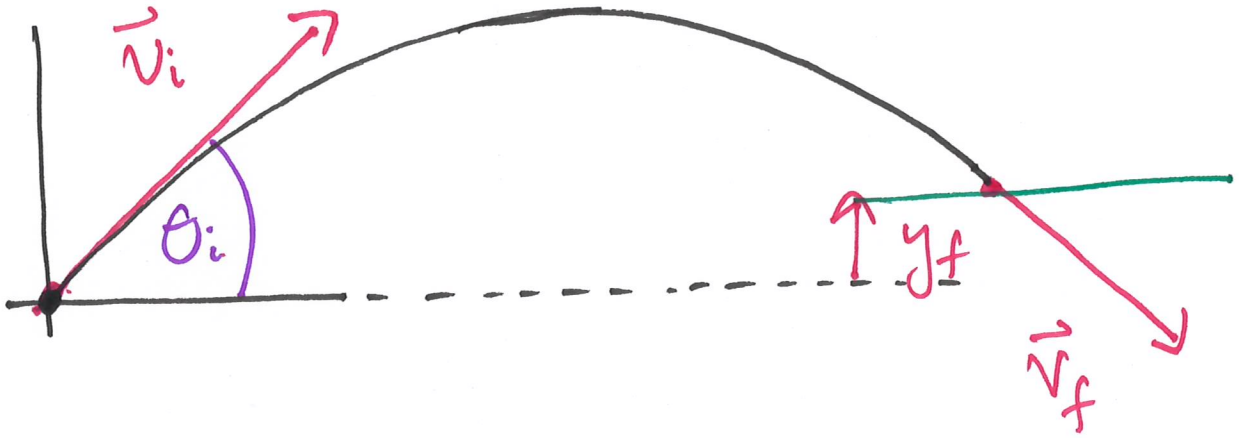
Question: A golfer hits a golf ball so that it leaves the tee at a speed of 17 m/s and an angle of 55°. If it lands on the green with a speed of 14 m/s, what is the change in elevation of the ball?

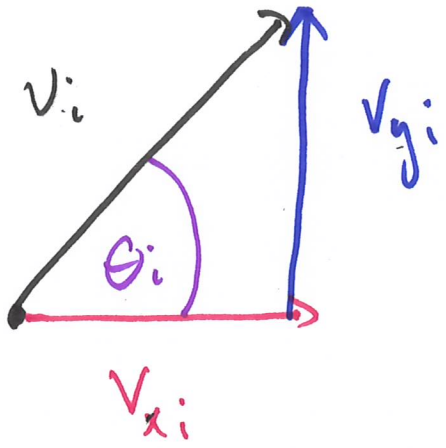
① Draw a picture



②

knowns	unknowns
$\lvert\vec{v}_i\rvert = 17\ m/s$	x_f
$\theta_i = 55°$	y_f
	t_f
$\lvert\vec{v}_f\rvert = 14\ m/s$	θ_f
$y_i = 0\ m$	v_{x_i}
$x_i = 0\ m$	v_{y_i}
$a_x = 0\ m/s^2$	v_{x_f}
$a_y = -g$	v_{y_f}
$g = 9.8\ m/s^2$	

free-fall



SOH CAH TOA

$$\cos(\theta_i) = \frac{V_{xi}}{V_i} \rightarrow V_i \cos(\theta_i) = V_{xi}$$

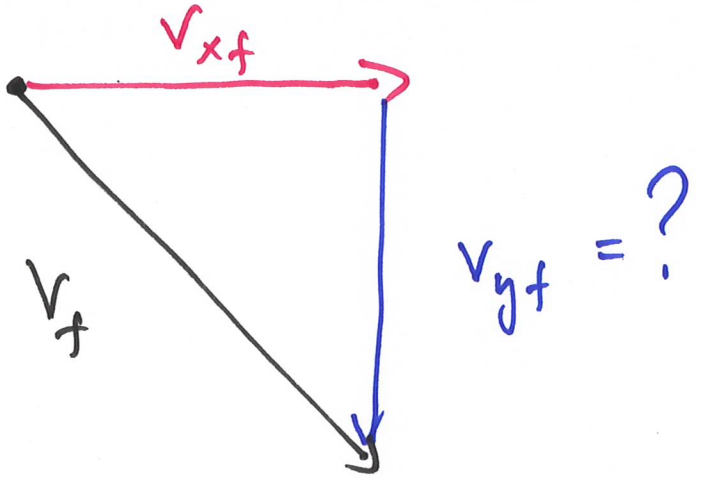
$$V_{xi} = (17\ m/s)\cos(55°)$$

$$= 9.8\ m/s$$

$$V_{yi} = (17\ m/s)\sin(55°)$$

$$= 13.9\ m/s$$

$$V_{xf} = 9.8\ m/s \qquad (= V_{xi})$$



$$v_f^2 = v_{x_f}^2 + v_{y_f}^2$$

$$v_{y_f} = \pm\sqrt{v_f^2 - v_{x_f}^2}$$

$$= -\sqrt{(14\ m/s)^2 - (9.8\ m/s)^2}$$

$$= -10.1\ m/s$$

---

① $y_f = y_i + v_{y_i} t_f + \frac{1}{2} a_y t_f^2$

② $v_{y_f}^2 = v_{y_i}^2 + 2 a_y \Delta y$

$\Delta y \rightarrow y_f - y_i \rightarrow 0 - y_i = y_f$

$$y_f = \frac{v_{y_f}^2 - v_{y_i}^2}{2 a_y}$$

$$= \frac{v_{y_f}^2 - v_{y_i}^2}{2(-g)} =$$