

Adding Vectors by components

Adding Vectors F(A) and F(B) by components

1. Determine components for each vector

$$F(A)_x = F(A)\cos(\text{angle1}) \quad F(A)_y = F(A)\sin(\text{angle1})$$

$$F(B)_x = F(B)\cos(\text{angle2}) \quad F(B)_y = F(B)\sin(\text{angle2})$$

2. Add X components; add Y components
3. Size by Pythagorean Thm: $c^2 = x^2 + y^2$
4. Angle by $\text{Arctan}(Y/X)$

EXAMPLE

- $F(A) = 550$ Newtons at 20 degrees
- $F(B) = 770$ Newtons at 80 degrees
- $F_x(A) = 517$ Newtons; $F_y(A) = 188$ Newtons
- $F_x(B) = 134$ Newtons; $F_y(B) = 758$ Newtons
- $\text{Sum} = (517 + 134, 188 + 758) = (651, 946)$
- Size: $c = 1,148$ Newtons
- Angle: $\text{Arctan}(946/651) = 55$ degrees

Group Activity

- Add vectors by components. (1) Determine F_x and F_y ; (2) Add X_s ; Add Y_s ; (3) size by Pythagorean Thm; (4) angle by $\arctan(y/x)$.
- 1. $F(A) = 275$ Newtons at 60 degrees; $F(B) = 185$ Newtons at -45 degrees
- 2. $F(A) = 275$ Newtons at 150 degrees; $F(B) = 185$ Newtons at 200 degrees

Problem #1

- 1. $F(A) = (138, 238)$; $F(B) = (131, -131)$
- 2. $F(A + B) = (138 + 131, 238 + -131) = (269, 107)$
- 3. Size = 289
- 4. angle = $\arctan(107/269) = 22$ degrees

Problem #2

- $F(A) = (-238, 138)$; $F(B) = (-174, -63)$
- $F(A + B) = (-238 + -174, 138 + -63) = (-412, 75)$
- Size: 419
- Angle: $\arctan(75/-412) = -10$ degrees = 170 degrees