Vectors and Scalars:

1. Measured values can be classified in to two categories: vectors and scalars.
2. A scalar is a measured value that represents only the magnitude of the measurement. For example: speed 80km/h, temperature 8°C, how much energy 100J, and distance 50m.
3. A vector is a measured value that represents both magnitude and direction. For example: velocity 80km/h North, force 10N East, position 10m west, and displacement -15m.
4. Vectors can be represented as a line with an arrow head. The Length of the line represents the magnitude of the measurement and the orientation represents the direction.
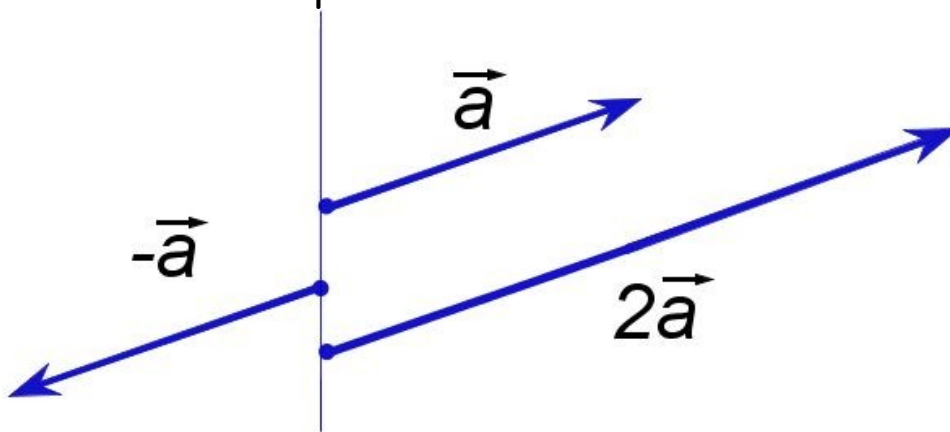
Addition of Vectors:

5. Vectors can be added using the "tip to tail" method. The tip of one vector is placed at the tail of another and the resultant vector is the new vector drawn from the tail of the first to the tip of the last vector.
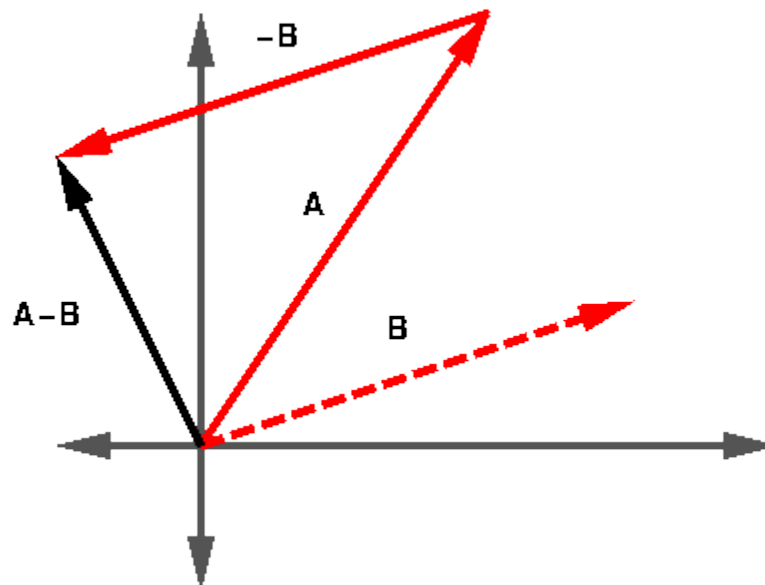
$$V_1 + V_2 + V_3 + \ldots = V_R$$

Scale: 2 cm = 1 km

N
W←⊕→E
S

3 km
[S]

5 km [E]

2 km
[S]

The resultant
vector is
5 km [S 11° E]

4 km [W]
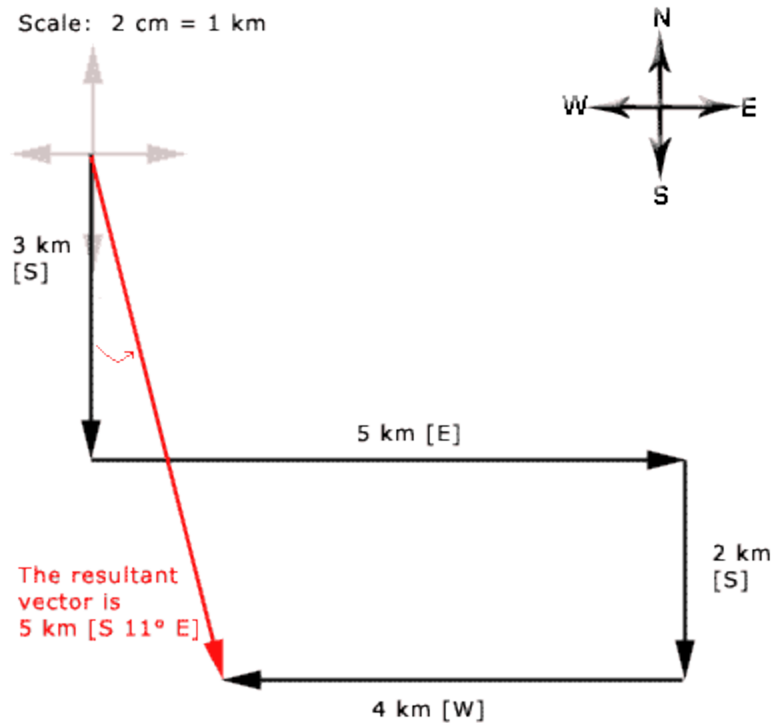
Subtraction of Vectors:

6. Vectors can be subtracted by using the same method with one
   exception. The subtraction needs to be changed to adding the
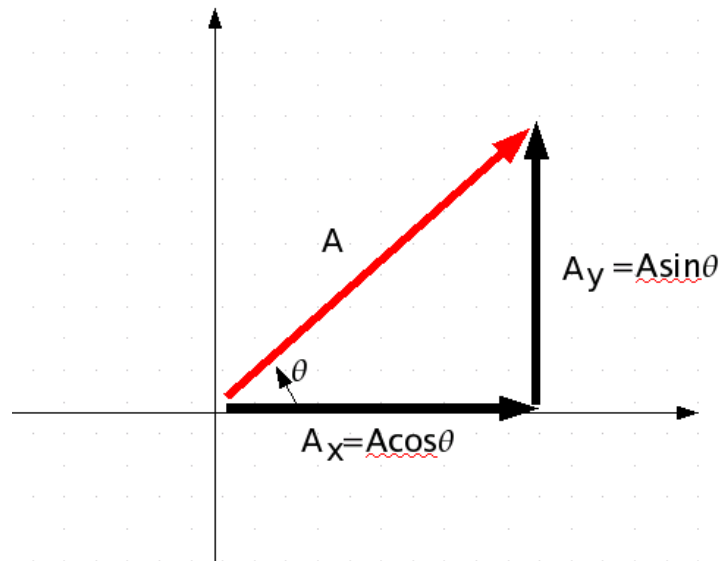   opposite. For example:
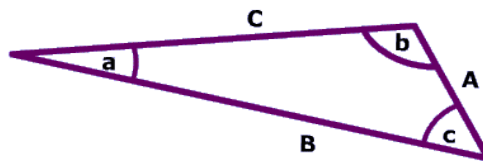
$$V_A - V_B = V_{A-B}$$

$$V_A + -V_B = V_{A-B}$$

−B

A

A−B

B

Vectors and Trigonometry:

7. Trigonometry can be used to decompose vectors into their x and y components.

A

$A_y = A\sin\theta$

θ

$A_x = A\cos\theta$

8. The sine law can be used to determine the resultant of vectors.

$$\frac{\sin(a)}{A} = \frac{\sin(b)}{B} = \frac{\sin(c)}{C}$$

C

a

b

A

B

c

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$$\frac{A}{\sin(a)} = \frac{B}{\sin(b)} = \frac{C}{\sin(c)}$$

9. The cosine law can also be used to find the resultant.

$$c^2 = a^2 + b^2 - 2ab\cos C$$

C

b

a

A

B

c