Speed, Velocity and Acceleration

3. **Typical Speeds**
- Walking = 1.5 m/s
- Running = 3 m/s
- Cycling = 6 m/s
- Car = 25 m/s
- Train = 55 m/s
- Plane = 250 m/s

1. **Speed** is how fast something is going without reference to a direction. It is a scalar quantity.

2. **Velocity** is a speed in a given direction. It is a vector.

4. $s = vt$ (Distance (m); Speed (m/s); Time (s))

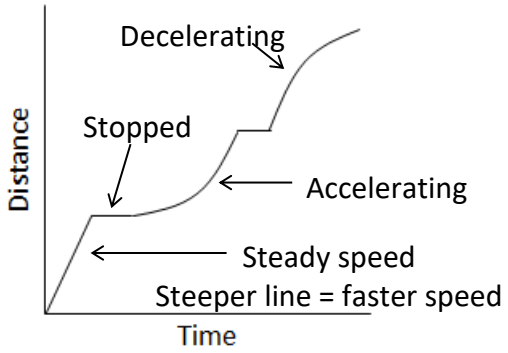
Acceleration

10. How **quickly** something is **speeding up**.

11. Deceleratation is negative acceleration (slowing down).

12. $a = \frac{\Delta v}{t}$ (Acceleration (m/s^2); Change in velocity (m/s); Time (s))

5. **Distance-Time Graphs**



Uniform Acceleration

18. This can happen due to gravity acting on an object in free fall.

19. $v^2 - u^2 = 2as$ (Final velocity (m/s); Initial velocity (m/s); Acceleration (m/s^2); Distance (m))

eg. If a car travelling at 24m/s (**u**) decelerates uniformly at 2m/s^2 (**a**) as it enters a housing estate 120m (**s**) away, what will its speed be as it reaches the housing estate (**v**)?

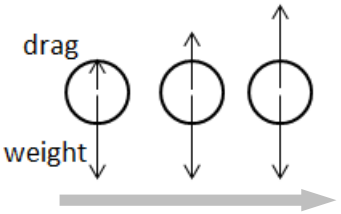
20. 1. Rearrange the equation: $v^2 = u^2 + 2as$

2. Put in numbers and calculate v^2: $v^2 = 24^2 + (2 \text{ x } -2 \text{ x } 120) = 96$

3. Find the square rout to give v: $v = \sqrt{96} = \mathbf{9.8m/s}$

Terminal Velocity

13. The maximum speed an object will fall at through a fluid (liquid or gas).



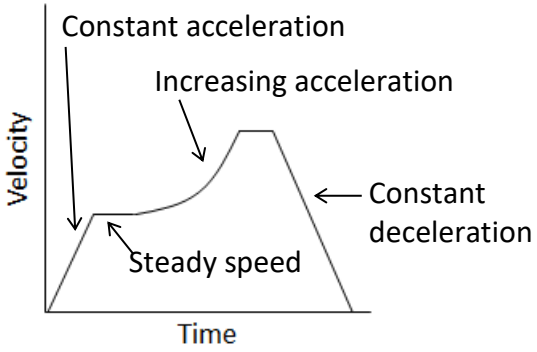
14. Speed increases so frictional force (drag) increases.

15. Acceleration is reduced until the drag is equal to the weight. Terminal velocity is reached.

16. The **shape**, and **surface area** will affect terminal velocity.

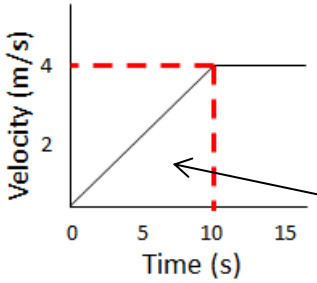
17. A larger surface area will increase air resistance so decrease terminal velocity.

6. **Velocity-Time Graphs**



7. The **acceleration** is the **gradient** of the line (**Δ v ÷ t**).

8. To work out the **distance** travelled, find the **area** under the line.



Eg. the distance over the first 10s is:

½ x 10 x 4 = 20m

9. The area under the line is a triangle, so ½ the area of a rectangle.