1. You place a 7.50 kg television set on a spring scale. If the scale reads 78.4 N, what is the acceleration of gravity at that location?

2. An airplane moves in straight level flight with a constant velocity. What is the net force acting on the airplane if the mass of the plane is 1500 kg and the frictional drag of the air is 1200 N?

3. A leaf with a mass of 15 grams falls from a tree. If it is acted on by a 0.15 N force of air resistance upwards, what will the leaf do?

4. A 5.6 kg monkey hangs from a banana. Draw a free body diagram and calculate the force of tension on the banana. Treat the banana as if it were a piece of rope.

5. A 4.0×10^3 kg truck and a 1.0×10^3 kg car are in a small fender bender. If the force exerted by the truck on the car is 8.0×10^3 N, describe the force that the car experiences, and the accelerations of each vehicle.

6. A race car has a mass of 710 kg. It starts from rest and travels 40.0 m in 3.0 s. The car is uniformly accelerated during the entire time. What net force is applied to it?

7. A lamp hangs vertically from a cord in an elevator which is descending (slowing down) with a downward acceleration of a = 2.00 m/s². The tension in the cord is F_T = 10.0 N. What is the mass m of this lamp?

8. The tension (T) in the rope attached to the object shown is 25 N. The force of gravity (F) acting on the object is 10 N. What is the unbalanced force acting on the object?

$T = 25\,\text{N}$

9. A 290 kg crate is pushed by a constant horizontal force of 990 N. The acceleration is 1.2 m/s². Draw a free body diagram and determine the kinetic coefficient of friction

10. Two people pull with 90N and 92N in opposite directions on a 25kg sled on frictionless ice. Draw a free body diagram and calculate sled's acceleration.

11. The frictionless car is moving at 4.0 m/s at 55 m above ground level. It has a mass of 1200 kg and is rolling along the hills in neutral. How fast will the car be moving when it reaches at ground level? What is the maximum height above the ground that the car can reach?

12. A 23.0 kg block is sitting on the ground. Two ropes are attached to the top of the block. Rope A is pulled upward with a force of 20.0 N and rope B is pulled upwards with a force of 5.0 N. What is the normal force on the block?

13. You're holding up a light fixture of mass 1.4 kg with a force of 21 N against the ceiling. What is the normal force?

14. A skydiver is jumping out of an airplane. During the first few seconds of one jump, the parachute is unopened, and the magnitude of the air resistance acting on the skydiver is 251 N. the acceleration of the skydiver during this time is 5.96 m/s² [down]. Calculate the mass of the skydiver

15. A sled with a mass of 10.0 kg is pulled right by a force of 1.0×10^2 N. At the same time, the force of friction opposing the pull is 6.0×10^1 N. What will the acceleration of the sled be?

16. An object, of mass 15.0 kg, is pushed along a surface, from rest, with an acceleration of 2.0 m/s² for 5.0 s. If the co-efficient of friction is 0.650, calculate the power required to do this.

17. A kid drags his little sister behind him on a wagon. The mass of the wagon and the girl is 25 kg and the coefficient of kinetic friction between the wheels and the ground is 0.2. What will the acceleration of the wagon be if the boy pulls with a force of 125 N?

18. Reckless Roland takes a spill while skiing and falls on a level section of ground while travelling at a speed of 15 m/s. If his mass is 95 kg and μ_K =0.25 between Roland and the snow, what will his acceleration be? How long will it take him to stop sliding?

19. A brick of mass 12 kg is attached to another brick with a mass of 15 kg by a rigid massless rope. The bricks are on a horizontal table. The first brick is pulled with a horizontal force of 320N to the right. The system is frictionless.
a) Calculate the acceleration of the system.
b) Calculate the tension in the rope.

20. A force of 20.0 N moves a 10.0 kg block of concrete along at constant speed. What is the coefficient of kinetic friction between the block and the surface?

21. A 100 N force is applied to the side of a crate resting on a level floor. The crate has a mass of 50 kg. If the coefficient of static friction is μs = 0.25, is the 100 N force enough to make the crate accelerate? Explain why or why not. Do include a **free body diagram**.

22. A horizontal force of 400.0 N is required to pull a 1760 N trunk across the floor at constant speed. Find the coefficient of sliding friction.
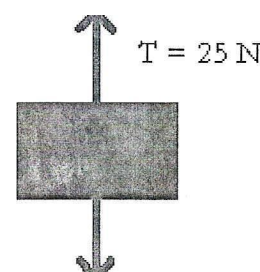
23. Two blocks on a frictionless horizontal surface are connected with a rope. A constant force of 265 N [R] is applied as shown in the diagram below.

B (m=78 kg)

$F_A = 265$ N[R]
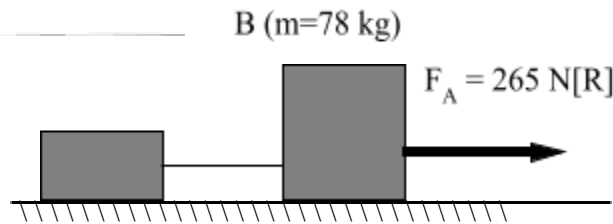
a. Draw an FBD for block A and block B.(No calculations for any forces needed)
b. Draw an FBD for the <u>system</u> and determine the acceleration of the blocks.
c. If the surface was not frictionless, determine the force of friction acting on block B. The coefficient of kinetic friction is 0.12

24. Use the following diagram to determine the **acceleration of the system** and **tension force between mass A and B**. A = 4.0 kg, B = 2.0 kg and C = 5.0 kg. There is no friction.

A   B

C

25. A box of mass 5.7 kg slides across a floor and comes to a complete stop. If it's initial speed was 10 km/h and $\mu_k = 0.34$, find:
   a. The friction acting on the box
   b. The acceleration of the box
   c. The distance travelled by the box before stopping
   d. The time it took to stop.

26. Find the force of gravity between Earth and the Moon. The mass of the Earth is 5.98 x 10^{24} kg. The Moon's mass is 7.36 x 10^{22} kg and it is 3.84 x 10^8 m from Earth.

27. The gravitational force of attraction between Earth and the Sun is 3.52 x 10^{22} N. The mass of the Earth is 5.98 x 10^{24} kg and the distance from Earth to the Sun is 1.50 x 10^{11} m. Calculate the mass of the Sun.

28. Calculate the gravitational field strength on the surface of Jupiter: mass = 1.8987x10^{27} kg, radius = 71,492 km.

29. A trampoline launches Hadfield, a 110 kg astronaut, straight up with a velocity of 2.3 m/s on the moon where the acceleration due to gravity is 1.6 m/s²
   a. Calculate Hadfield's weight on the moon.
   b. In the absence of air resistance, how long will it take Hadfield to reach the top of her trajectory or highest point?
   c. How high will Hadfield jump?

30. Michael, on a sunny resort beach, measures the gravitational attraction between him and a mysterious stranger 50 m away to be 1.067×10^{-10} N. Assuming she has a mass of 60 kg, what is the mass of the mysterious stranger?

31. If the force of gravity on a rocket 10000 km from the centre of the Earth is 900N, what will be the force of gravity at 30000 km?