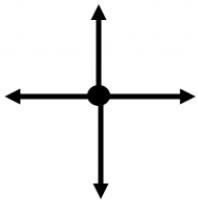
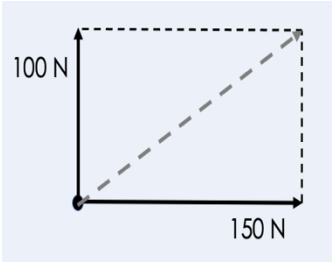
Scalars and Vectors

1. **Scalars** are quantities which only have **size** (magnitude), such as distance, speed, mass and energy.
2. **Vectors** are quantities with **size** and **direction**, such as displacement, velocity, acceleration, force and weight.
3. **Resultant force** is a **vector** quantity
4. Forces acting in the same direction can be added together
5. Forces acting in opposite directions can be subtracted
6. Resultant forces can be **resolved** into their horizontal and vertical **components**





Newton's Laws

7. Newton's **Third** Law states that **every action has an equal and opposite reaction**
8. Newton's **First** Law states than an **object's motion will not change unless acted upon by an unbalanced force**
9. If the resultant force is 0 N a stationary object will remain stationary
10. If the resultant force is 0 N an object in motion will continue moving at the same velocity
11. If the resultant force is not 0 N a stationary object will accelerate in the direction of the resultant force
12. If the resultant force is not 0 N an object in motion will accelerate in the direction of the resultant force

Acceleration

13. Acceleration is the **rate of change of velocity**
14. Change in velocity is calculated using final velocity minus initial velocity
15. Acceleration happens when there is change in velocity (**speeding up, slowing down or a change in direction**)
16. Negative acceleration (slowing down) can be called **deceleration**
17. The SI unit for acceleration is **m/s^2**
18. An object moving in a circle is accelerating because it is constantly changing direction
19. Objects near Earth's surface experience gravitational acceleration of 9.8 m/s^2
20. **Air resistance/drag increases with speed**

$$Acceleration = \frac{Change\ in\ velocity}{Time}$$

Velocity-Time Graphs

21. Velocity-time graphs can be used to describe motion
22. A **horizontal line** shows a **constant velocity**
23. A straight line with a **positive gradient** (slope) shows that an object has a **positive acceleration** (speeding up)
24. A straight line with a **negative gradient** (slope) shows that an object has a **negative acceleration**/deceleration (slowing down)
25. **Acceleration** can be calculated by calculating the **gradient**
26. **Distance** can be calculated from the **area under the graph**
27. A **curved** line shows that **acceleration** is **changing**