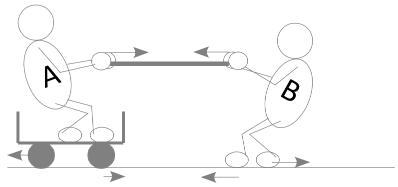
Newton's Laws Answers

1. 25N
2. It continues at the same speed forever
3. Friction
4.
   (a) No force is acting on it which would change its speed so it continues at the speed of the plane.
   (b) 600km/h.
   (c) 0km/h.
5. The head's inertia will force it down onto the handle.
6. It doubles
7. It halves
8. The 2kg rock has twice as much mass/inertia/resistance to acceleration.
9. $a = F \div m = 500 \div 2000 = 0.25\ ms^{-2}$
10. $a = F \div m = (4\times3\times10^{4}) \div 3\times10^{5} = 0.4\ ms^{-2}$
11.
    (a) 100N.
    (b) 0N.
    (c) $0\ ms^{-2}$
12. a) $a = F \div m = 20 \div 2 = 10\ ms^{-2}$
    b) $a = F \div m = (20-4) \div 2 = 8\ ms^{-2}$
13. 1 N (in the opposite direction)
14. The forces are equal in magnitude (strength) and opposite in direction.
15. The water pushes you forward.
16. The acceleration is too small because of the Earth's large mass.

17.

a)



b) Person A accelerates (his/her net force is not zero)

c) Person B does not accelerate.

18.

a) P and f. The net force is P - f

b) F and P. The net force is F - P

c) F and f. The net force is F – f.

d) So the net force on it will exceed zero.

19. 200 N
20. It can't exert the huge force back.
21. In order to walk forward you exert a backward force on the log.
22. When you push downwards on the sink, the sink pushes you upward. This tends to lift you off the scales and decrease the reading on the scale. If you pull upwards on the sink, it will push you downwards and increase the reading.
23. The force is the same on both. The acceleration of the bug is significant, the acceleration of the bus is insignificant.
24. No (according to Newton's 3rd Law). It is impossible for one of the rope to be under greater tension than the other.
25. 50N
26. It doesn't change in different locations
27. $2\times9.8 = 19.6$N (20 to 2 s.f.)
28. $2000\times9.8 = 19600$N
29. About 102g ($1 \div 9.8 = 0.102$ kg)
30. The person's mass is $500 \div 9.8 = 51$ kg, so their weight on Jupiter is $51\times26 = 1330$ N
31. $F = ma = 10\times9.8 = 98$ N
    $a = F \div m = 98 \div 20 = 4.9\ ms^{-2}$
32. They are equal and opposite but not because of Newton's 3rd Law directly, since the forces in question are on the same body but in Newton's 3rd Law the forces act on two different bodies. There are actually two action-reaction pairs which combine to make the effect – gravity provides the Earth-person attraction and the *normal* (perpendicular) force provides the Earth-person repulsion (it is equal and opposite to prevent the person sinking into the Earth).
33. 100N
34. $F = ma = 1 \times 9.8 = 9.8$ N
35.

(a) The net force decreases since air drag increases (gets closer and closer to the weight of the skydiver, that is, the force of gravity)

(b) Acceleration decreases since net force decreases and $a = F \div m$

(c) Third, since speed is greater.

(d) First, since air drag is less.