Vector Addition 2

The second method of adding vectors is the mathematical method.

Adding Vectors Using Mathematics

Adding Parallel Vectors
The simplest case of addition occurs when the vectors are parallel. In other words, all of the vectors being added point in exactly the same direction. In such cases, the vectors can simply be added as if they were regular, scalar quantities.

Example 1
Add the vectors $A = 3.0 \ m \ [E]$ and $B = 4.0 \ m \ [E]$.

Adding Antiparallel Vectors
Equally simple is the case of antiparallel vectors, or vectors that point in exactly opposite directions. The resultant of adding two antiparallel vectors can be found by subtracting one vector from the other.

Example 2
Add the vectors $A = 3.0 \ m \ [E]$ and $B = 4.0 \ m \ [W]$.

Adding Perpendicular Vectors
Two vectors that are perpendicular to each other can be added using right-angled trigonometry.
The following steps outline how this is done:

1. Draw a **sketch** of the vectors to be added. The vectors should be drawn tail-to-head, as if we
   were going to add them using a scale diagram. Include the resultant vector in your sketch.
2. Use the Pythagorean relation to determine the magnitude of the resultant.
3. Use sine, cosine, or tangent to determine the direction (angle) of the resultant.
4. Write your answer in correct vector notation.

Example 3
Add the vectors $A = 385 \ m \ [E]$ and $B = 218 \ m \ [N]$.

Homework
Add the following combinations of vectors using **mathematical methods**:

1. $B + G$
2. $C + F$
3. $D + G$
4. $A + D$
5. $C + G$

6. $B + F$
7. $A + G$
8. $D + E$
9. $D + F$
10. $A + B + C + D$

$A = 100 \ m \ [N]$
$B = 50 \ m \ [E]$
$C = 42.5 \ m \ [S]$
$D = 63.5 \ m \ [W]$

$E = 94.5 \ m \ [S]$
$F = 15 \ m \ [N]$
$G = 175 \ m \ [W]$