Bàn giáo viên	Bảng

V: Vắng học; PB: Phát biểu, xây dựng bản; CBT: Chữa bài tập; TL: Thảo luận

CỬA VÀO ⇐===

PHẠM THỊ THỦY NGA V: PB: CBT: TL	HOÀNG THỊ NGÂN V: PB: CBT: TL	NGUYỄN MINH NGHĨA V: PB: CBT: TL	NGUYỄN THỊ NGHĨA V: PB: CBT: TL	Hành lang đi lại	NGUYỄN VĂN TOẠI V: PB: CBT: TL	NGUYỄN NGỌC TOẢN V: PB: CBT: TL	NGÔ THỊ TRANG V: PB: CBT: TL	NGUYỄN THỊ TRANG (A) V: PB: CBT: TL
BÙI THỊ NGUYỆT V: PB: CBT: TL	NGUYỄN THỊ NGUYỆT V: PB: CBT: TL	VI THỊ NHÀN V: PB: CBT: TL	TRẦN MINH NHẬT V: PB: CBT: TL		NGUYỄN THỊ TRANG (B) V: PB: CBT: TL	NGUYỄN THỊ TRANG (C) V: PB: CBT: TL	NGUYỄN THỊ HUYỀN TRANG V: PB: CBT: TL	NGUYỄN THỊ LINH TRANG V: PB: CBT: TL
NGUYỄN THỊ NHỤY V: PB: CBT: TL	NGUYỄN ĐỨC PHƯƠNG V: PB: CBT: TL	CAO DIỆP QUỲNH V: PB: CBT: TL	HOÀNG ANH QUỲNH V: PB: CBT: TL		NGỤY THỊ HỒNG TRANG V: PB: CBT: TL	PHAN THỊ KIỀU TRANG V: PB: CBT: TL	NGUYỄN QUANG TRƯỜNG V: PB: CBT: TL	TRẦN DƯƠNG ANH TUẤN V: PB: CBT: TL
NGUYỄN THỊ THẢO V: PB: CBT: TL	HỒ THỊ THẢO V: PB: CBT: TL	NGUYỄN MINH THẮNG V: PB: CBT: TL	PHAN THỊ HÀ QUỲNH V: PB: CBT: TL		CAO THỊ VINH V: PB: CBT: TL	NGUYỄN QUANG VŨ V: PB: CBT: TL	ĐẬU THỊ XOAN V: PB: CBT: TL	
VÕ THỊ PHƯƠNG THẢO V: PB: CBT: TL	NGUYỄN THỊ ANH THƠ V: PB: CBT: TL	TẦN THỊ PHƯƠNG THỦY V: PB: CBT: TL	NGÔ THỊ THỦY V: PB: CBT: TL		NGUYỄN THỊ XOAN V: PB: CBT: TL	NGUYỄN HẢI YẾN V: PB: CBT: TL	PHẠM THỊ YẾN V: PB: CBT: TL	

Bàn giáo viên	Bảng

V: Vắng học; PB: Phát biểu, xây dựng bản; CBT: Chữa bài tập; TL: Thảo luận

CỬA VÀO ⇐===

NGUYỄN THỊ THU HUYỀN V: PB: CBT: TL	ĐẶNG THỊ HUYỀN V: PB: CBT: TL	ĐẶNG QUỐC HUY V: PB: CBT: TL	CAO TIẾN HUY V: PB: CBT: TL	Nhóm 7	Nhóm 1	LÊ THỊ QUỲNH ANH V: PB: CBT: TL	HOÀNG BẢO ANH V: PB: CBT: TL	HỒ THỊ TÚ ANH V: PB: CBT: TL	HỒ THỊ NGỌC ANH V: PB: CBT: TL
PHAN THỊ NGỌC HUYỀN V: PB: CBT: TL	TRẦN THỊ KHÁNH HUYỀN V: PB: CBT: TL	NGUYỄN THỊ HƯỜNG V: PB: CBT: TL	CAO THỊ HƯƠNG V: PB: CBT: TL	8	2	NGUYỄN CÔNG ANH V: PB: CBT: TL	NGUYỄN THỊ NGỌC ANH V: PB: CBT: TL	TRẦN THỊ NGỌC ÁNH V: PB: CBT: TL	NGÔ AN BÌNH V: PB: CBT: TL
ĐẶNG THUỲ LINH V: PB: CBT: TL	NGÔ ĐỨC LÂM V: PB: CBT: TL	PHẠM THỊ THANH LAM V: PB: CBT: TL	NGUYỄN THỊ LAN HƯƠNG V: PB: CBT: TL	9	3	HOÀNG VĂN DŨNG V: PB: CBT: TL	NGUYỄN THỊ HUYỀN DIỆU V: PB: CBT: TL	ĐẶNG QUỐC CƯỜNG V: PB: CBT: TL	ĐẶNG THỊ LINH CHI V: PB: CBT: TL
NGUYỄN THỊ LINH V: PB: CBT: TL	NGUYỄN THỊ MỸ LINH V: PB: CBT: TL	TRẦN THANH LONG V: PB: CBT: TL	HỒ THỊ NHẬT MAI V: PB: CBT: TL	10	4	Nguyễn Trung Đức V: PB: CBT: TL	HOÀNG GIA V: PB: CBT: TL	TRẦN THỊ GIANG V: PB: CBT: TL	TRẦN THỊ HƯƠNG GIANG V: PB: CBT: TL
ĐẶNG THỊ NGA V: PB: CBT: TL	KIM THỊ NANG V: PB: CBT: TL	LÊ DUY MẠNH V: PB: CBT: TL	TRẦN THỊ MẾN V: PB: CBT: TL	11	5	VŨ THỊ GIANG V: PB: CBT: TL	NGUYỄN PHI HỔ V: PB: CBT: TL	PHAN THỊ QUỲNH HÀ V: PB: CBT: TL	VÕ THỊ HẢI V: PB: CBT: TL
HỒ THỊ NGA V: PB: CBT: TL				12	6	NGUYỄN THỊ HẬU V: PB: CBT: TL	TRẦN THỊ HẠNH V: PB: CBT: TL	HOÀNG THỊ HẰNG V: PB: CBT: TL	THÁI KHẮC HIẾU V: PB: CBT: TL

6. KẾ HOẠCH DẠY HỌC:

Tuần	Nội dung	CĐR	Hoạt động dạy, học	
			Hoạt động của GV	**Hoạt động của SV** *(H/đ ở lớp và chuẩn bị ở nhà)*
4	Chapter 4. NEWTON'S LAWS OF MOTION 4.1 Force and Interactions	G3.1	Thuyết trình, hướng dẫn Example 4.1	Nghe giảng, làm bài tập Example 4.1
	4.2 Newton's First Law	G3.1	Thuyết trình, hướng dẫn Example 4.3	Nghe giảng, làm bài tập Example 4.3
	4.3 Newton's Second Law	G3.2, G3.3	Thuyết trình, hướng dẫn Example 4.4, 4.5	Nghe giảng, làm bài tập Example 4.4, 4.5
	4.4 Mass and Weight	G3.3	Thuyết trình, hướng dẫn	Nghe giảng, làm bài tập Example 4.7

7. ĐÁNH GIÁ HỌC TẬP:

Hệ thống câu hỏi, bài tập theo từng tín chỉ

Tín chỉ	CĐR học phần		Hệ thống câu hỏi, bài tập
2	G3.1	Khái niệm lực trong vật lý	Q4.1
	G3.2	Ý nghĩa của hợp lực tác dụng lên vật	E: 4.1, 4.4, 4.6; P: 4.35
	G3.3	Mối quan hệ giữa hợp lực với khối lượng và gia tốc của vật	Q: 4.12, 4.13, 4.16; E: 4.13, 4.14 P: 4.33, 4.40
	G3.4	Mối quan hệ giữa các lực do hai vật tương tác với nhau	E: 4.21, 4.22, 4.24, 4.25 P: 4.54, 4.57

4 NEWTON'S LAWS OF MOTION

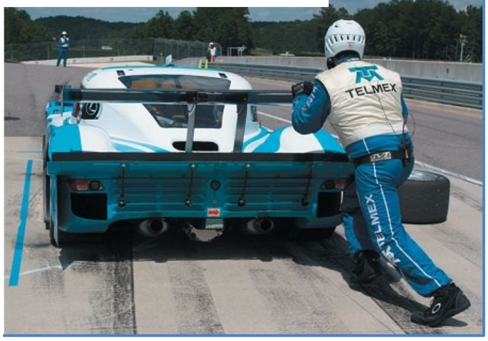
Concept of force (n): khái niệm lực
The significance (n): ý nghĩa
an object (n): một vật
Relationship (n): quan hệ
Dynamics (n): động lực học
Newton's laws of motion: các định luật Nưu tơn
contact force (n): lực tiếp xúc
long-range force (n): lực tương tác tầm xa
Net forces (n): hợp lực
Tension force (n): lực căng sợp dây
Friction force (n): lực ma sát
Pressure force (n): áp lực
Normal force (n): lực theo phương vuông góc (phản lực)
Weight (n): trọng lực

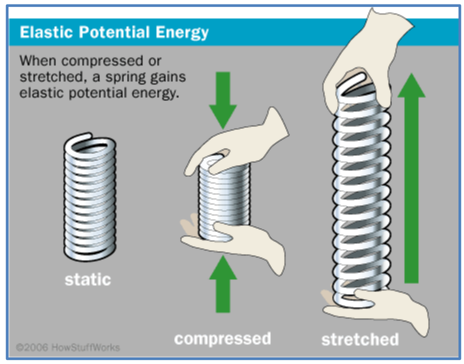
LEARNING GOALS

By studying this chapter, you will learn:

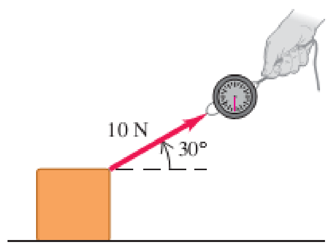
- What the concept of force means in physics, and why forces are vectors.
- The significance of the net force on an object, and what happens when the net force is zero.
- The relationship among the net force on an object, the object's mass, and its acceleration.
- How the forces that two bodies exert on each other are related.

4.1 Force and Interactions

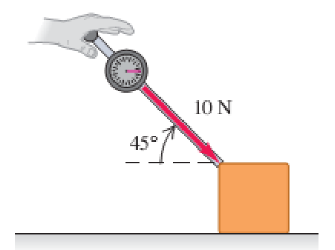




(a) A 10-N pull directed 30° above the horizontal

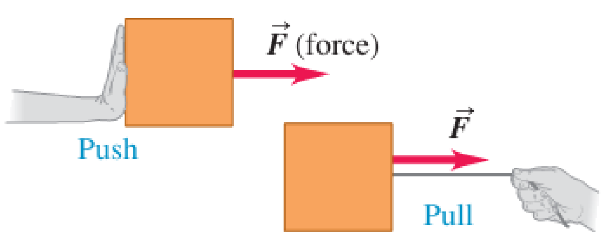


(b) A 10-N push directed 45° below the horizontal

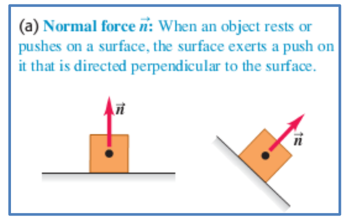


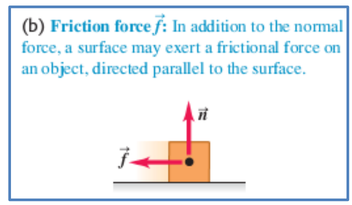
4.1 Some properties of forces.

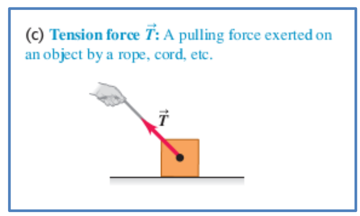
- A force is a push or a pull.
- A force is an interaction between two objects or between an object and its environment.
- A force is a vector quantity, with magnitude and direction.



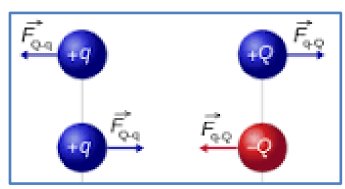
contact force

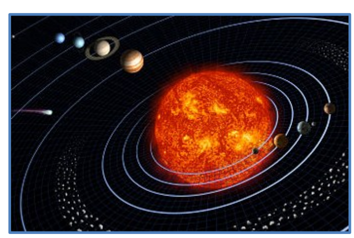






long-range forces





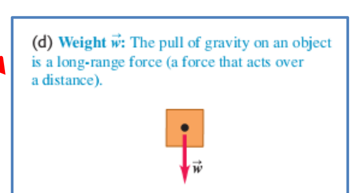
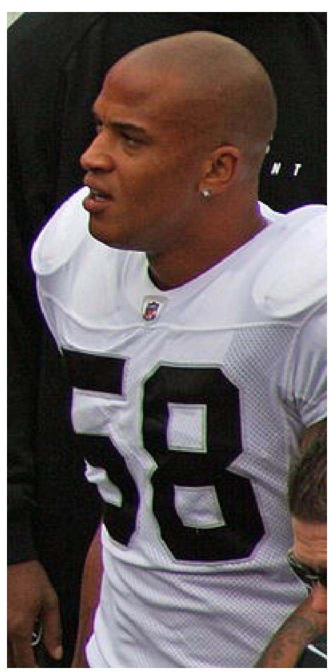


Table 4.1 Typical Force Magnitudes

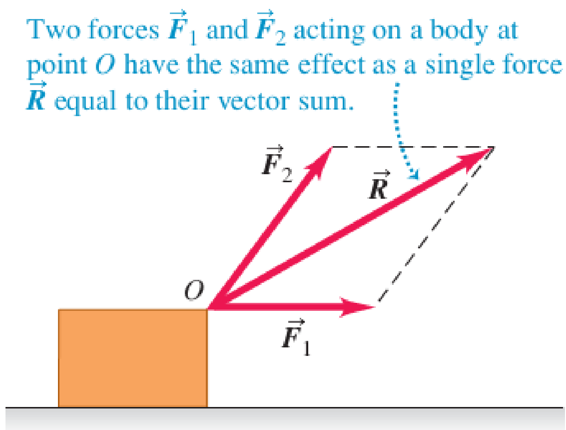
Sun's gravitational force on the earth	3.5×10^{22} N
Thrust of a space shuttle during launch	3.1×10^{7} N
Weight of a large blue whale	1.9×10^{6} N
Maximum pulling force of a locomotive	8.9×10^{5} N
Weight of a 250-lb linebacker	1.1×10^{3} N
Weight of a medium apple	1 N
Weight of smallest insect eggs	2×10^{-6} N
Electric attraction between the proton and the electron in a hydrogen atom	8.2×10^{-8} N
Weight of a very small bacterium	1×10^{-18} N
Weight of a hydrogen atom	1.6×10^{-26} N
Weight of an electron	8.9×10^{-30} N
Gravitational attraction between the proton and the electron in a hydrogen atom	3.6×10^{-47} N

Bruce Davis (Linebacker)



Superposition of Forces

4.4 Superposition of forces.

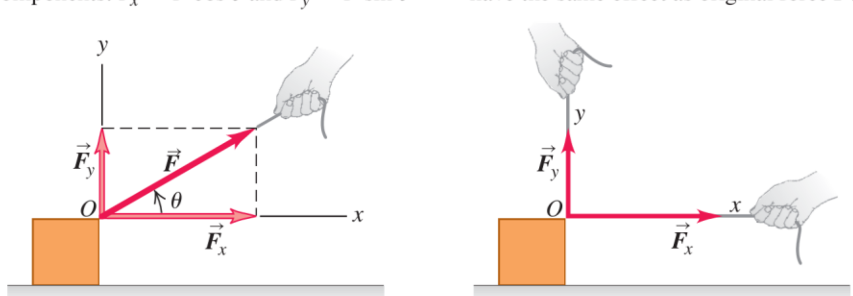


More generally, any number of forces applied at a point on a body have the same effect as a single force equal to the vector sum of the forces. This important principle is called superposition of forces.

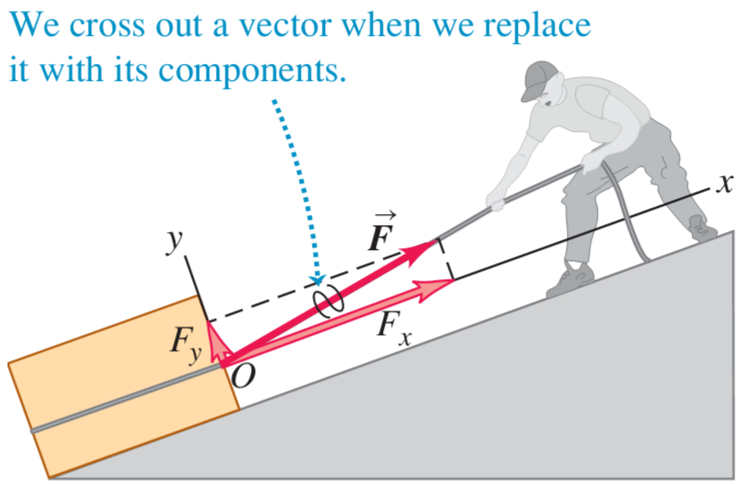
4.5 The force $\vec{F}$, which acts at an angle θ from the x-axis, may be replaced by its rectangular component vectors $\vec{F}_x$ and $\vec{F}_y$.

(a) Component vectors: $\vec{F}_x$ and $\vec{F}_y$
Components: $F_x = F\cos\theta$ and $F_y = F\sin\theta$

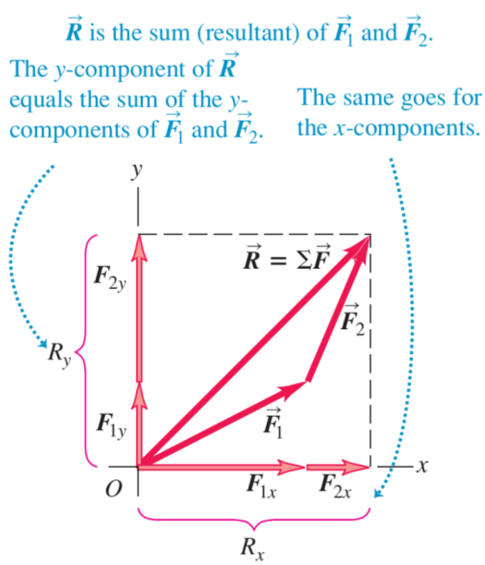
(b) Component vectors $\vec{F}_x$ and $\vec{F}_y$ together have the same effect as original force $\vec{F}$.



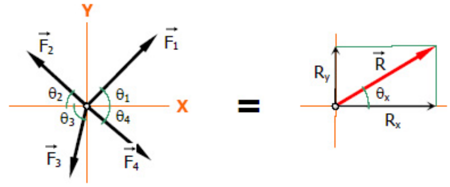
4.6 F_x and F_y are the components of $\vec{F}$ parallel and perpendicular to the sloping surface of the inclined plane.



4.7 Finding the components of the vector sum (resultant) $\vec{R}$ of two forces $\vec{F}_1$ and $\vec{F}_2$.



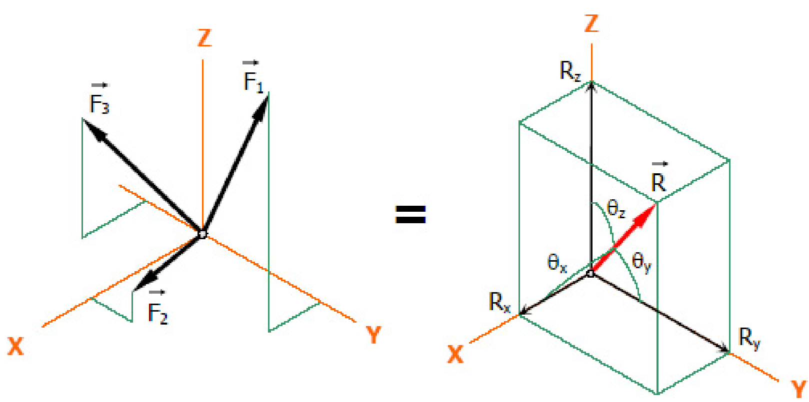
$$\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \cdots = \sum \vec{F} \qquad (4.1)$$



$$R_x = \sum F_x \qquad R_y = \sum F_y \qquad (4.2)$$

$$R = \sqrt{R_x^{\,2} + R_y^{\,2}}$$

$$\tan \theta_x = \frac{R_y}{R_x}$$



In three-dimensional problems, forces may also have z-components; then we add the equation $R_z = \sum F_z$ to Eq. (4.2). The magnitude of the net force is then

$$R = \sqrt{R_x^2 + R_y^2 + R_z^2}$$

$$\cos \theta_x = \frac{R_x}{R}$$

$$\cos \theta_y = \frac{R_y}{R}$$

$$\cos \theta_z = \frac{R_z}{R}$$

đô vật chuyên nghiệp

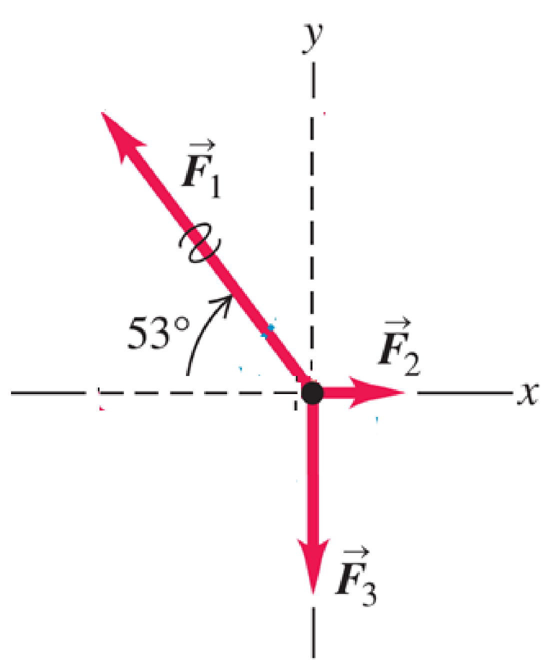
đang thi đấu

l ực ngang

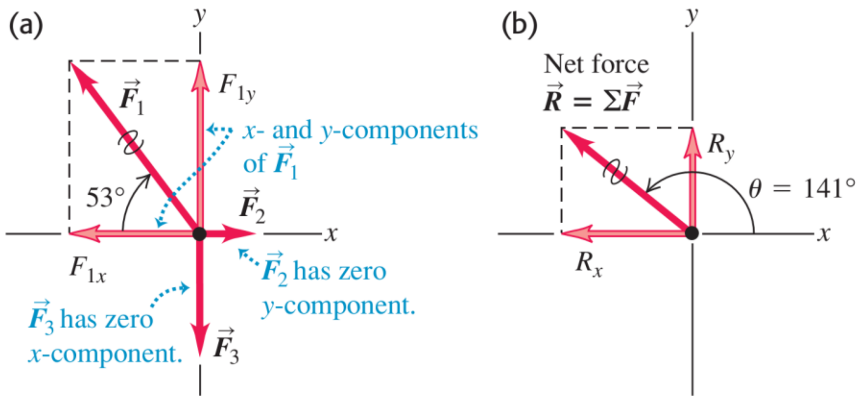
Example 4.1 Superposition of forces

Three professional wrestlers are fighting over a champion's belt. Figure 4.8a shows the horizontal force each wrestler applies to the belt, as viewed from above. The forces have magnitudes $F_1 = 250$ N, $F_2 = 50$ N, and $F_3 = 120$ N. Find the x- and y-components of the net force on the belt, and find its magnitude and direction.

Đai (thắt lưng)



4.8 (a) Three forces acting on a belt. (b) The net force $\vec{R} = \sum\vec{F}$ and its components.



The net force has a negative x-component and a positive y-component, as shown in Fig. 4.8b.

The magnitude of $\vec{R}$ is

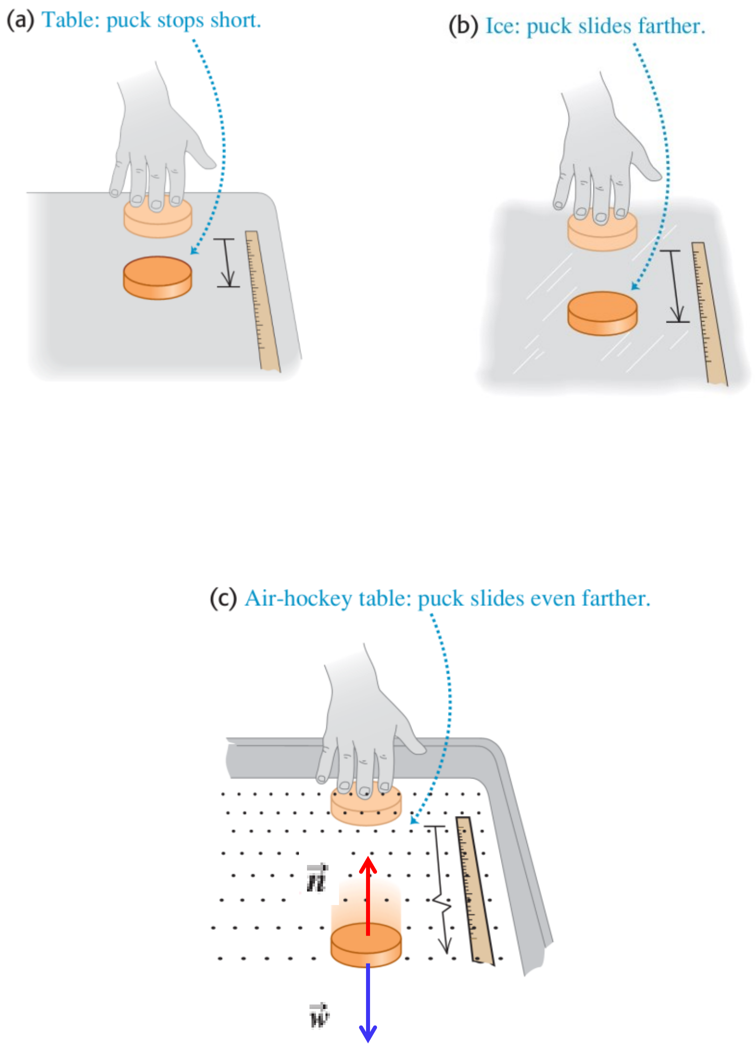
$$R = \sqrt{R_x^2 + R_y^2} = \sqrt{(-100\ \text{N})^2 + (80\ \text{N})^2} = 128\ \text{N}$$

To find the angle between the net force and the $+x$-axis, we use Eq. (1.8):

$$\theta = \arctan\frac{R_y}{R_x} = \arctan\left(\frac{80\ \text{N}}{-100\ \text{N}}\right) = \arctan(-0.80)$$

4.2 Newton's First Law

4.9 The slicker the surface, the farther a puck slides after being given an initial velocity. On an air-hockey table (c) the friction force is practically zero, so the puck continues with almost constant velocity.



Newton's first law of motion: **A body acted on by no net force moves with constant velocity (which may be zero) and zero acceleration.**

Chú ý: Thỏa luận nhóm về hệ quy chiếu quán tính

Inertial Frames of Reference

Pages: 110-111

Gợi ý

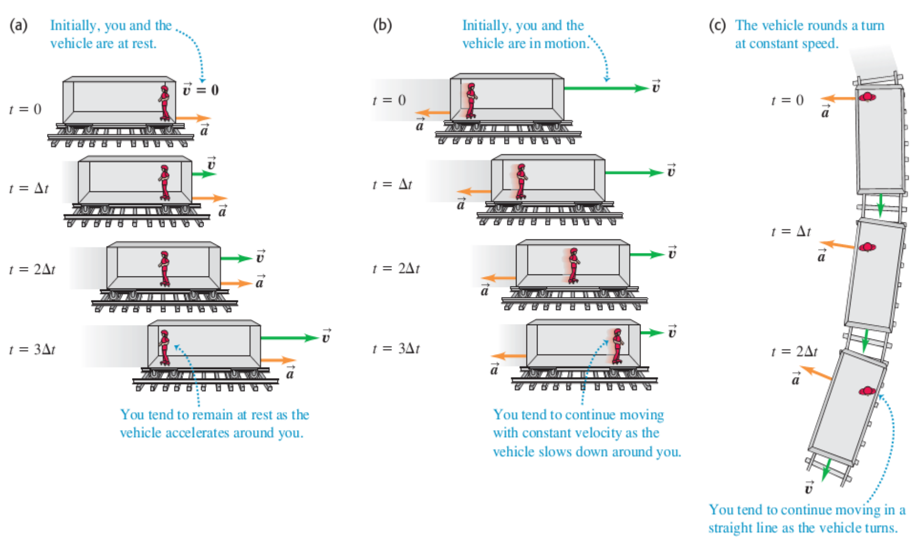
Hệ quy chiếu là gì?

Hệ quy chiếu gồm những những yếu tố nào?

Thế nào là hệ quy chiếu quán tính?

Thế nào là hệ quy chiếu không quán tính?

Những lưu ý gì khi chọn hệ quy chiều?



Application **Sledding with Newton's First Law**

The downward force of gravity acting on the child and sled is balanced by an upward normal force exerted by the ground. The adult's foot exerts a forward force that balances the backward force of friction on the sled. Hence there is no net force on the child and sled, and they slide with a constant velocity.

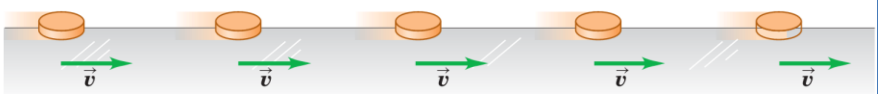
Conceptual Example 4.2 Zero net force means constant velocity

In the classic 1950 science fiction film *Rocketship X-M*, a spaceship is moving in the vacuum of outer space, far from any star or planet, when its engine dies. As a result, the spaceship slows down and stops. What does Newton's first law say about this scene?

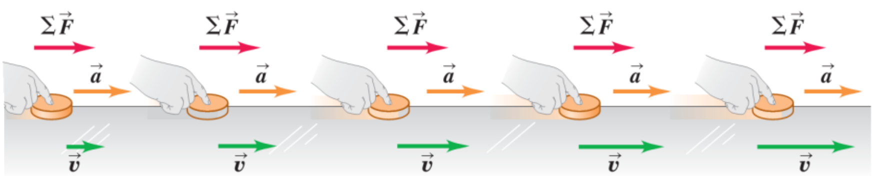
4.3 Newton's Second Law

4.13 Exploring the relationship between the acceleration of a body and the net force acting on the body (in this case, a hockey puck on a frictionless surface).

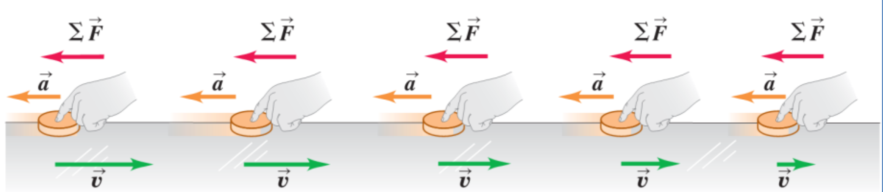
(a) A puck moving with constant velocity (in equilibrium): $\Sigma\vec{F} = 0$, $\vec{a} = 0$



(b) A constant net force in the direction of motion causes a constant acceleration in the same direction as the net force.

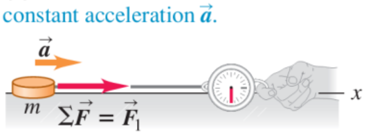


(c) A constant net force opposite the direction of motion causes a constant acceleration in the same direction as the net force.

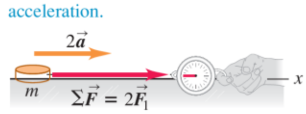


4.15 For a body of a given mass m, the magnitude of the body's acceleration is directly proportional to the magnitude of the net force acting on the body.

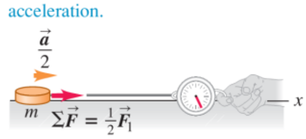
(a) A constant net force $\Sigma\vec{F}$ causes a constant acceleration $\vec{a}$.



(b) Doubling the net force doubles the acceleration.

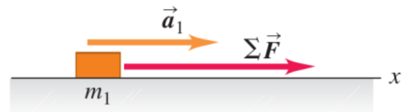


(c) Halving the force halves the acceleration.

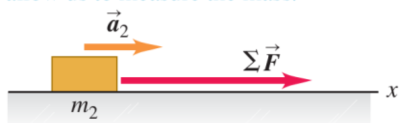


4.16 For a given net force $\sum \vec{F}$ acting on a body, the acceleration is inversely proportional to the mass of the body. Masses add like ordinary scalars.

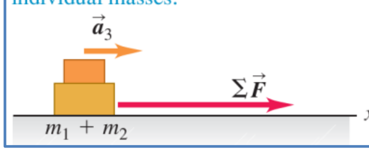
(a) A known force $\sum \vec{F}$ causes an object with mass m_1 to have an acceleration $\vec{a}_1$.



(b) Applying the same force $\sum \vec{F}$ to a second object and noting the acceleration allow us to measure the mass.



(c) When the two objects are fastened together, the same method shows that their composite mass is the sum of their individual masses.



$$\sum \vec{F} = m\vec{a} \qquad \text{(Newton's second law of motion)} \qquad (4.7)$$

$$\vec{a} = \frac{\sum \vec{F}}{m}$$

Newton's second law of motion: If a net external force acts on a body, the body accelerates. The direction of acceleration is the same as the direction of the net force. The mass of the body times the acceleration of the body equals the net force vector.

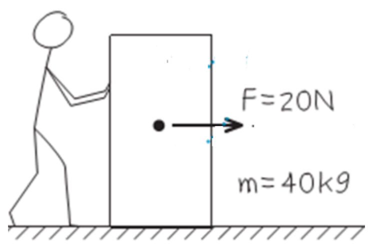
$$\sum F_x = ma_x \qquad \sum F_y = ma_y \qquad \sum F_z = ma_z \qquad \text{(Newton's second law of motion)} \qquad (4.8)$$

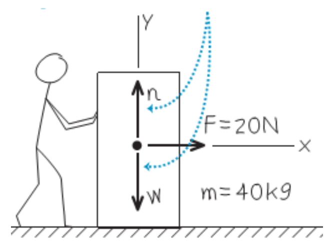
Example 4.4 Determining acceleration from force

A worker applies a constant horizontal force with magnitude 20 N to a box with mass 40 kg resting on a level floor with negligible friction. What is the acceleration of the box?

đang đứng yên trên sàn

bỏ qua ma sát



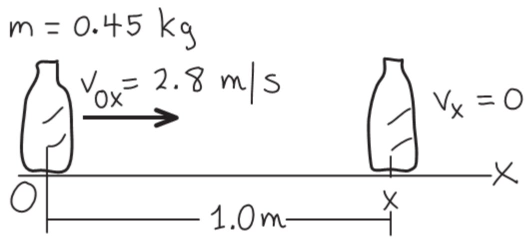


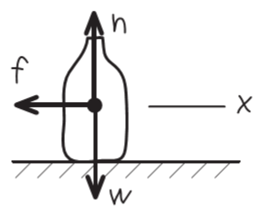
Ng ười phục vụ

đẩy

Example 4.5 Determining force from acceleration

A waitress shoves a ketchup bottle with mass 0.45 kg to her right along a smooth, level lunch counter. The bottle leaves her hand moving at 2.8 m/s, then slows down as it slides because of a constant horizontal friction force exerted on it by the countertop. It slides for 1.0 m before coming to rest. What are the magnitude and direction of the friction force acting on the bottle?





Chú ý: Thỏa luận nhóm về hệ quy chiếu quán tính

4.4 Mass and Weight

Pages: 117-118

Gợi ý

Khối lượng là gì?

Những đặc trưng cơ bản của khối lượng?

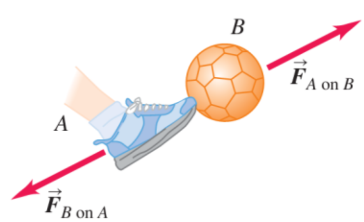
Khối lượng quán tính và khối lượng hấp dẫn có trùng nhau không?

Phân biệt giữa khối lượng và trọng lượng?

Momentum (n): động lượng, xung lượng
Uniform motion (n): chuyển động không đổi
Stationary: đứng yên
Net forces (n): hợp lực
interaction forces (n): các lực tương tác
Accelerative force (n): lực tăng tốc
Decelerative force (n): lực giảm tốc
Elastic force (n): lược đàn hồi
Gravity force (n): lực hâp dẫn, trong lực
Resistance force(n): lực cản
Repulsive force (n): lực đẩy
Pressure force (n): áp lực

4.5 Newton's Third Law

4.25 If body A exerts a force $\vec{F}_{A \text{ on } B}$ on body B, then body B exerts a force $\vec{F}_{B \text{ on } A}$ on body A that is equal in magnitude and opposite in direction: $\vec{F}_{A \text{ on } B} = -\vec{F}_{B \text{ on } A}$.

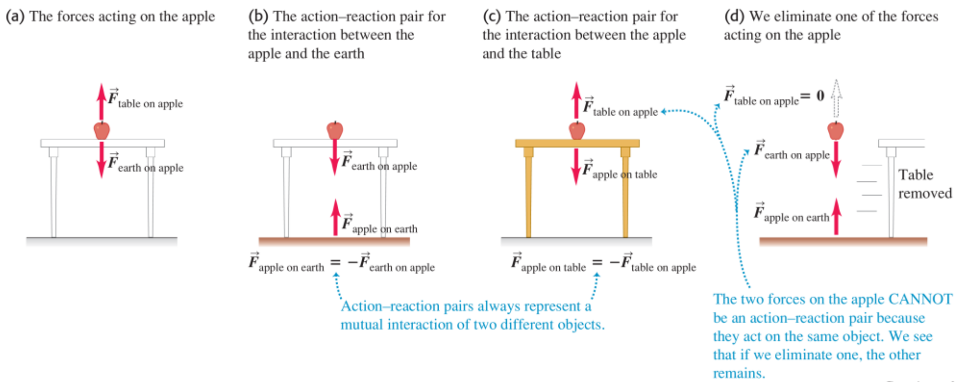


Newton's third law of motion: If body A exerts a force on body B (an "action"), then body B exerts a force on body A (a "reaction"). These two forces have the same magnitude but are opposite in direction. These two forces act on *different* bodies.

Conceptual Example 4.9 Applying Newton's third law: Objects at rest

An apple sits at rest on a table, in equilibrium. What forces act on the apple? What is the reaction force to each of the forces acting on the apple? What are the action–reaction pairs?

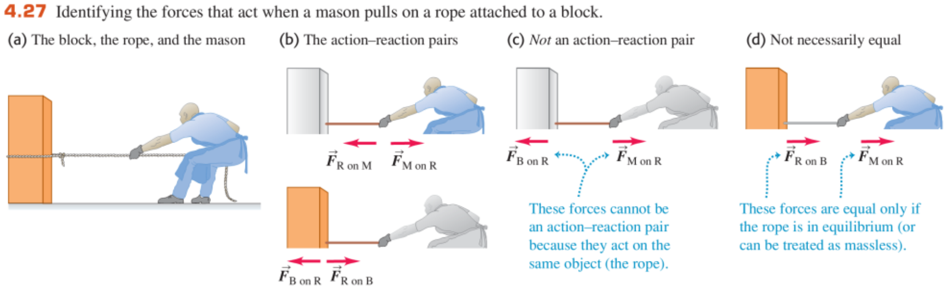
4.26 The two forces in an action–reaction pair always act on different bodies.



Conceptual Example 4.10 Applying Newton's third law: Objects in motion

A stonemason drags a marble block across a floor by pulling on a rope attached to the block (Fig. 4.27a). The block is not necessarily in equilibrium. How are the various forces related? What are the action–reaction pairs?

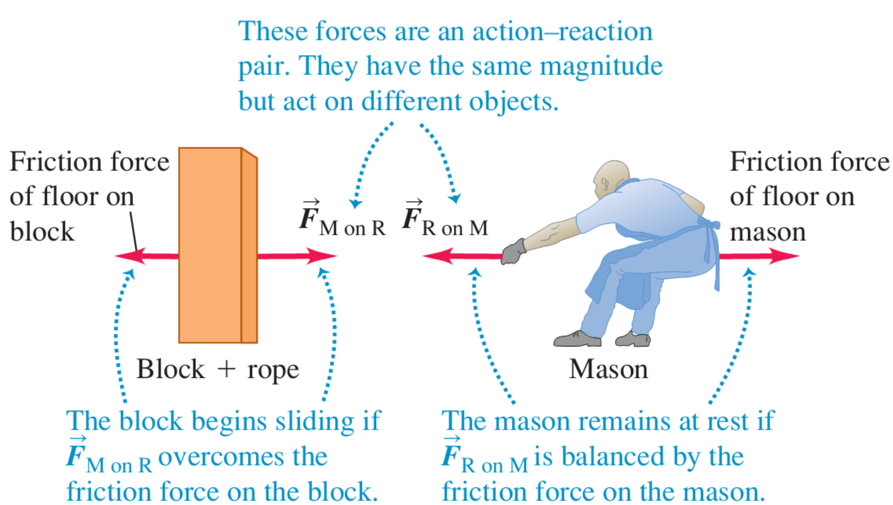
4.27 Identifying the forces that act when a mason pulls on a rope attached to a block.



Conceptual Example 4.11 A Newton's third law paradox?

We saw in Conceptual Example 4.10 that the stonemason pulls as hard on the rope–block combination as that combination pulls back on him. Why, then, does the block move while the stonemason remains stationary?

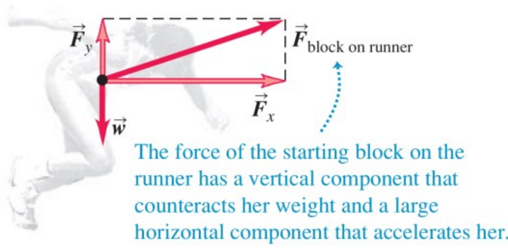
4.28 The horizontal forces acting on the block–rope combination (left) and the mason (right). (The vertical forces are not shown.)

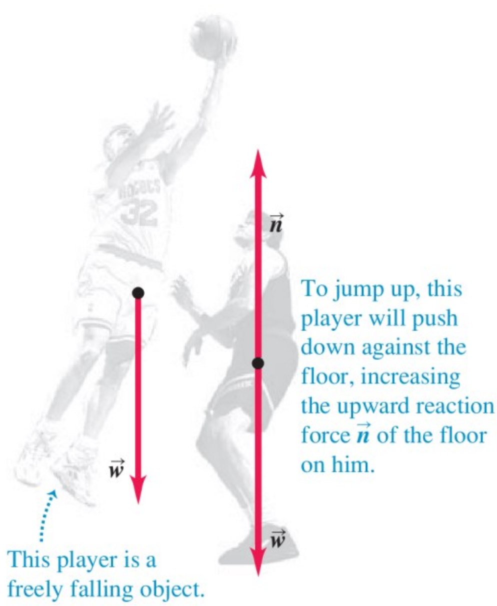


4.6 Free-Body Diagrams

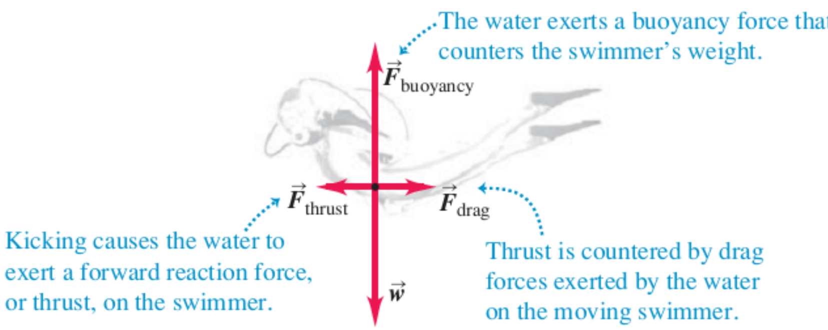
(a)

(b)





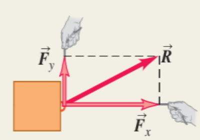
(c)



CHAPTER 4 SUMMARY

Force as a vector: Force is a quantitative measure of the interaction between two bodies. It is a vector quantity. When several forces act on a body, the effect on its motion is the same as when a single force, equal to the vector sum (resultant) of the forces, acts on the body. (See Example 4.1.)

$$\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \cdots = \sum \vec{F} \quad (4.1)$$



CHAPTER 4 SUMMARY

The net force on a body and Newton's first law: Newton's first law states that when the vector sum of all forces acting on a body (the *net force*) is zero, the body is in equilibrium and has zero acceleration. If the body is initially at rest, it remains at rest; if it is initially in motion, it continues to move with constant velocity. This law is valid only in inertial frames of reference. (See Examples 4.2 and 4.3.)

$$\sum \vec{F} = 0$$

CHAPTER 4 SUMMARY

Mass, acceleration, and Newton's second law: The inertial properties of a body are characterized by its *mass*. The acceleration of a body under the action of a given set of forces is directly proportional to the vector sum of the forces (the *net force*) and inversely proportional to the mass of the body. This relationship is Newton's second law. Like Newton's first law, this law is valid only in inertial frames of reference. The unit of force is defined in terms of the units of mass and acceleration. In SI units, the unit of force is the newton (N), equal to 1 $kg \cdot m/s^2$. (See Examples 4.4 and 4.5.)

$$\sum \vec{F} = m\vec{a}$$

$$\sum F_x = ma_x$$

$$\sum F_y = ma_y$$

$$\sum F_z = ma_z$$

CHAPTER 4 SUMMARY

Newton's third law and action–reaction pairs: Newton's third law states that when two bodies interact, they exert forces on each other that at each instant are equal in magnitude and opposite in direction. These forces are called action and reaction forces. Each of these two forces acts on only one of the two bodies; they never act on the same body. (See Examples 4.8–4.11.)

$$\vec{F}_{A \text{ on } B} = -\vec{F}_{B \text{ on } A}$$