Forces worksheet 1

1. **a** A body of mass 8 kg is moving with an acceleration of 4 m/s2 in a straight line. Find the resultant force acting on the body.

b A body of mass 10 kg is moving in a straight line. The resultant force acting on the body is 5 N. Find the magnitude of the acceleration of the body.

2. **a** A force of 10 N acts on a particle of mass m kg and produces an acceleration of $2.5 \ m \ s^{-2}$. Find the value of m.

b A force of F N acts on a particle of 2 kg and produces an acceleration of $3.5 \ m \ s^{-2}$. Find the value of F.

3. An electron of mass 9×10^{-31} kg in a magnetic field has at a given instant, an acceleration of $6 \times 10^{16} \ m \ s^{-2}$. Find the resultant force on the electron at that instant.

4. A truck of mass 25 tonnes is travelling at 50 km/h when its brakes are applied. What constant force is required to bring it to rest in 10 seconds?

5. What force is necessary to accelerate a train of mass 200 tonnes at $0.2 \ m \ s^{-2}$ against a resistance of 20 000 N? What will be the acceleration if the train free-wheels against the same resistance?

6. What size mass would be accelerated upwards at $1.2 \ m \ s^{-2}$ by the vertical force of 96 N?

7. A parachutist of mass 75 kg, whose parachute only partly opens, accelerates downwards at $1\ m\ s^{-2}$. What upward force must her parachute be providing?

8. In a lift that is accelerating upwards at $2\ m\ s^{-2}$ the normal reaction is 24.5 N. What would be the normal reaction if the lift were at rest?

9. A box of mass 10 kg lies on the horizontal floor of a lift which is accelerating upwards at $1.5\ m\ s^{-2}$. Find the reaction, in newtons, of the lift floor on the box.

10. In a lift that is accelerating downwards at $1\ m\ s^{-2}$, a normal reaction is 24.5 N. What would be the normal reaction if the lift was:
a at rest?

b accelerating upwards at $2\ m\ s^{-2}$?

11. A reindeer is hauling a heavy sled of mass 300 kg across a rough surface. The reindeer exerts a horizontal force of 600 N on the sled while the resistance to the sled's motion is 550 N. If the sled is initially at rest, find the velocity of the sled after three seconds.

12. The engine of a train of mass 200 tonnes exerts a force of 78400 N, and the total air and rail resistance is 196 N/tonne. How long will it take the train on level ground to acquire a speed of 30 km/h from rest?

13. One man can push a wardrobe of mass 250 kg with an acceleration of magnitude $0.15 \, m \, s^{-2}$. With help from another man pushing just as hard (i.e. with the same force), the wardrobe accelerates at $0.4 \, m \, s^{-2}$. How hard is each man pushing and what is the resistance to sliding?

14. A load of 200 kg is being raised by a cable. Find the tension in the cable when:
a the load is lifted at a steady speed of 2 m/s

b the load is lifted with an upward acceleration of $0.5 \, m \, s^{-2}$