

Vectors And Scalars

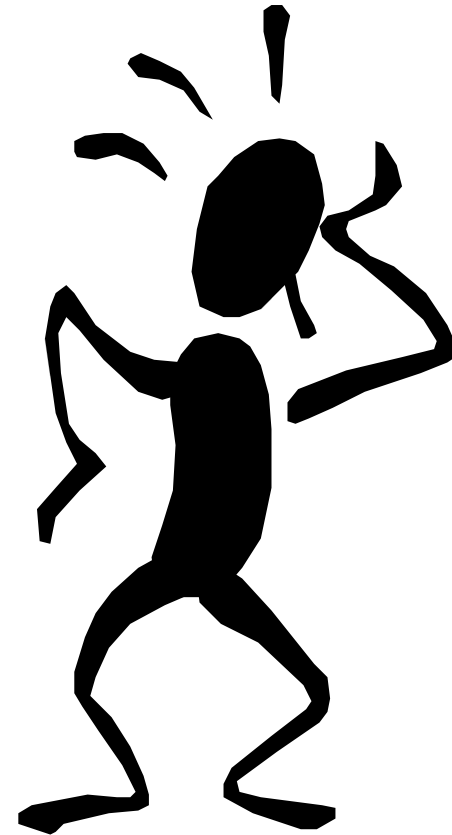
An introduction to Vectors and
Scalars

Vectors and Scalars

- All quantities we deal with in Physics can be classified as **vectors** or **scalars** (note the spelling!)
- Scalars can be described simply with a number indicating the magnitude (size)
 - Mass of 2 kg
 - Temperature of 22°C
- Vectors must have a **magnitude** and a **direction**. A vector quantity is incomplete and incorrect if it does not have a direction
 - Force of 30N to the right


Vectors and Scalars

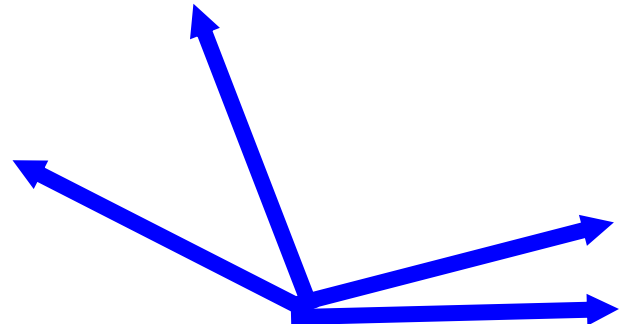
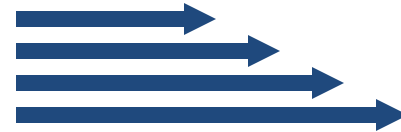
- So far in Physics almost everything has been treated as a scalar. These can be added and subtracted as normal numbers
- ...unfortunately life isn't so simple with vectors!



Using Vectors

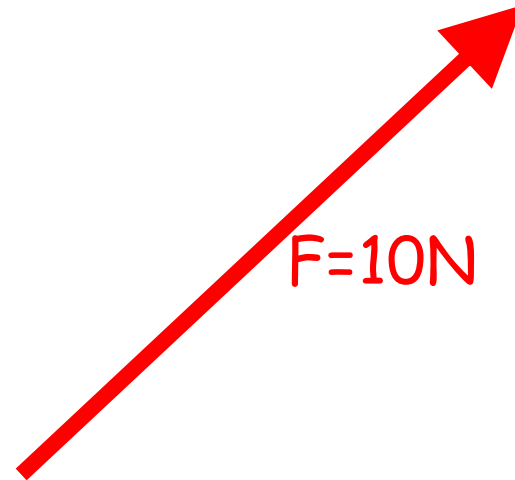
- It is very useful to use diagrams (arrows) to represent vectors.
- The length of the arrow denotes the magnitude of the vector

 The direction of the arrow represents...the direction of the vector!



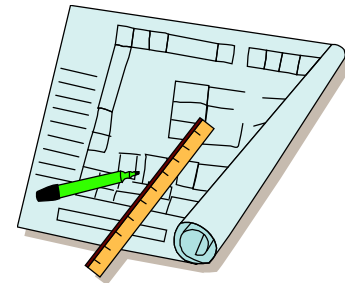
Using Vectors

- It is a good habit to label your vectors in a diagram
- Always include an arrowhead on your diagram




Adding Vectors


- Vectors can be added using trigonometry (SOH-CAH-TOA) or scale diagrams
- We will start with scale diagrams

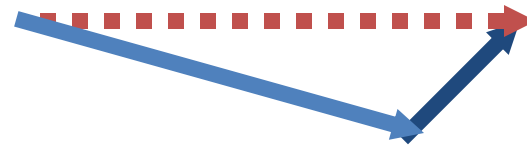
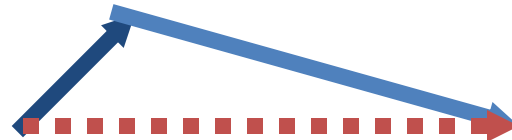


Combining Vectors

- Vectors must always be added “head to tail”.

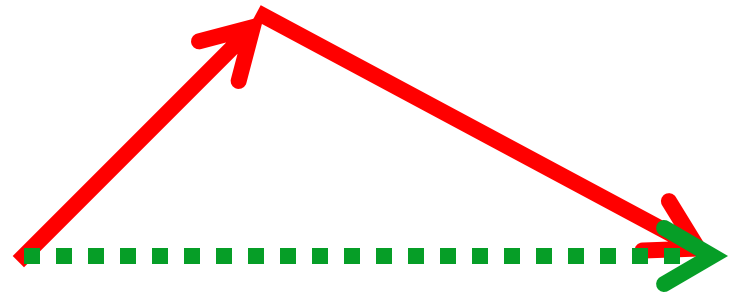
 It does not matter which order you add them in.

 You can translate vectors, but you must not rotate them.



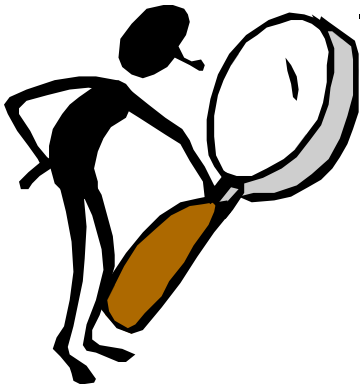
Combining Vectors

- The individual vectors are called **components**
- The “overall” vector is called the **resultant**.

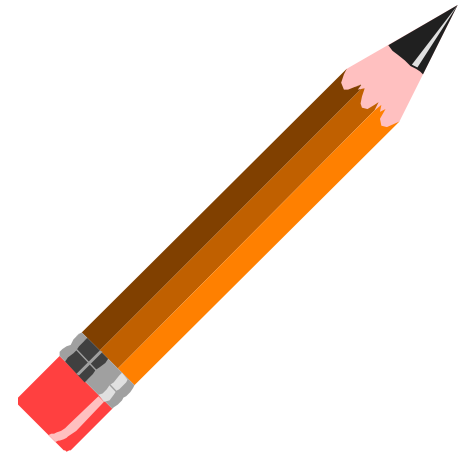


Combining Vectors

- Always:
 - Use a sharp pencil
 - Use a ruler
 - Use a protractor (buy one!)
 - Measure carefully
 - Make the diagram



BIG



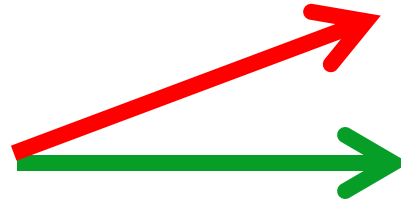
Types of Vector

- Force
- Displacement
 - This is a distance in a given direction
- Velocity
 - This is a speed in a given direction. It is calculated from displacement / time
- ...and a few more you'll meet soon!

Problems

1. Add the following vectors together:

- 10N horizontally
- 10N at 20°



Don't forget to label the vectors!

2. Add the following vectors together:

- 20ms⁻¹ at 25° below horizontal
- 15 ms⁻¹ 13° above horizontal

