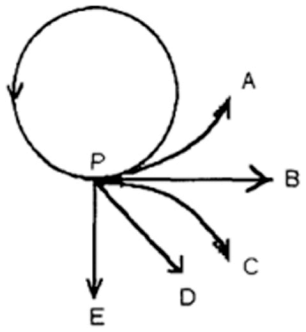
1) In a collision between a huge SUV and a small hybrid car, the SUV exerts a larger force on the hybrid than the hybrid exerts on the SUV.
   A) True
   B) False
   C) It depends on whether the collision is a head–on collision or a rear–end collision.

2) A box is placed on a table which rests on the floor. The box pushes on the table; the reaction force to the box's push on the table is the table's push on the floor.
   A) True B) False

3) A girl attaches a rock to a string, which she then swings counter–clockwise in a horizontal circle. The string breaks at point P in the figure, which shows a bird's–eye view (as seen from above). Which path (A–E) will the rock follow?



   A) Path A B) Path B C) Path C D) Path D E) Path E

4) If you pound a feather with a hammer, which one feels a greater force?
   A) always the hammer
   B) If the feather moves, then it felt the greater force. Otherwise the force was the same on both.
   C) The size of the force is always exactly the same on both of them.
   D) always the feather

5) You pull on a crate with a rope. If the crate moves, the rope's pull on the crate must have been larger than the crate's pull on the rope, but if the crate does not move, both of these pulls must have been equal.
   A) True B) False

6) If the rockets of a spaceship in outer space (far from all gravity) suddenly lose power and go off, the spaceship will gradually slow to a stop.
   A) True B) False

7) While flying horizontally in an airplane, you notice that a string dangling from the overhead luggage compartment hangs at rest at 15° away from the vertical toward the front of the plane. Using this observation, you can conclude that the airplane is
   A) accelerating backward.
   B) moving forward.
   C) accelerating forward.
   D) not accelerating because the string is at rest.
   E) moving backward.

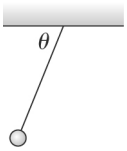
8) Bill and his daughter Susan are both standing on identical skateboards (with really good frictionless ball bearings), initially at rest. Bill weighs three times as much as Susan. Bill pushes horizontally on Susan's back, causing Susan to start moving away from Bill. Just after Bill stops pushing,

A) Susan is moving away from Bill, and Bill is stationary.
B) Susan and Bill are moving away from each other, and Susan's speed is three times that of Bill.
C) Susan and Bill are moving away from each other, and Susan's speed is one–third that of Bill.
D) Susan and Bill are moving away from each other, with equal speeds.

9) A small car and a large SUV are at a stoplight. The car has a mass equal to half that of the SUV, and the SUV can produce a maximum accelerating force equal to twice that of the car. When the light turns green, both drivers push their accelerators to the floor at the same time. Which vehicle pulls ahead of the other vehicle after a few seconds?

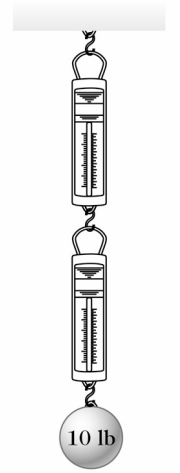
A) It is a tie. B) The SUV pulls ahead. C) The car pulls ahead.

10) Inside of a train a ball of weight W is hanging by a light wire at rest from the ceiling. The wire makes an angle θ with the ceiling, as shown in the figure. Which one of the following conditions must be true about the tension T in the wire?



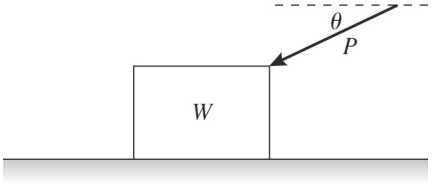
A) $T \tan\theta = W$ B) $T \sin\theta = W$ C) $T = W$ D) $T \cos\theta = W$ E) $T = ma$

11) In the figure, a 10–lb weight is suspended from two spring scales, each of which has negligible weight. Which one of the following statements about the readings in the scales is true?



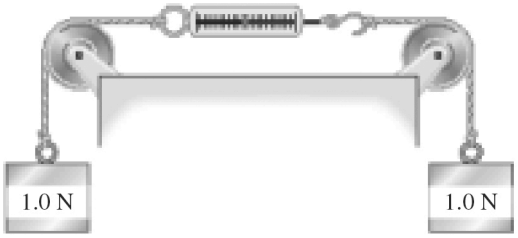
A) The lower scale will read zero, the top scale will read 10 lb.
B) Each scale will read 5 lb.
C) The top scale will read zero, the lower scale will read 10 lb.
D) Each scale will show a reading between one and 10 lb, such that the sum of the two is 10 lb. However, exact readings cannot be determined without more information.
E) None of these is true.

12) A push of magnitude P acts on a box of weight W as shown in the figure. The push is directed at an angle θ below the horizontal, and the box remains a rest. The box rests on a horizontal surface that has some friction with the box. The normal force on the box due to the floor is equal to



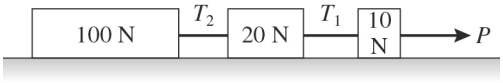
A) W. B) $W + P\cos\theta$. C) $W - P\sin\theta$. D) $W + P$. E) W + P sin θ.

13) In the figure, what does the spring scale read? The pulleys are ideal and the strings and scale are also massless.



A) exactly 2.0 N.
B) 0.00 N
C) 0.50 N
D) exactly 1.0 N
E) more than 19.6 N

14) Three boxes are pulled along a horizontal frictionless floor by a constant horizontal pull P. The boxes are connected by very light horizontal strings having tensions T_1 and T_2 as shown in the figure. Which of the following statements about the tensions is correct? (There could be more than one correct choice.)



A) $T_2 = P$ B) $T_1 > T_2$ C) $T_1 = P$ D) $T_1 + T_2 = P$ E) $T_2 > T_1$

15) A 200–N sled slides down a frictionless hillside that rises at 37° above the horizontal. What is the magnitude of the force that the surface of the hill exerts on the sled?

16) A block of mass m sits at rest on a rough inclined ramp that makes an angle θ with the horizontal. What must be true about force of static friction f on the block?

17) If I weigh 741 N on Earth at a place where $g = 9.80\ \text{m/s}^2$ and 5320 N on the surface of another planet, what is the acceleration due to gravity on that planet?

18) A 450–kg sports car accelerates from rest to 100 km/h in 4.80 s. What magnitude force does a 68.0 kg passenger experience during the acceleration?

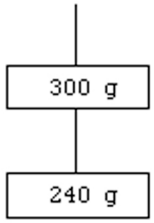
19) A flatbed truck is carrying an 800–kg load of timber that is not tied down. The maximum friction force between the truck bed and the load is 2400 N. What is the greatest acceleration that the truck can have without losing its load?

20) A box of mass 72 kg is at rest on a horizontal frictionless surface. A constant horizontal force of magnitude F then acts on the box, accelerating it to the right. You observe that it takes the box 3.4 seconds to travel 13 meters. What is the magnitude of the force F?

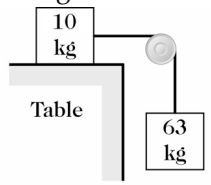
21) A 45.0–kg person steps on a scale in an elevator. The scale reads 460 N. What is the magnitude of the acceleration of the elevator?

22) A tightrope walker walks across a 30–m long wire tied between two poles. The center of the wire is displaced vertically downward by 1.0 m when he is halfway across. If the tension in both halves of the wire at this point is 6294 N, what is the mass of the tightrope walker? Neglect the mass of the wire.

23) As shown in the figure, two blocks are connected by a very light string, and the upper block is pulled upward by a different string. The masses of the upper and lower blocks are 300 g and 240 g, respectively. The string between the blocks will break if its tension exceeds 3.6 N, and the string that pulls the combination upward will break if its tension exceeds 7.8 N.
(a) What is the largest upward acceleration that the blocks can be given without either string breaking?
(b) If the upward acceleration is slightly higher than this, which string breaks, the upper one or the lower one?



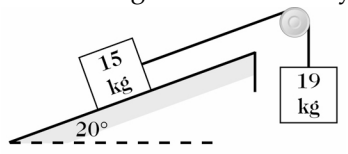
24) As shown in the figure, a 10–kg block on a perfectly smooth horizontal table is connected by a horizontal string to a 63–kg block that is hanging over the edge of the table. What is the magnitude of the acceleration of the 10–kg block when the other block is gently released?



25) A driver in a 1000–kg car traveling at 24 m/s slams on the brakes and skids to a stop. If the coefficient of friction between the tires and the level road is 0.80, how long will the skid marks be?

26) You push downward on a trunk at an angle 25° below the horizontal with a force of 750 N. If the trunk is on a flat surface and the coefficient of static friction between the surface and the trunk is 0.61, what is the most massive trunk you will be able to move?

27) A 15–kg block is on a frictionless ramp that is inclined at 20° above the horizontal. It is connected by a very light string over an ideal pulley at the top edge of the ramp to a hanging 19–kg block, as shown in the figure. The string pulls on the 15–kg block parallel to the surface of the ramp. Find the magnitude of the acceleration of the 19–kg block after the system is gently released?



28) A 6.0–kg box slides down an inclined plane that makes an angle of 39° with the horizontal. If the coefficient of kinetic friction is 0.40, at what rate does the box accelerate down the slope?

Answer Key
Testname: HW_CH04_NEWTONS_LAWS

1) B
2) B
3) B
4) C
5) B
6) B
7) A
8) B
9) A
10) B
11) E
12) E
13) D
14) B
15) 160 N
16) $f = mg \sin \theta$
17) 70.4 m/s^2
18) 394 N
19) 3.0 m/s^2
20) 160 N
21) 0.422 m/s^2
22) 85 kg
23) (a) 4.6 m/s^2 (b) upper string
24) 8.5 m/s^2
25) 37 m
26) 81 kg
27) 4.0 m/s^2
28) 3.1 m/s^2