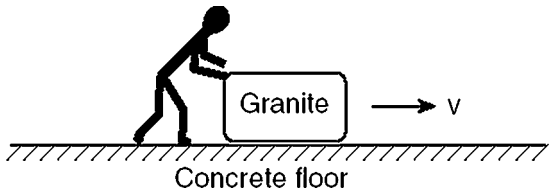
**Practice - Friction**

**Name:** _____ **Date:** _____

1. The accompanying diagram shows a granite block being slid at constant speed across a horizontal concrete floor by a force parallel to the floor.




Which pair of quantities could be used to determine the coefficient of friction for the granite on the concrete?

A. mass and speed of the block

B. mass and normal force on the block

C. frictional force and speed of the block

D. frictional force and normal force on the block

2. A 50.-newton horizontal force is needed to keep an object weighing 500. newtons moving at a constant velocity of 2.0 meters per second across a horizontal surface. The magnitude of the frictional force acting on the object is

A. 500. N B. 450. N

C. 50. N D. 0 N

3. 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

A. 0 N B. 6 N C. 60 N D. 600 N

4. An 8.0-newton wooden block slides across a horizontal wooden floor at constant velocity. What is the magnitude of the force of kinetic friction between the block and the floor?

A. 2.4 N B. 3.4 N C. 8.0 N D. 27 N

5. A wooden block is at rest on a horizontal steel surface. If a 10.-newton force applied parallel to the surface is required to set the block in motion, how much force is required to keep the block moving at constant velocity?

A. less than 10. N B. greater than 10. N

C. 10. N

6. If a 30-newton force is required to accelerate a 2-kilogram object at 10 meters per second$^2$, over a level floor, then the magnitude of the frictional force acting on the object is

A. 0 N B. 10 N C. 20 N D. 30 N

7. Compared to the force needed to start sliding a crate across a rough level floor, the force needed to keep it sliding once it is moving is

A. less B. greater C. the same

8. A box is pushed toward the right across a classroom floor. The force of friction on the box is directed toward the

A. left B. right

C. ceiling D. floor

9. 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

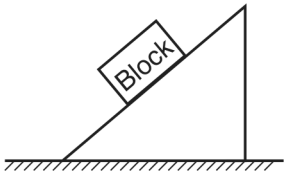
A. is greater than the force of static friction

B. is less than the force of static friction

C. increases as the speed of the object relative to the surface increases

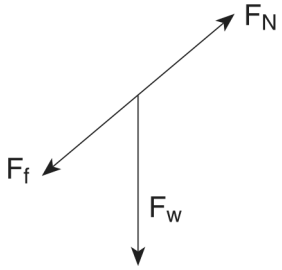
D. decreases as the speed of the object relative to the surface increases

10. The diagram below represents a block at rest on an incline.

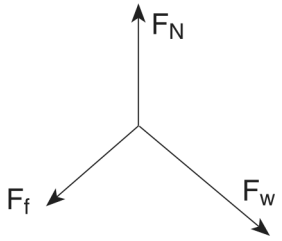



Which diagram best represents the forces acting on the block? ($F_f$ = frictional force, $F_N$ = normal force, and $F_w$ = weight.)

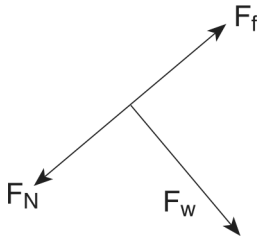
A.



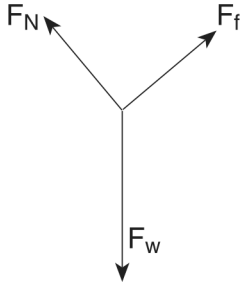

B.



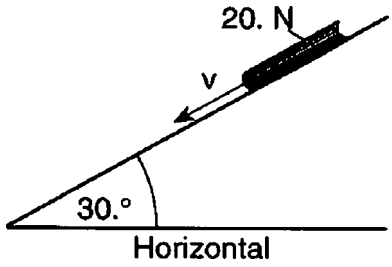

C.




D.




11. A book weighing 20. newtons slides at constant velocity down a ramp inclined 30.° to the horizontal as shown in the accompanying diagram.




What is the force of friction between the book and the ramp?

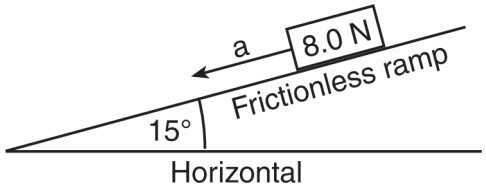
A. 10. N up the ramp

B. 17 N up the ramp

C. 10. N down the ramp

D. 17 N down the ramp

12. An 8.0-newton block is accelerating down a frictionless ramp inclined at 15° to the horizontal, as shown in the diagram below.




What is the magnitude of the net force causing the block's acceleration?

A. 0 N B. 2.1 N C. 7.7 N D. 8.0 N

13. Base your answer(s) to the following question(s) 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.

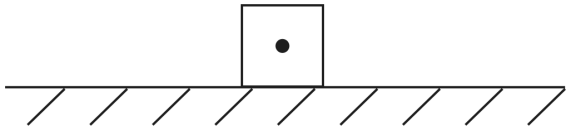
Calculate the magnitude of the force of friction between the crate and the floor. [Show all work, including the equation and substitution with units.]

14. Base your answer(s) to the following question(s) 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.

a. On the diagram below, draw and label all vertical forces acting on the crate.

b. On the diagram below, draw and label all horizontal forces acting on the crate.



15. What is the magnitude of the net force acting on the crate?

16. Is the crate accelerating? Explain your answer.

17. Base your answer(s) to the following question(s) on the information below.

A manufacturer's advertisement claims that their 1,250-kilogram (12,300-newton) sports car can accelerate on a level road from 0 to 60.0 miles per hour (0 to 26.8 meters per second) in 3.75 seconds.

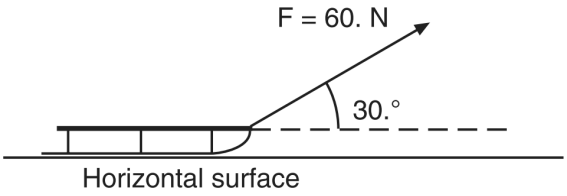
The coefficient of friction between the car's tires and the road is 0.80. Calculate the maximum force of friction between the car's tires and the road. [Show all work, including the equation and substitution with units.]

18. A skier on waxed skis is pulled at constant speed across level snow by a horizontal force of 39 newtons. Calculate the normal force exerted on the skier. [Show all work, including the equation and substitution with units.]

19. A 10.-kilogram rubber block is pulled horizontally at constant velocity across a sheet of ice. Calculate the magnitude of the force of friction acting on the block. [Show all work, including the equation and substitution with units.]

20. Base your answer(s) to the following question(s) on the information and diagram below.

A force of 60. newtons is applied to a rope to pull a sled across a horizontal surface at a constant velocity. The rope is at an angle of 30. degrees above the horizontal.

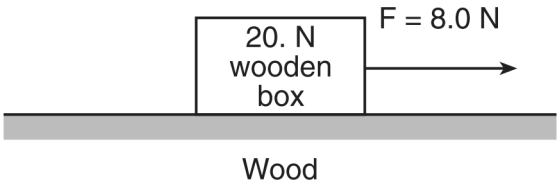



Calculate the magnitude of the component of the 60.-newton force that is parallel to the horizontal surface. [Show all work, including the equation and substitution with units.]

21. Determine the magnitude of the frictional force acting on the sled.

22. Base your answer(s) to the following question(s) on the information and diagram below.

A horizontal force of 8.0 newtons is used to pull a 20.-newton wooden box moving toward the right along a horizontal, wood surface, as shown.




Calculate the magnitude of the frictional force acting on the box. [Show all work, including the equation and substitution with units.]

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1.
Answer: D
Points: 1

2.
Answer: C
Points: 1

3.
Answer: D
Points: 1

4.
Answer: A
Points: 1

5.
Answer: A
Points: 1

6.
Answer: B
Points: 1

7.
Answer: A
Points: 1

8.
Answer: A
Points: 1

9.
Answer: B
Points: 1

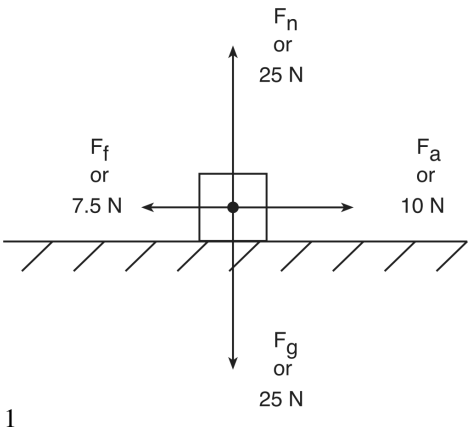
10.
Answer: D
Points: 1

11.
Answer: A
Points: 1

12.
Answer: B
Points: 1

13.
Answer: 7.5 N
Points: 1

14.
Answer:




Points: 1

15.
Answer: 2.5 N
Points: 1

16.
Answer: The crate is accelerating because a net force acts on it
Points: 1

17.
Answer: 9,800 N
Points: 1

18.
Answer: $F_N = 780\,\text{N}$
Points: 1

19.
Answer: 14.7 N
Points: 1

20.
Answer:
$$A_x = A \cos \theta$$
$$F_x = (60.\ \text{N}) \cos 30.^\circ$$
$$F_x = 52\ \text{N}$$
Points: 1

21.
Answer: 52 N
Points: 1

22.
Answer:
$$F_f = \mu F_N$$
$$F_f = (0.30)(20.\ \text{N})$$
$$F_f = 6.0\ \text{N}$$
Points: 1