5.1 Motion in Two Dimensions

STANDARDS

5.1 I can define, interpret, and analyze objects moving in two dimensions.

The Race Is On

START FINISH

$x = vt$

100 m

① 9 m/s, 30°: $t = \frac{x}{v} = \frac{115\text{ m}}{9\text{ m/s}} = 12.8\text{ s}$

② 8 m/s: $t = \frac{x}{v} = \frac{100\text{ m}}{8\text{ m/s}} = 12.5\text{ s}$

$\cos 30 = \frac{100}{d}$

$d = 115\text{ m}$

30°

100 m

9 m/s, 30°

$\cos 30 = \frac{V_x}{9}$

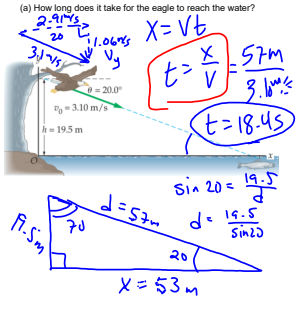
$V_x = 7.8\text{ m/s}$

The Eagle Descends

An eagle perched on a tree limb 19.5 m above the water spots a fish swimming near the surface. The eagle pushes off from the branch and descends toward the water. By adjusting its body in flight, the eagle maintains a constant speed of 3.10 m/s at an angle of 20.0° below horizontal.

The Eagle Descends

(a) How long does it take for the eagle to reach the water?



$x = vt$

$t = \frac{x}{v} = \frac{57\text{ m}}{3.10\text{ m/s}}$

$t = 18.4\text{ s}$

$\sin 20 = \frac{19.5}{d}$

$d = \frac{19.5}{\sin 20}$

$d = 57\text{ m}$

70°, 20°, 19.5 m

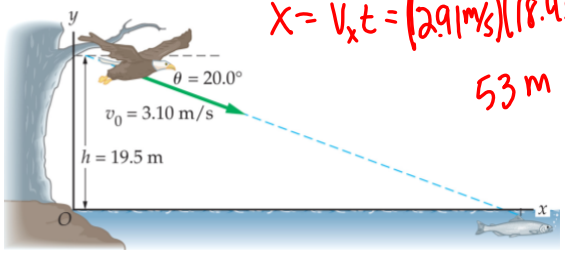
$x = 53\text{ m}$

$t = \frac{y}{V_y} = \frac{19.5\text{ m}}{1.06\text{ m/s}}$

$t = 18.4\text{ s}$

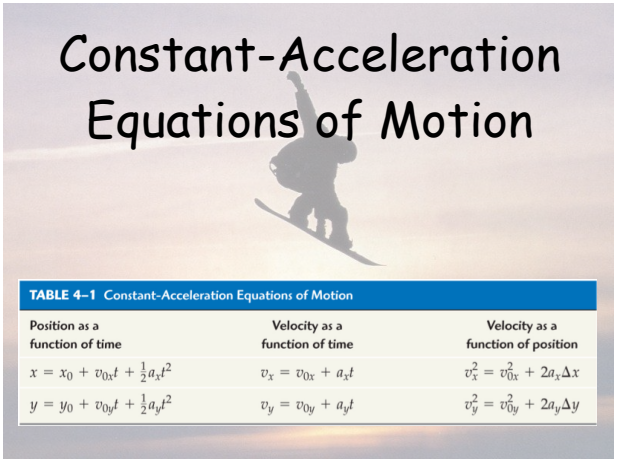
The Eagle Descends

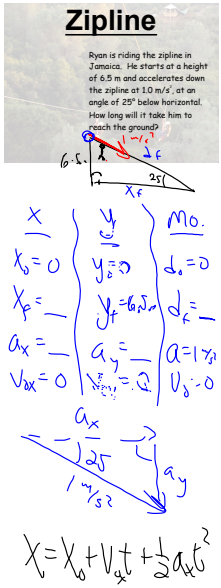
(b) How far has the eagle traveled in the horizontal direction when it reaches the water?



$x = V_x t = (2.91\text{ m/s})(18.4\text{ s})$

53 m





HOMEWORK

Unit 5 Problems (1-4)