8. Three vectors are shown in Figure 2-19; their magnitudes are given in arbitrary units. Determine the sum of the three vectors. Give the resultant in terms of
   a) components.
   b) magnitude and angle with the x-axis.

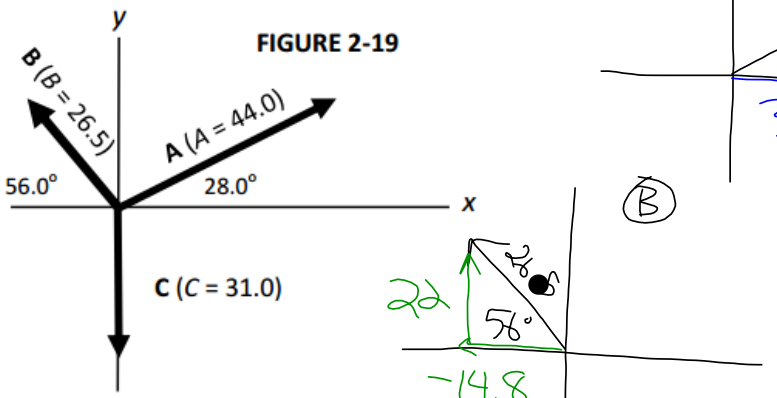
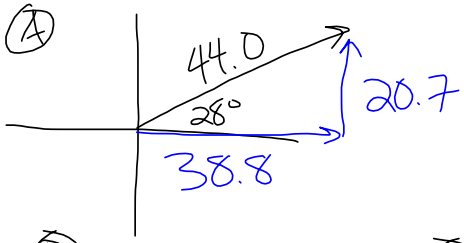
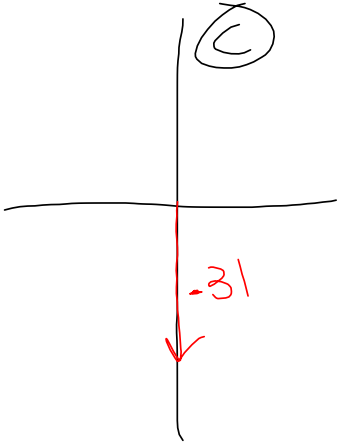


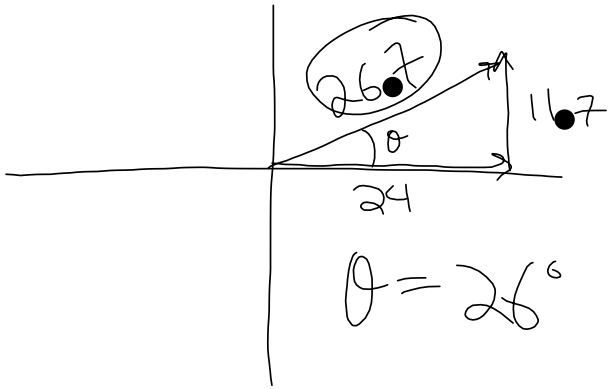
FIGURE 2-19





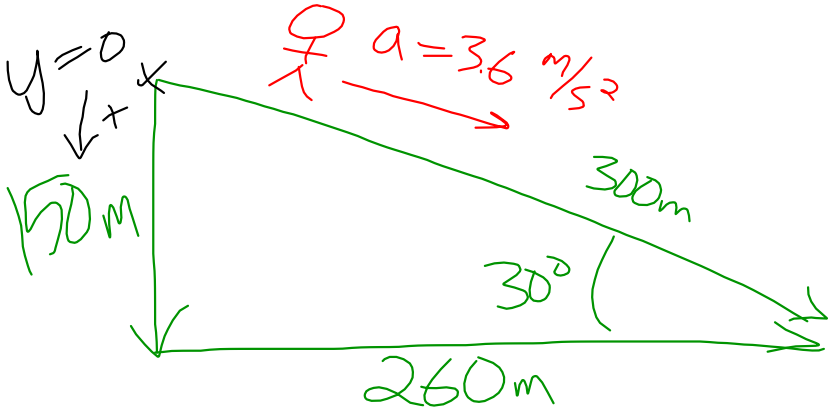
X: 38.8 + −14.8 = 24

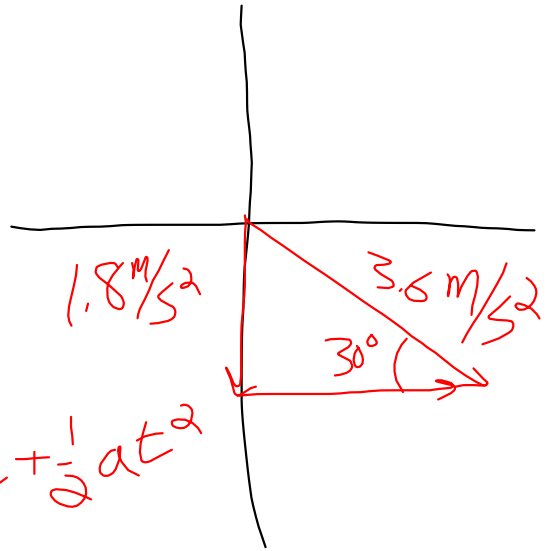
Y: 20.7 + 22 − 31 = 11.7



θ = 26°

12. A skier is accelerating down a 30.0° hill at 3.60 m/s^2.
    a) What is the vertical component of her acceleration? 1.8 m/s^2 down
    b) How long will it take her to reach the bottom of the hill, assuming she starts from rest and accelerates uniformly, if the elevation change (elevation is a measure of the vertical direction) is 150 m?

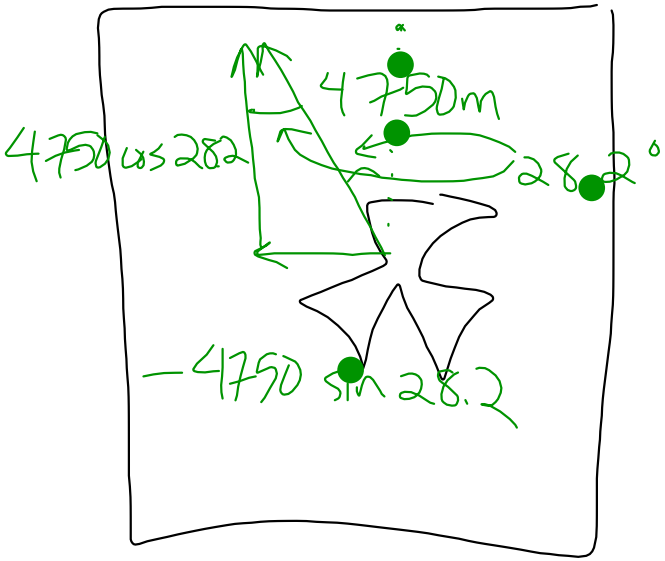


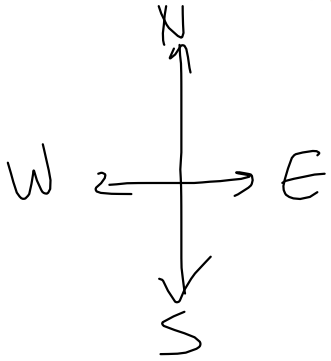


$y_0 = 0$
$y = 150m$
$v_{0y} = 0$
$v_y =$
$a_y = 1.8\ m/s^2$
$t =$

$y = y_0 + v_{0y}t + \frac{1}{2}at^2$
$150 = \frac{1}{2}(1.8)t^2$
$t = 12.9\ s$

17. The summit of a mountain, 2150 m above a camp, is measured on a map to be 4750 m horizontally from the camp in a direction 28.2° west of due north. What are the components of the displacement vector from camp to summit? What is its length? Choose the x-axis east, y-axis north, and z-axis up.



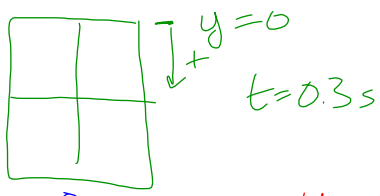


(−2245, 4186, 0)

(0, 0, 2150)

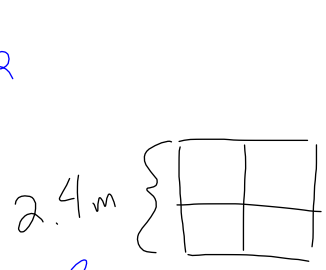
(−2245, 4186, 2150) ≈ 5214m

44. A falling stone takes 0.30 s to pass a window 2.4 m high. In other words, as the stone is falling, 0.30 seconds pass AS the stone falls past the window. From what height above the top of the window did the stone fall?



$y_0 = 0$
$y = 2.4\,m$
$v_0 = 6.53\,m/s$
$v =$
$a = 9.8\,m/s^2$
$t = 0.3\,s$

$y = y_0 + v_0 t + \frac{1}{2}at^2$
$2.4 = v_0(.3) + \frac{1}{2}(9.8)(.3^2)$
$v_0 = 6.53\,m/s$



$y_0 = 0$
$y =$
$v_0 = 0\,m/s$
$v = 6.53\,m/s$
$a = 9.8\,m/s^2$
$t =$

$v^2 = v_0^2 + 2a(y - y_0)$
$6.53^2 = 2(9.8)(y)$
$y = 2.18\,m$