

Part A

Answer all questions in this part.

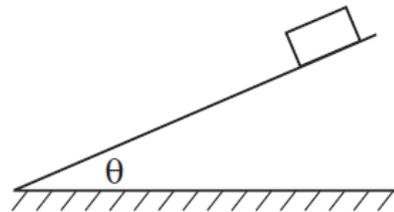
Directions (1-25): For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2006 Edition Reference Tables for Physical Setting/Physics*. Record your answers on your separate answer sheet.

- A car travels 90. meters due north in 15 seconds. Then the car turns around and travels 40. meters due south in 5.0 seconds. What is the magnitude of the average velocity of the car during this 20.-second interval?
 - 2.5 m/s
 - 5.0 m/s
 - 6.5 m/s
 - 7.0 m/s
- How far will a brick starting from rest fall freely in 3.0 seconds?
 - 15 m
 - 29 m
 - 44 m
 - 88 m
- A 1,200-kilogram car traveling at 10. meters per second hits a tree and is brought to rest in 0.10 second. What is the magnitude of the average force acting on the car to bring it to rest?
 - 1.2×10^2 N
 - 1.2×10^3 N
 - 1.2×10^4 N
 - 1.2×10^5 N
- A ball is thrown at an angle of 38° to the horizontal. What happens to the magnitude of the ball's vertical acceleration during the total time interval that the ball is in the air?
 - It decreases, then increases.
 - It decreases, then remains the same.
 - It increases, then decreases.
 - It remains the same.
- A basketball player jumped straight up to grab a rebound. If she was in the air for 0.80 second, how high did she jump?
 - 0.50 m
 - 0.78 m
 - 1.2 m
 - 3.1 m

- A man standing on a scale in an elevator notices that the scale reads 30 newtons greater than his normal weight. Which type of movement of the elevator could cause this greater-than-normal reading?
 - accelerating upward
 - accelerating downward
 - moving upward at a constant speed
 - moving downward at a constant speed
- A spring scale reads 20. newtons as it pulls a 5.0-kilogram mass across a table. What is the magnitude of the force exerted by the mass on the spring scale?
 - 49 N
 20. N
 - 5.0 N
 - 4.0 N

Note that question 8 has only three choices.

- The diagram below shows a block sliding down a plane inclined at angle θ with the horizontal.



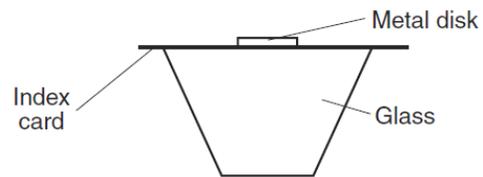
As angle θ is increased, the coefficient of kinetic friction between the bottom surface of the block and the surface of the incline will

- decrease
- increase
- remain the same

- 9 A 60-kilogram skydiver is falling at a constant speed near the surface of Earth. The magnitude of the force of air friction acting on the skydiver is approximately
- (1) 0 N (3) 60 N
(2) 6 N (4) 600 N
- 10 When a 12-newton horizontal force is applied to a box on a horizontal tabletop, the box remains at rest. The force of static friction acting on the box is
- (1) 0 N
(2) between 0 N and 12 N
(3) 12 N
(4) greater than 12 N
- 11 A box is pushed toward the right across a classroom floor. The force of friction on the box is directed toward the
- (1) left (3) ceiling
(2) right (4) floor
- 12 The force required to start an object sliding across a uniform horizontal surface is larger than the force required to keep the object sliding at a constant velocity. The magnitudes of the required forces are different in these situations because the force of kinetic friction
- (1) is greater than the force of static friction
(2) is less than the force of static friction
(3) increases as the speed of the object relative to the surface increases
(4) decreases as the speed of the object relative to the surface increases
- 13 A 5.0-newton force could have perpendicular components of
- (1) 1.0 N and 4.0 N (3) 3.0 N and 4.0 N
(2) 2.0 N and 3.0 N (4) 5.0 N and 5.0 N
- 14 Which is a scalar quantity?
- (1) acceleration (3) speed
(2) momentum (4) displacement

- 15 A 5.0-newton force and a 7.0-newton force act concurrently on a point. As the angle between the forces is increased from 0° to 180° , the magnitude of the resultant of the two forces changes from
- (1) 0.0 N to 12.0 N (3) 12.0 N to 2.0 N
(2) 2.0 N to 12.0 N (4) 12.0 N to 0.0 N
- 16 An object is dropped from rest and falls freely 20. meters to Earth. When is the speed of the object 9.8 meters per second?
- (1) during the entire first second of its fall
(2) at the end of the first second of fall
(3) during the entire time of fall
(4) after it has fallen 9.8 meters

Base your answers to questions 17 and 18 on the diagram below, which shows a 1.0-newton metal disk resting on an index card that is balanced on top of a glass.



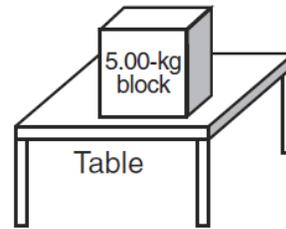
- 17 What is the net force acting on the disk?
- (1) 1.0 N (3) 0 N
(2) 2.0 N (4) 9.8 N
- 18 When the index card is quickly pulled away from the glass in a horizontal direction, the disk falls straight down into the glass. This action is a result of the disk's
- (1) inertia (3) shape
(2) charge (4) temperature
- 19 A man is pushing a baby stroller. Compared to the magnitude of the force exerted on the stroller by the man, the magnitude of the force exerted on the man by the stroller is
- (1) zero
(2) smaller, but greater than zero
(3) larger
(4) the same

- 20 A projectile is fired with an initial velocity of 120. meters per second at an angle θ above the horizontal. If the projectile's initial horizontal speed is 55 meters per second, then angle θ measures approximately
- (1) 13° (3) 63°
 (2) 27° (4) 75°

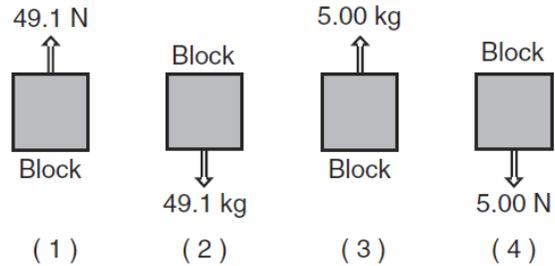
Note that question 22 has only three choices.

- 21 Compared to the force needed to start sliding a crate across a rough level floor, the force needed to keep it sliding is
- (1) less
 (2) greater
 (3) the same
- 22 A 400-newton girl standing on a dock exerts a force of 100-newtons on a 10 000-newton sailboat as she pushes it away from the dock. How much force does the sailboat exert on the girl?
- (1) 25 N (3) 400 N
 (2) 100 N (4) 10 000 N

- 23 The diagram below shows a 5.00-kilogram block at rest on a horizontal, frictionless table.

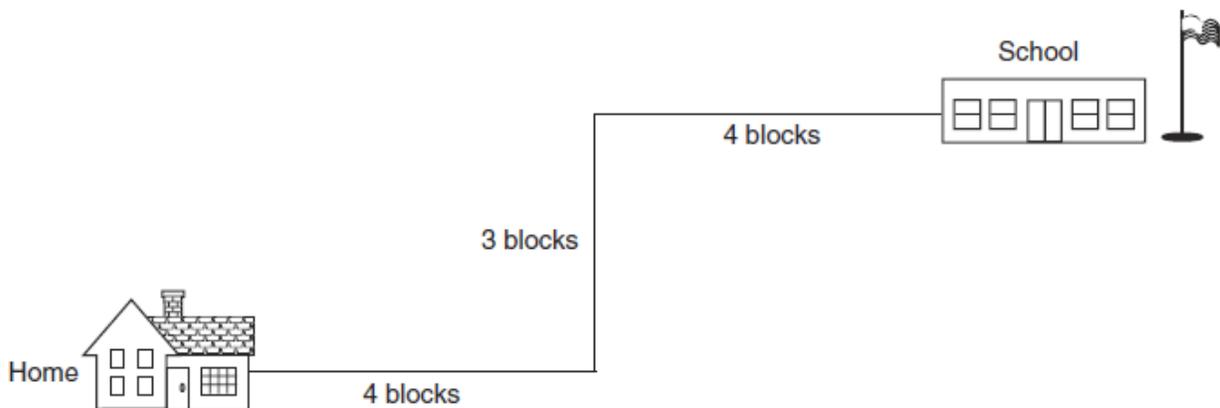


Which diagram best represents the force exerted on the block by the table?



Note that question 24 has only three choices.

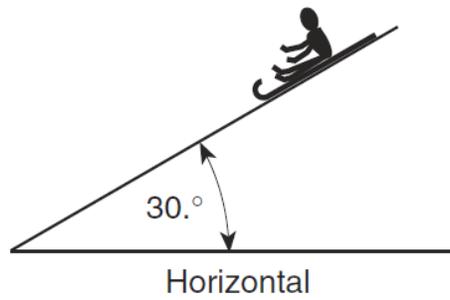
- 24 A student on her way to school walks four blocks east, three blocks north, and another 4 blocks east as shown in the diagram below



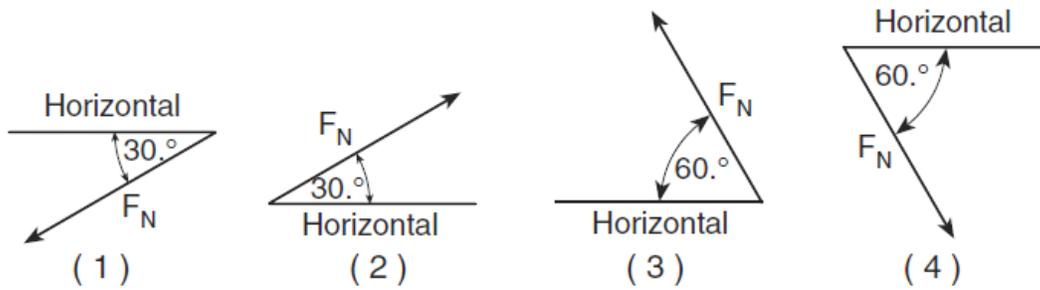
Compared to the distance she walks, the magnitude of her displacement from home to school is

- (1) less (2) greater (3) the same

- 25 The diagram below shows a sled and rider sliding down a snow-covered hill that makes an angle of 30° with the horizontal.



Which vector best represents the direction of the normal force, F_N , exerted by the hill on the sled?



Part B-1

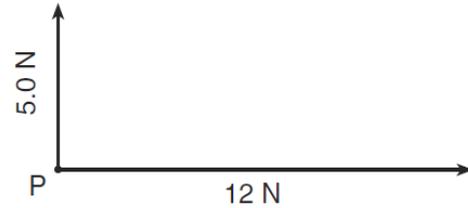
Answer all questions in this part.

Directions (26-29): For *each* statement or question, choose the number of the word or expression that, of those given, best completes the statement or answers the question.

26 An egg is dropped from a third story window. The distance the egg falls from the window to the ground is closest to

- (1) 10^0 m
- (2) 10^1 m
- (3) 10^2 m
- (4) 10^3 m

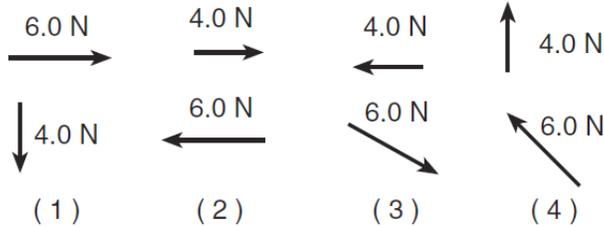
27 The diagram below represents a 5.0-newton force and a 12-newton force acting on point *P*.



The resultant of the two forces has a magnitude of

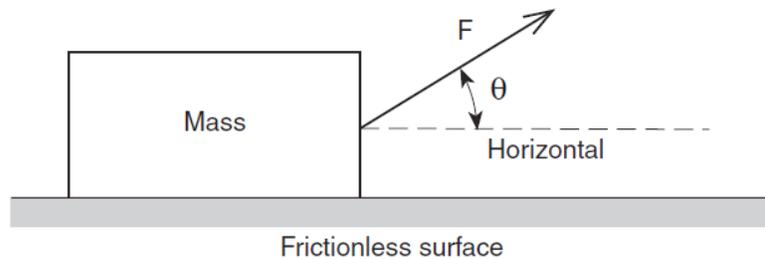
- (1) 5.0 N
- (2) 7.0 N
- (3) 12 N
- (4) 13 N

28 Which pair of forces acting concurrently on an object will produce the resultant of greatest magnitude?



Note that question 28 has only three choices.

29 The diagram below shows a force of magnitude *F* applied to a mass at angle relative to a horizontal frictionless surface.



As angle θ is increased, the horizontal acceleration of the mass

- (1) decreases
- (2) increases
- (3) remains the same

Part B–2

Answer all questions in this part.

Directions (30-32): Record your answers in the spaces provided in your answer booklet.

An outfielder throws a baseball to the first baseman at a speed of 19.6 meters per second at an angle of $30.^\circ$ above the horizontal.

- 30 If the ball is caught at the same height from which it was thrown, calculate the amount of time the ball was in the air. [Show all work, including the equation and substitution with units.] [1]

Base your answers to questions 31 and 32 on the information below.

A hiker walks 5.00 kilometers due north and then 7.00 kilometers due east..

- 31 What is the magnitude of her resultant displacement? [1]
- 32 What total distance has she traveled?

Part C

Answer all questions in this part.

Directions (33-40): Record your answers in the spaces provided in your answer booklet.

Base your answers to questions 39 through 41 on the information below.

A force of 6.0×10^{-15} newton due south and a force of 8.0×10^{-15} newton due east act concurrently on an electron, e^- .

- 33 *In your answer booklet*, determine the resultant force on the electron, *graphically*. Label the resultant vector R. [1]
- 34 Determine the magnitude of the resultant vector R. [1]
- 35 Determine the angle between the resultant and the 6.0×10^{-15} -newton vector. [1]
- _____

Base your answers to questions 36 through 40 on the information below.

A force of 10. newtons toward the right is exerted on a wooden crate initially moving to the right on a horizontal wooden floor. The crate weighs 25 newtons.

- 36 Calculate the magnitude of the force of friction between the crate and the floor. [Show all work, including the equation and substitution with units.] [1]
- 37 On the diagram *in your answer booklet*, draw and label all vertical forces acting on the crate. [1]
- 38 On the diagram *in your answer booklet*, draw and label all horizontal forces acting on the crate. [1]
- 39 What is the magnitude of the net force acting on the crate?
- 40 Is the crate accelerating? Explain your answer. [1]
- _____

PHYSICAL SETTING PHYSICS

Monday, October 22, 2018 — 8:00 a.m. to 2:47 p.m., only

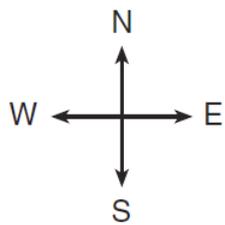
ANSWER BOOKLET

Student Sex: Male
 Female
Teacher
School Grade

Record your answers for Part B–2 and Part C in this booklet.

30
31
32

33



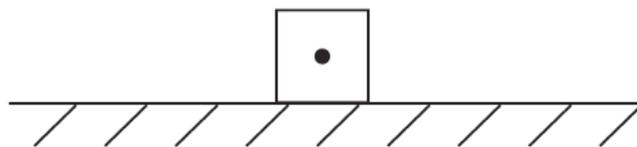
e^-
●

34 _____ N

35 _____ °

36

37-38



39 _____ N

40 _____
