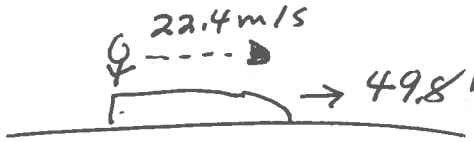
03 – Smith Train

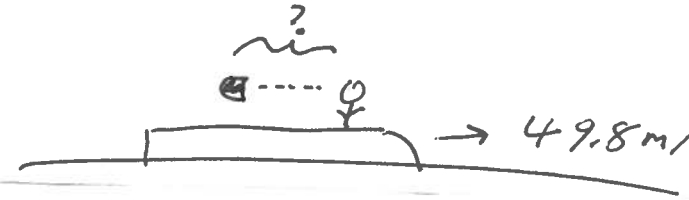
1. 

want v_{BE} (Bullet wrt Earth)

$v_{BE} = v_{BT} + v_{TE}$

$22.4 + 49.8 = 72.2$

$\boxed{v_{BE} = 72.2 \text{ m/s}}$

2. 

----> $v_{BE} = +26.4$ m/s (FOWARD)

want v_{BT}:

$v_{BE} = v_{BT} + v_{TE}$

$26.4 = v_{BT} + 49.8$

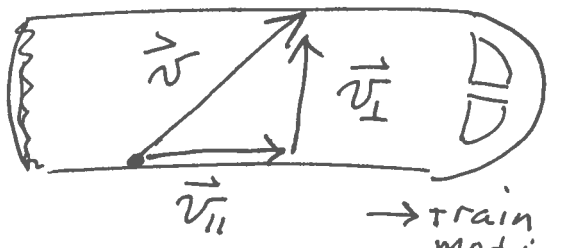
$v_{BT} = 26.4 - 49.8 =$

$= -23.4$ m/s (she shot towards end of train)

3. Here $v_{\parallel}^2 + v_{\perp}^2 = v^2$

$v_{\parallel} = 49.8$ m/s

$v_{\perp} = 29.2$ m/s

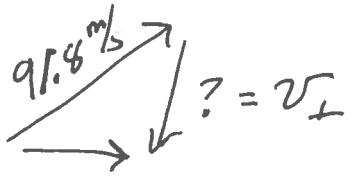


$v = \sqrt{v_{\parallel}^2 + v_{\perp}^2} = \boxed{57.7 \text{ m/s} = v}$

4.

$v_{\parallel}^2 + v_{\perp}^2 = v^2$

$(49.8)^2 + v_{\perp}^2 = (91.8)^2$



$v_{\perp}^2 = 91.8^2 - 49.8^2 = \boxed{v_{\perp} = 77.1 \text{ m/s}}$