

## Chapter 3-Two Dimensional Motion

### Vectors and 2D Motion

- scalar-quantity with magnitude (HOW MUCH) only, ex. 10 degrees Celsius, 40 m/s NO DIRECTION
- vector-quantity with magnitude and direction, ex. 10 m/s up, 5 m/s<sup>2</sup> North, 4.2 Newton (East of North)

Vector components-the part of the vector that is in the x or y direction

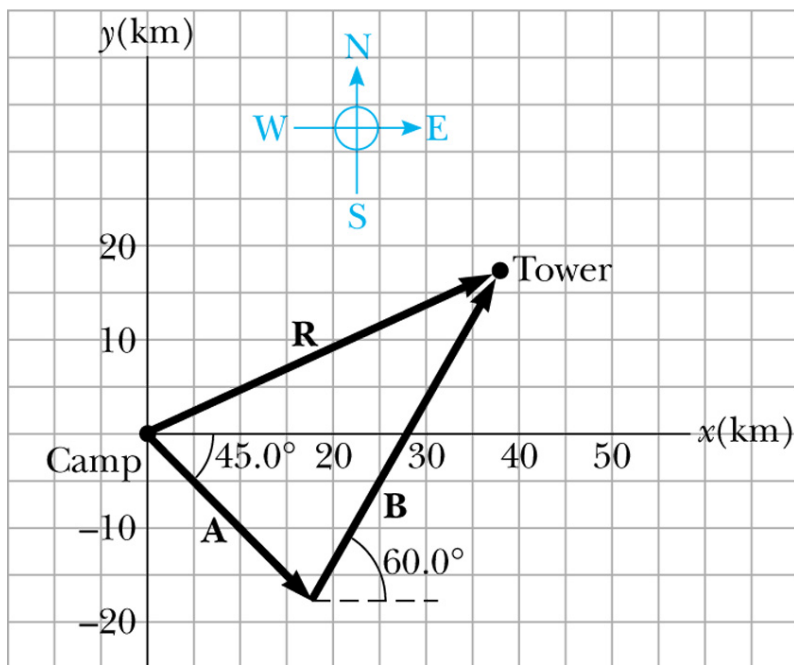
there are displacement, velocity, force vectors

$$V_x = V \cos \theta$$

$$V_y = V \sin \theta$$

To add vectors, use components!

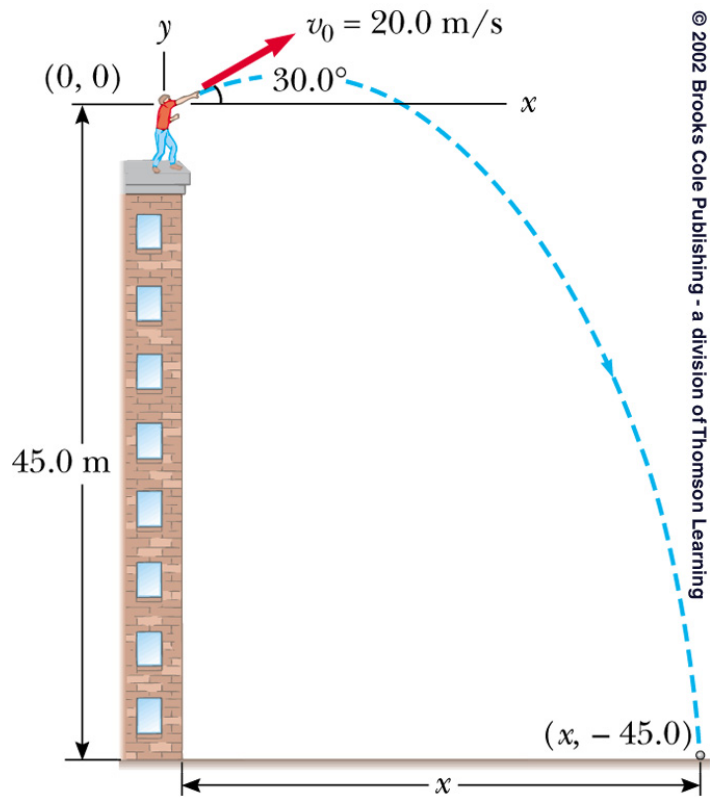
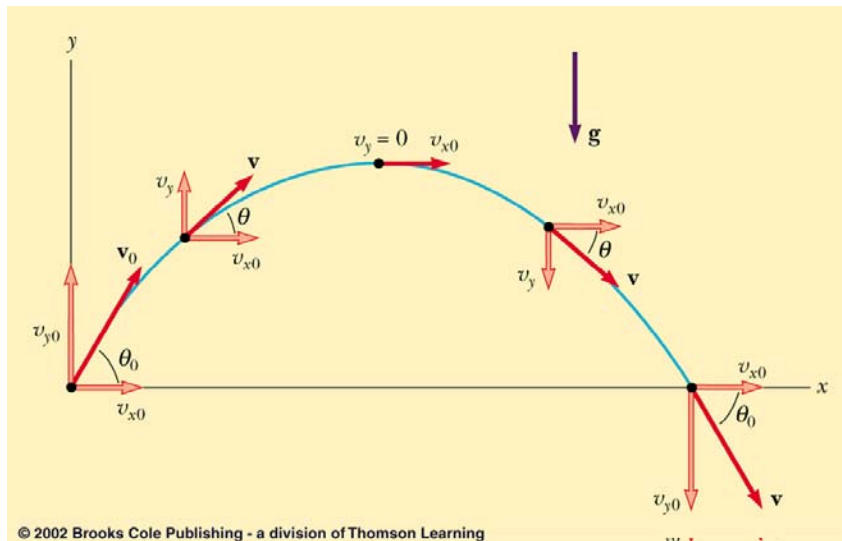
Displacement Vector addition



© 2002 Brooks Cole Publishing - a division of Thomson Learning

(a)

## Velocity Vectors of projectile motion



sign convention

right, up is +

left, down is -

## Projectile Motion

at tippy top of path  $v=0$

$$a_y = -9.8 \text{ m/s}^2 \text{ (also } -32.2 \text{ ft/s}^2\text{)}$$

$$a_x = 0, v_{ix} = v_{fx}$$

$$t_x = t_y$$

### horizontal motion formulas

$$v_{fx} = v_{ix}$$

$$d_x = v_{ix}t$$

### vertical motion formulas

$$v_{fy} = v_{iy} + a_y t$$

$$d_y = v_{iy}t + \frac{1}{2}a_y t^2$$

$$v_{fy}^2 = v_{iy}^2 + 2a_y d_y$$