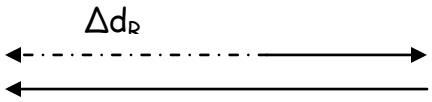
Vector Addition – Part 2

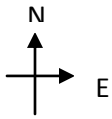
1) **Collinear Vectors** – are vectors that are in a straight line. (1D)
ie: I walk 5 m [E] and then 20 m [W].

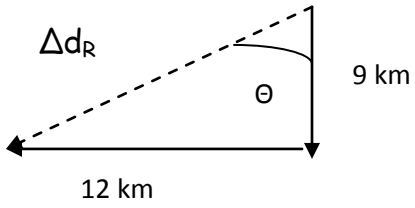


Draw: tail-to-tip The resultant vector starts at the start and ends at the end.
Draw: the resultant arrow as a dashed arrow.

Mathematically: Set [E] as +ve. So all directions are east. (west is a negative)
So… (+5) + (-20) = -15 m [E]

2) **Non-collinear** – are vectors that are not ina straight line (2D)
Easy non-collinear
ie: what is my final position if I travel 9 km [S] and then turn and travel 12 km [W]?
Draw: Tail-to-tip. Include resultant.





Mathematically: cannot add with integers. Must add with geometry/trig.
Length of Δd_R : Use Pythagorean $a^2 + b^2 = c^2$

Angle (Θ) : Use trig ratios. Tan Θ = 12/9 Θ = 53°

When the math is done, Δd_R = 13 km [S 53°W]

What if I have more than 2 vectors?

ie: my dog loves to run after squirrels. If he runs 5 m [W], then 2 m [S], then 15 m [N] and 2 m [W], what is his displacement from his starting point?

Draw it first to see a general answer. Try this in the space below.

Mathematically: Set North and East as +ve

Add the N/S vectors ('y' vectors) together for a total

ie: (-2) + (+15) = +13 m [N]

Add the E/W vectors ('x' vectors) together for a total

ie: (-5) + (-2) = -7 m [E]

Put these 2 vectors together to form a triangle. Now you have the situation above – solve with Pythagorean and trig.