

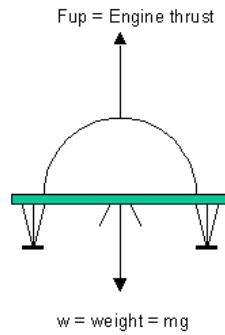


## Higher Forces Answers

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1. **N1** – An object will remain in the state of rest or uniform motion unless acted upon by an unbalanced force.  
**N2** – An object will accelerate or decelerate if acted upon an unbalanced force  
**N3** – For every action force there is an equal and opposite reaction force.
  
2. a) Balanced forces – Equal in **magnitude** and opposite in **direction**.  
b) **Stationary** or moving with a **constant velocity**.
  
3.  $T = 800\text{N}$ .
  
4.  $T = 4\text{N}$ .
  
5.  $F_H = 14\text{N}$ .
  
6.  $T = 0\text{N}$ .
  
7.  $T = 1400\text{N}$ .
  
8. a)  $a = 0.25\text{ms}^{-2}$ .  
b)  $F_E = 2500\text{N}$ .  
c)  $F_C = 1500\text{N}$ .
  
9.  $F_{Fr} = 500\text{N}$  to the left.
  
10. Upthrust =  $5390\text{N}$ .

11. a)



$$W = mg = 24,000\text{N.}$$

Weight and Engine Thrust are balanced forces. (Equal and opposite)

b) i)  $a = -0.1\text{ms}^{-2}$ .

ii)  $v = -0.2\text{ms}^{-1}$ .

iii)  $S = -19.8\text{m}$ .

12. i) The lift could be accelerating upwards **OR**

ii) The lift could be decelerating downwards.

13.  $a = 2.2\text{ms}^{-2}$  upwards.

14. Reading on Balance = 12.8N.

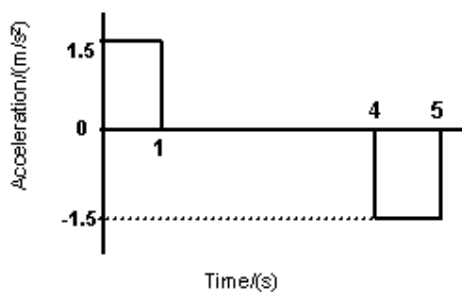
15.  $F = 8580\text{N}$ .

16. a) From  $W = mg$ .

b)  $a = 1.5\text{ms}^{-2}$ .

c)  $a = -1.5\text{ms}^{-2}$ .

d)



17. a)  $a = 8.21\text{ms}^{-2}$ .

b) i) Terminal velocity.

ii) The forces on the skydiver are balanced.

The weight of the skydiver acting downwards is equal and opposite to the air resistance acting upwards.

The greater the velocity the greater the air resistance.

So when the skydiver reaches a the terminal velocity, the **air resistance** will have increased to a level where it is **equal** to the **weight**.

18. a) Upthrust acting vertically upwards and the weight acting vertically downwards.

b)  $F = 2.08 \times 10^5\text{N}$ .

c)  $a = 5.2\text{ms}^{-2}$ .

d) i) The acceleration of the rocket will increase as the mass of fuel will decrease during the flight decreasing the mass and the weight of the rocket and increasing the unbalanced force.

ii) The acceleration will increase outwith the Earth's atmosphere as there is no air resistance. In reality the rocket motor engines are switched off at this point to conserve fuel, and the rocket will be able to continue with a constant velocity.

19. a)  $R = 637\text{N}$ .

b)  $R = 728\text{N}$ .

c)  $R = 637\text{N}$ .

d)  $R = 559\text{N}$ .

e)  $R = 637\text{N}$ .

20. a)  $0.25\text{ms}^{-2}$ .

b) i) The 95kg will increase acceleration to  $0.47\text{ms}^{-2}$

ii) The 85kg teacher will continue to move with the velocity that he/she had when the rope snapped.