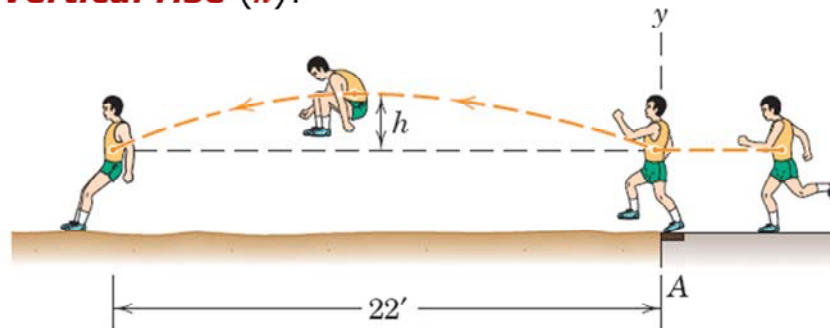


### Projectile Motion: Exercise

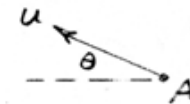
With a horizontal **velocity** ( $v_x = 30$  ft/s), what is the vertical **velocity** ( $v_y$ ) of the long jumper at takeoff to make the jump shown? What is the **vertical rise** ( $h$ )?



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$$2s = \frac{u^2 \sin 2\theta}{g} = \frac{2(u \cos \theta)(u \sin \theta)}{g}$$



But  $2s = 22$  ft,  $u \cos \theta = 30$  ft/sec,  $u \sin \theta = v_y$

$$\text{So } v_y = \frac{2sg}{2u \cos \theta} = \frac{22(32.2)}{2(30)} = \underline{11.81 \text{ ft/sec}}$$

$$\text{Also, } h = \frac{u^2 \sin^2 \theta}{2g} = \frac{v_y^2}{2g} = \frac{(11.81)^2}{2(32.2)} = \underline{2.16 \text{ ft}}$$