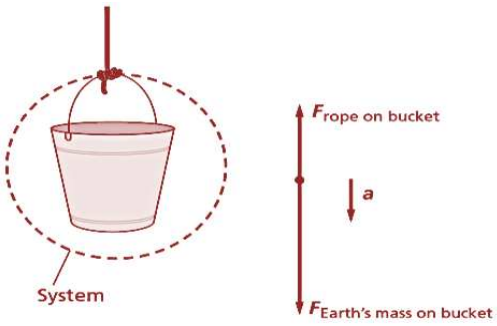
Free Response:

1. The diagrams below show three identical objects A, B and C. Each object is acted on only by the forces shown. Complete the table below to identify if the objects remain in equilibrium or accelerate.

Object	Remain in Equilibrium/ Accelerate
A	Accelerate
B	Accelerate
C	Remain in Equilibrium

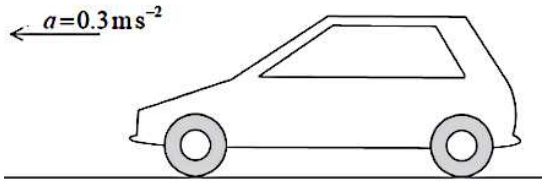


2. Draw a free-body diagram of a water bucket being lifted by a rope at a decreasing speed. Specifically identify the system. Label all forces with their agents and make the arrows the correct lengths.

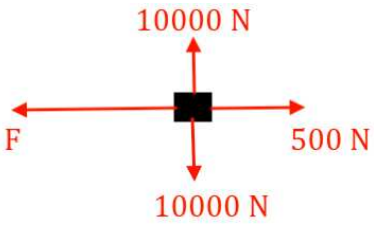


3. A car of mass 1000 kg accelerates on a straight, flat, horizontal road with an acceleration $a = 0.3\ m/s^2$. The driving force F on the car is opposed by a resistive force of 500 N.

a. What is the weight of the car?
$F_g = mg = 1000\ kg \times 10\ m/s^2 = 10000\ N$



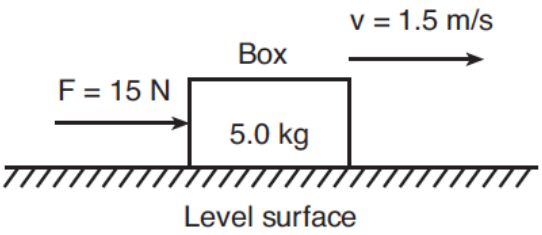
b. Draw a free body diagram for the car.



c. Find the net force on the car.
$F_{net} = ma = 1000\ kg \times 0.3\ m/s^2 = 300\ N$

d. What is the magnitude of the driving force F?
$F_{net} = F - 500\ N$
$F = 300\ N + 500 = 800\ N$

4. A box and its contents have a combined mass of 5.0 kg. A horizonatl force of 15 N is required to push the box at a constant speed of 1.5 m/s across a rough surface.

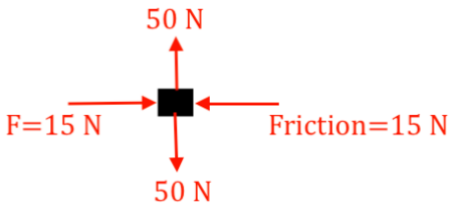


a. What is the weight of the box with its contents?
$F_g = mg = 5.0\ kg \times 10\ m/s^2 = 50\ N$

b. What is the net force on the box? Explain your answer.
Since the velocity is constant, the acceleration is zero
Since the net force $F_{net} = ma$, F_{net} is zero

c. Calculate the frictional force due to the rough surface?
$F_{net} = F_{friction} - 15\ N = 0 + 15\ N = 15\ N$

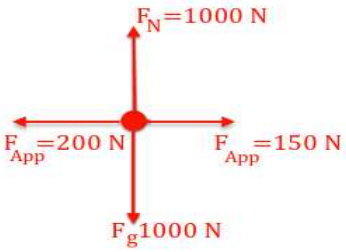
d. Draw a free body diagram for the car.

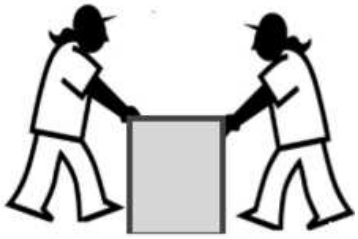


e. Tick (√) the box(es) which is/are true.
The inertia of the box and its contents increases if there is an increase in the ____.
- ☐ speed of the box
- ☐ mass of the contents of the box
- ☐ magnitude of the horizontal force applied to the box

5. Two men try to move a 100 kg box on a frictionless surface, one man pushes to the right with a force of 150 N, and the other pushes to the left with 200 N

a. Draw a free body diagram for the box.





b. Calculate the net force on the box.
$F_{net} = -200 + 150 = -50\ N\ or\ 50\ N\ to\ the\ left$

c. Find the acceleration of the box.
$a = \frac{F_{net}}{m} = \frac{-50}{100} = -0.5 m/s^2$

d. Calculate the acceleration of the box if there is a frictional force of 3 N between the box and the ground.
$F_{net} = -50 + 3 = -47\ N$

$a = \frac{F_{net}}{m} = \frac{-47}{100} = -0.47 m/s^2$

6. The figure below shows two horizontal forces that act on a car travelling along a straight level road. Force B is caused by air resistance and friction.

a. In the figure above, draw two other forces acting on the car.
The weight and normal forces.

b. The forward force A and the backward force B are equal.
Describe the motion of the car.
The car moves with constant velocity.

c. The mass of the car is 800 kg. Find its weight.
$W = mg = 800kg \times \frac{10m}{s^2} = 8000\ N$

d. What is the force exerted by the ground on the car?
$Normal\ force = W = 8000N$

e. Force A increases to 5000 N. This causes the car to accelerate initially at 1.5 m/s^2. Calculate the size of force B.
$F_{net} = F_A - F_B$
$F_B = F_A - ma$
$F_B = 5000\ N - (800\ kg \times 1.5\ m/s^2) = 5000\ N - 1200\ N = -6000\ N$

f. Force A remains constant at 5000 N. Explain why the acceleration decreases as the car travels along the level road.
As the car accelerates and its speed increases, it causes a greater air resistance. Thus, force B increases, which causes the net force to decrease, causing lesser acceleration

g. The car later reaches a constant speed. If it takes a turn at a circular bend with the same speed, why is the car still accelerating?
Although the car's speed is constant, its direction is changing, thus causing a change in velocity and since acceleration is the rate of change of velocity, it accelerates.

7. Describe the importance of using a seat belt while driving.

When the car crashes, there is no unbalanced force acting on the person, so he continues moving forward (Newton's First Law). The person moves against the seat belt, exerting a force on it. The seat belt then exerts a force back on the person (Newton's Third Law). This causes a controlled deceleration of the person.

Subtopic 4.2: Weight and Drag Force

1. What is the weight of a 0.5 kg book placed on a table?

A. 0.5 N
√ B. 5.0 N
C. 10 N
D. 20 N

2. What is the mass of an object that experiences a gravitational force of 685 N near Earth's surface?

A. 6.85 kg
√ B. 68.5 kg
C. 685 kg
D. 6850 kg

3. A person who normally weighs 700 N is riding in a rather swift elevator that is moving at a constant speed of 9.8 m/s. If this person is standing on a bathroom scale inside the elevator, what would the scale read?

A. more than 700 N
B. less than 700 N
√ C. 700 N
D. It could be more or less than 700 N, depending on whether the elevator is going up or down

4. An elevator suspended by a vertical cable is moving downward but slowing down. The tension in the cable must be ___.

√ A. greater than the weight of the elevator
B. less than the weight of the elevator
C. equal to the weight of the elevator
D. zero

5. When a 45 kg person steps on a scale in an elevator, the scale reads a steady 480 N. Which of the following statements must be true?

I. The elevator is accelerating upward at a constant rate.
II. The elevator is accelerating downward at a constant rate.
III. The elevator is moving upward at a constant rate.
IV. The elevator is moving downward at a constant rate.
V. From the given information, we cannot tell if the elevator is moving up or down.

A. I and II only
B. II and III only
D. II and IV only
√ E. I and V only

6. A 100 kg man is standing on a bathroom scale in an elevator. What is the scale reading when the elevator is moving upward with a constant speed?

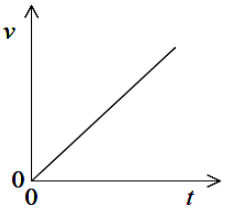
A. 0 N
B. 900 N
√ C. 1000 N
D. 2000 N

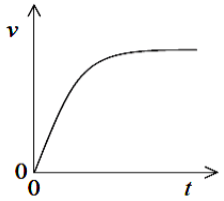
7. Which of the following is/are true for an object that reaches a terminal velocity?

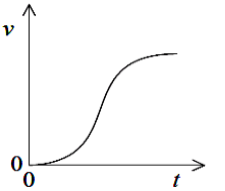
I. Velocity is uniform
II. Acceleration is zero
III. Velocity is maximum

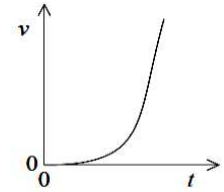
A. I only
B. II only
C. I and III only
√ D. I, II and III

8. A raindrop falling from rest at time $t = 0$ reaches terminal velocity. Which graph best describes how the speed v of the raindrop varies with time t?

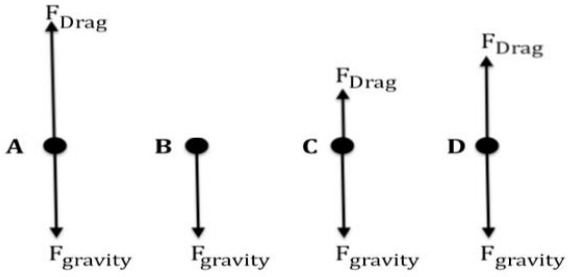
A.


√ B.


C.


D.


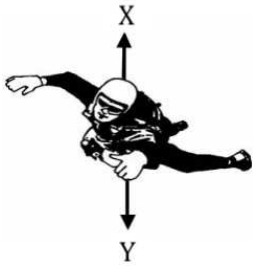
9. A skydiver jumps off a plane and eventually reaches his terminal velocity. Which of the free



body diagrams A to D below correctly describes his motion when he reached his terminal velocity?

A. A
B. B
C. C
√ D. D

10. A sky-diver shown below jumps from a plane.



The two forces X and Y acting on the sky-diver as he falls are _____.

		Force *X*	**Force *Y***
	A.	Air resistance	Normal
√	B.	Air resistance	Weight
	C.	Normal	Gravity
	D.	Weight	Air resistance

11. A 400 N steel ball is suspended by a light rope from the ceiling. The tension in the rope is _____.

A. Zero
B. 200 N
√ C. 400 N
D. 800 N

20. A skydiver of mass 80 kg falls vertically with a constant speed of 50 m/s. The upward force acting on the skydiver is approximately _____.

A. 0 N
B. 80 N
√ C. 800 N
D. 4000 N

Free Response:

1. A boy stands on a bathroom scale in an elevator. His normal weight is 600 N and the scale reads 720 N.

a. Is the acceleration at this moment upward, downward or zero? Explain.

The direction of acceleration is upward.
An upward acceleration results in an apparent weight greater than the actual weight (The net force is upward)

b. Find the magnitude of the net force acting on the boy.

$F_{net} = apparent\ weight - actual\ weight$
$F_{net} = 720\ N - 600\ N = 120\ N$

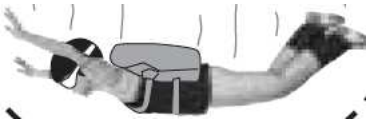
c. What is the mass of the boy?

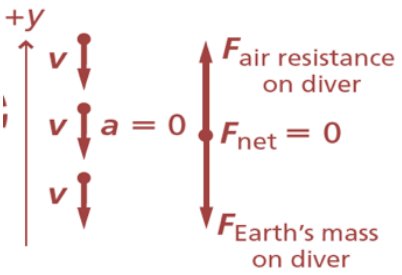
$$m = \frac{F_g}{g} = \frac{600\ N}{10\ m/s^2} = 60\ kg$$

d. Calculate the magnitude of the boy's acceleration.

$$a = \frac{F_{net}}{m} = \frac{120\ N}{60\ kg} = 2\ m/s^2$$

2. The figure below shows a sky diver falling downward through the air at constant velocity. Draw a free body diagram for the sky diver.





3. If a parachutist has a greater weight compared to a lighter parachutist, explain how the terminal velocity of a parachutist will change at each stage:

a. At the initial fall
Initially, the object accelerates downwards due to the force of gravity

b. A few seconds after falling
As the object's speed increases, frictional forces such as air resistance or drag increase

c. When he/she has reached terminal velocity
At terminal velocity, the weight of the object due to gravity is balanced by the frictional forces, and the resultant (net) force is zero

4. The diagram shows the forces acting on a skydiver. Tick the correct answer to complete the following sentences.

a. Force ***J*** is caused by _____.
- ☐ air resistance
- ☐ friction
- ☐ gravity

b. Force ***K*** is caused by _____.
- ☐ air resistance
- ☐ friction
- ☐ gravity

c. When the skydiver jumps from the aircraft, force ***J*** is _____ force ***K.***
- ☐ bigger than
- ☐ the same as
- ☐ smaller

d. When the skydiver jumps from the aircraft, the skydiver _____.
- ☐ accelerates downwards
- ☐ accelerates upwards
- ☐ falls at a steady speed

Subtopic 4.3: Newton's Third Law

1. Which of the following statements is/are true regarding Newton's third law interaction pair?

I. They are of the same type
II. They act on different objects
III. They are equal in magnitude

A. I only
B. II only
C. II and III only
√ D. I, II and III

2. A tennis player's racket applies an average force of 200 *N* to a tennis ball for 0.025 second. The average force exerted on the racket by the tennis ball is ____.

A. 0.025 *N*
B. 5.00 *N*
C. 80.0 *N*
√ D. 200 *N*

3. Which of the following statements is NOT true regarding Newton's third law interaction pair?

A. They are of the same type
√ B. They act on the same object
C. They are equal in magnitude
D. They are opposite in direction

4. Which of the following statements are correct regarding Newton's 3rd law?

I. Forces in nature always exist in pairs
II. Action and reaction forces cancel each other
III. The action and reaction forces act on different objects
IV. For every action, there is an equal and opposite reaction

A. I and II only
B. II and III only
C. I, II and III only
√ D. I, III and IV only

5. The “reaction" force does not cancel the “action" force because _____.

A. the action force is greater than the reaction force

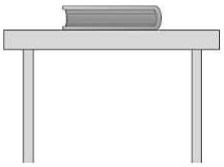
√ B. they act on different bodies

C. they are in the same direction

D. the reaction force exists only after the action force is removed

Questions 6 and 7

A book of mass 1 kg is at rest on a table top as shown below.



6. A downward force of _____ is exerted by the_____ on the book.

A.	1 N	table
B.	1N	gravity
C.	10 N	table
√ D.	10 N	gravity

7. Which of the following is an action-reaction pair?

I. Force of the table on the book
II. Force of the book on the table
III. Force of gravity on the book
IV. Force of gravity on the table

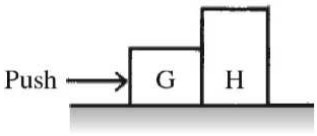
√ A. I and II

B. I and III

C. II and III

D. II and IV

8. You push on box G that is next to box H, causing both boxes to slide along the floor, as shown in the figure. The reaction force to your push is



A. the push of box G on box H

B. the push of box H on box G

√ C. the push of box G against you

D. the upward force of the floor n box G

9. A horse pulls a cart with force $\vec{\mathbf{F}}$. As a result of this force the cart accelerates with constant acceleration. The magnitude of the force that the cart exerts on the horse _____

A. Is zero

√ B. equal to the magnitude of $\vec{\mathbf{F}}$

C. less than the magnitude of $\vec{\mathbf{F}}$

D. greater than the magnitude of $\vec{\mathbf{F}}$

Questions 10 and 11.

The figure below shows an Atwood’s machine.

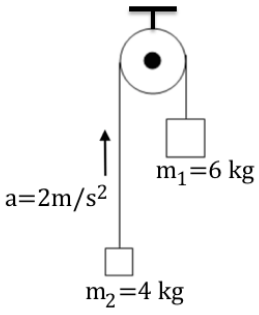
10. What is the net force on the mass m_2?

A. 2.0 N

B. 6.0 N

√ C. 8.0 N

D. 12.0 N



11. What is the tension in the string?

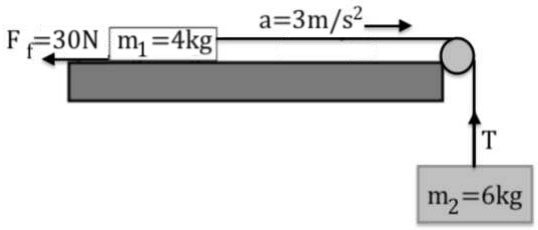
A. 20 N

B. 32 N

√ C. 48 N

D. 72 N

Questions 12 and 13
A mass m_1 rests on a rough table surface and is connected to mass m_2 by a string of negligible mass, running over a massless, frictionless pulley. The mass m_1 accelerates at a rate of 3.0 m/s^2, while a frictional force of 30 N acts on it as shown below.



12. What is the net force acting on the mass m_1?

A. 2 N
B. 10 N
√ C. 12 N
D. 42 N

13. The tension T in the string is ____.

A. 18 N
√ B. 42 N
C. 60 N
D. 78 N

14. What magnitude net force is required to accelerate a 1200-kg car uniformly from 0 m/s to 27.0 m/s in 10.0 s?

A. 444 N
B. 1620 N
√ C. 3240 N
D. 4360 N

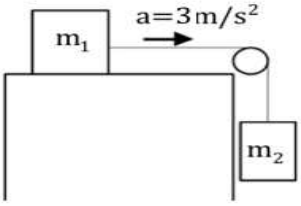
15. A force of 600 N is applied to stretch a spring by 15 cm. What is the spring constant of the spring?

A. 0.025
B. 40 N/m
√ C. 4000 N/m
D. 9000 N/m

Questions 16 and 17.
Two masses $m_1 = 4kg$ and $m_2 = 2kg$ are connected by a light string. Mass m_1 is placed on the table and m_2 is suspended by the string. The frictional force between m_1 and the table is 2N.

16. What is the net force on m_1?

A. 2 N
B. 3 N
C. 6 N
√ D. 12 N

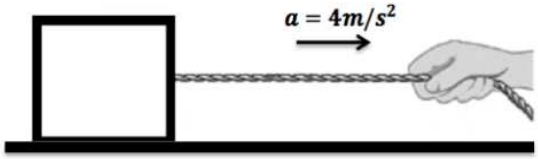


17. What is the tension in the string?

A. 3 N
B. 12 N
√ C. 14 N
D. 28 N

Free Response:

1. A 7 kg box is being pulled on a frictionless table by a rope to accelerate it by $4m/s^2$ as shown below.



a. Identify **two** action and reaction pairs for the diagram above with their directions and complete the table below.

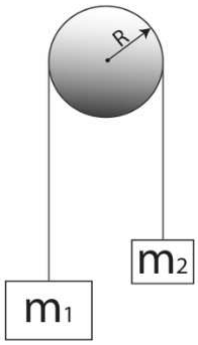
Action	Reaction
The box pushes the table down	The table pushes the box up
The rope (or hand) pulls the box to the right	The box pulls the rope (or hand) to the left

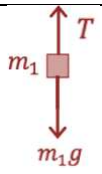
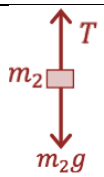
b. Find the normal force acting on the box
$F_N = F_N = mg = 7 \times 10 = 70\ N$

c. Find the tension in the rope.
$T = ma = 7 \times 4 = 28\ N$

2. Two masses, m_1 and m_2, are hanging by a massless string from a frictionless pulley. Mass m_1 is greater than mass m_2.

a. Draw a free body diagram for masses m_1 and m_2 in the table below.



Mass m_1	Mass m_2
	

b. Use Newton's law to write an equation for mass m_1.
$m_1 g - T = m_1 a$
$T = m_1 g - m_1 a$

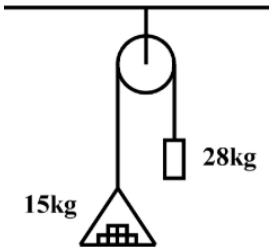
c. Use Newton's law to write an equation for mass m_2.
$T - m_2 g = m_2 a$
$T = m_2 g + m_2 a$

d. Combine the equations from part (b) and (c) to find the acceleration of the two masses.
Combining equations from (b) and (c):
$m_1 g - m_1 a = m_2 g + m_2 a$
$a(m_1 + m_2) = g(m_1 - m_2)$
$a = \dfrac{g(m_1 - m_2)}{(m_1 + m_2)}$

3. A 15.0 kg load of bricks hangs from one end of a rope that passes over a small, frictionless pulley. A 28.0 kg counterweight is suspended from the other end of the rope, as shown in the figure below. The system is released from rest.

a. Draw a free body diagram for the masses 15.0 kg and 28.0 kg in the table below.

Mass 15.0 kg	Mass 28.0 kg
	

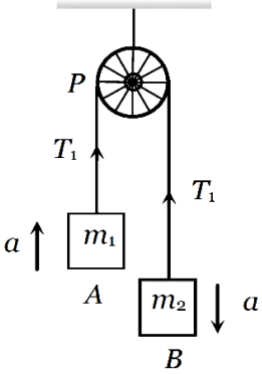


b. Use Newton's law to write an equation for the 15.0 kg mass.
$T - m_1 g = m_1 a$
$T = 15.0g + 15.0a$

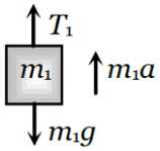
c. Use Newton's law to write an equation for the 28.0 kg mass.
$m_2 g - T = m_2 a$
$T = 28.0g - 28.0a$

d. Combine the equations from part (b) and (c) to find the acceleration of the two masses.
Combining equations from (b) and (c):
$15.0g + 15.0a = 28.0g - 28.0a$
$a(15.0 + 28.0) = 10(28.0 - 15.0)$
$a = \frac{10(13)}{(43)} = \frac{130}{43}$

4. Two masses $m_1 = 3.0\ kg$ and $m_2 = 6.0\ kg$ are connected together by a massless string which is strung over a massless, frictionless pulley. The masses are released from rest and accelerate as shown below.

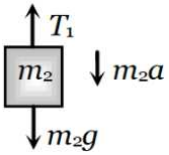


a. Use the free body diagram for the mass m_1 below to write an equation for the tension T_1 in terms of a. (Substitute all known values)



$m_1 a = T_1 - m_1 g$
$3a = T_1 - (3 \times 10)$
$T_1 = 3a + 30$

b. Use the free body diagram for the mass m_2 below to write an equation for the tension T_1 in terms of a. (Substitute all known values)



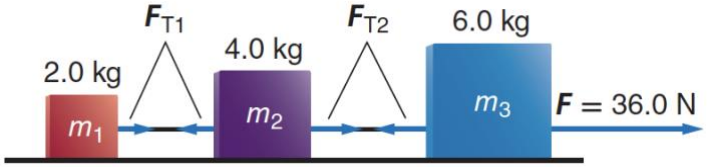
$m_2 a = m_2 g - T_1$
$6a = (6 \times 10) - T_1$
$T_1 = 60 - 6a$

c. Use the equations in parts a and b to find:
   i. The acceleration of the masses.
   $3a + 30 = 60 - 6a$
   $9a = 30$
   $a = \frac{30}{9} = \frac{10}{3} m/s^2$

ii. The tension in the string.

$$T_1 = 3a + 30 = 3\left(\frac{10}{3}\right) + 30 = 40\ N$$

5. Three blocks that are connected by massless strings are pulled along a frictionless surface by a horizontal force, as shown in the figure below.



a. What is the acceleration of each block?

$$a = \frac{F_{net}}{M} = \frac{36.0\ N}{(6.0 + 4.0 + 2.0)kg} = 3\ m/s^2$$

b. What are the tension forces in each of the strings?

$$F_{T1} = m_1 a = (2.0\ kg)(3\ m/s^2) = 6.0\ N$$
$$F_{T2} = (m_1 + m_2)a = (2.0\ kg + 4.0\ kg)(3\ m/s^2) = 18.0\ N$$

6. The figure below shows a block in four different situations. Rank them according to the magnitude of the normal force between the block and the surface, greatest to least.

From left to right: second > fourth > third > first