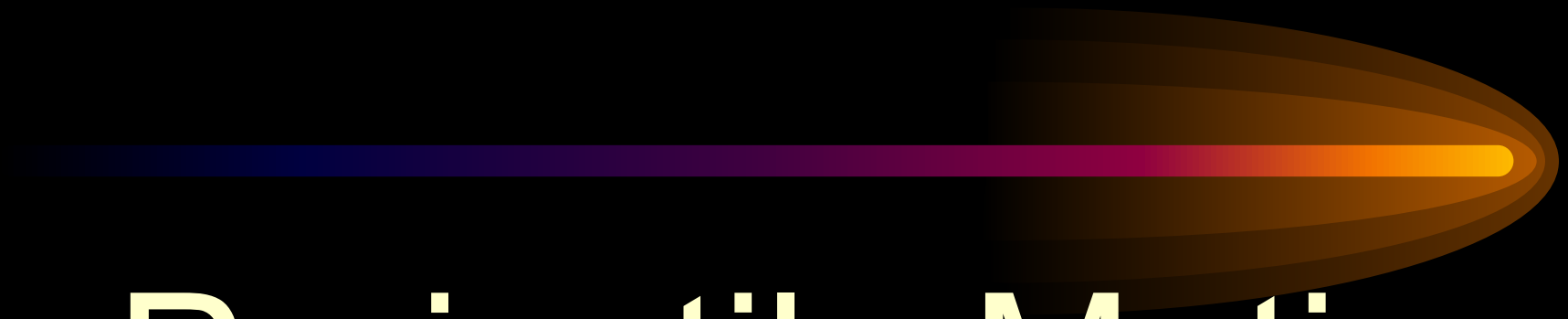
*Chapter 3*



# Projectile Motion

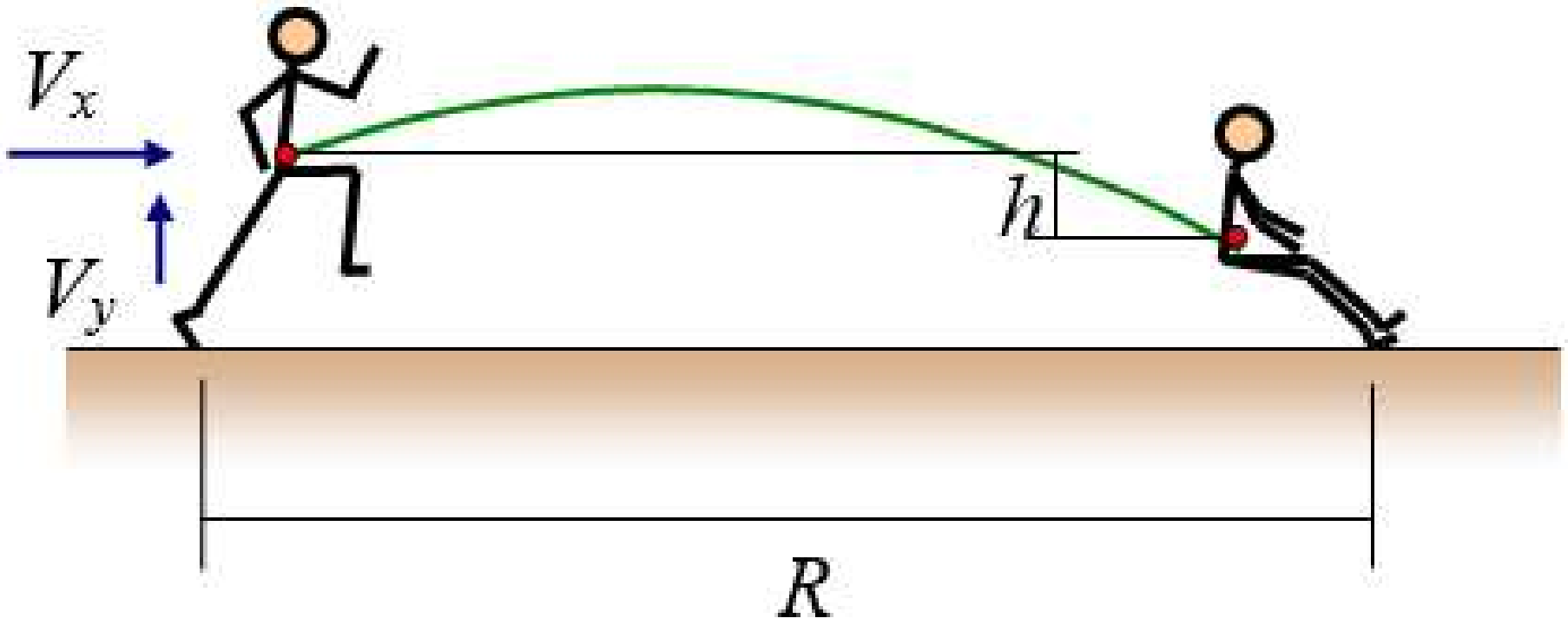
# *Scalars*

- A quantity that can be specified from its size only with units
- No direction needed
- Examples are speed and distance
- Represented by italics; $s = 2.4$ m/s

# *Vectors*

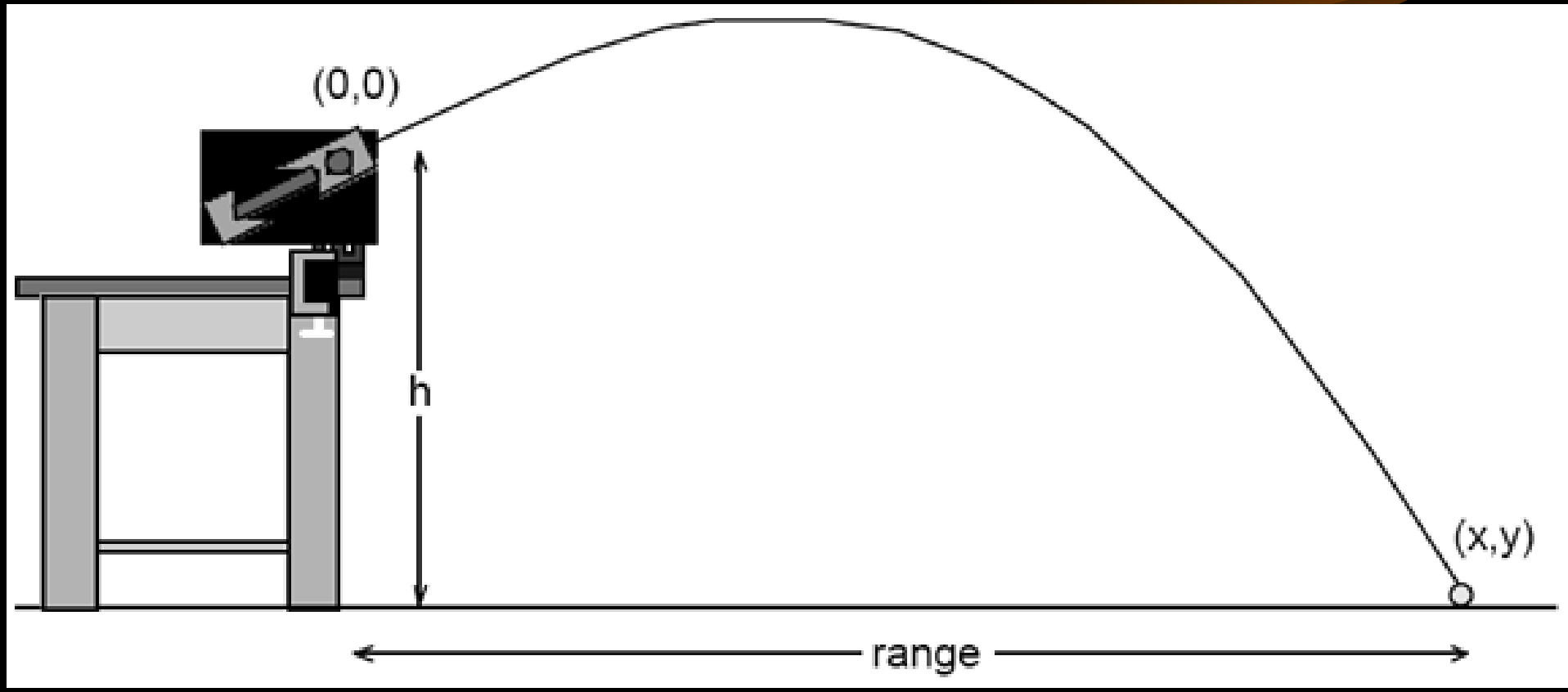
- A quantity with both magnitude and direction.
- Examples are velocity and displacement.
- Represented by boldface; **v** = 2.4 m/s to the north

- Velocity and displacement can be broken down into x and y components.
- Imagine a high jumper, he or she has both a horizontal and a vertical velocity.


$V_x$
$V_y$
$h$
$R$

# Projectile Motion

- Objects that are thrown or launched into the air and are subject to gravity are called projectiles.
- The path of a projectile is a curve called a **parabola**.
- The velocity of the projectiles for sample problems will be considered constant -no air resistance


(0,0)
h
(x,y)
range

# *Equations*

- $y = -1/2\ g\ (t^2)$
- $x = v\ (t)$

# *Example Problem*

- A pelican flying along a horizontal path drops a fish from a height of 5.4 m. The fish travels 8 m horizontally before it hits the water below. What is the pelican's speed?

$$\mathbf{Y = -\tfrac{1}{2} g t^2}$$

$$\mathbf{X = V t}$$

# Vectors

# *Pythagorean Theorem*

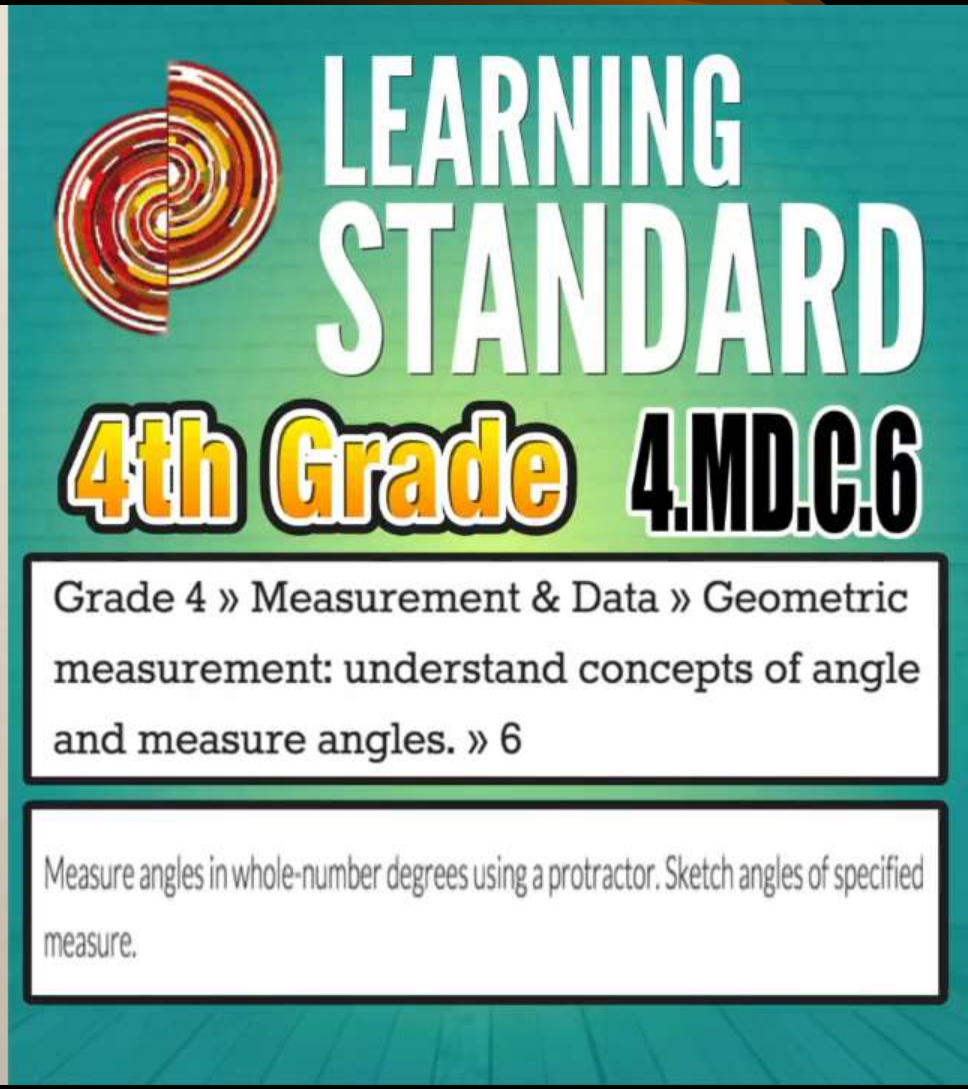
- If two vectors are at a $90^0$ angle, use the Pythagorean Theorem to find the resultant vector.
- $C^2 = a^2 + b^2$

- A pirate walks 45 m north, then 7.5 m east. What is his displacement?
- Use Pythagorean theorem since it is a 90 degree angle.

# Adding Vectors

- Vectors can be added graphically.
- When adding two or more vectors, the answer is called the resultant.
- Vectors can be moved as long as they don't change direction or length.
- Draw vectors using head to tail method.

# *How to use a Protractor*



# *Scaling*

- You can't draw 75 miles on a piece of paper so you change it to 7.5 cm.
- But what you do to one number you have to do to the others.  For example:
- 75 miles = 7.5 cm
- 12 miles = 1.2 cm
- Then you have to UNDO it at the end of the problem – so you measure 4.5 cm and the answer  is???


Force 1: 5N @ 25°
Force 2: 4N @ 112°

An arrow shoots 34 m/s North than the wind blows 25 m/s at an angle of 10 degrees North West. What is the resultant?