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## Section 2. Problem Solving

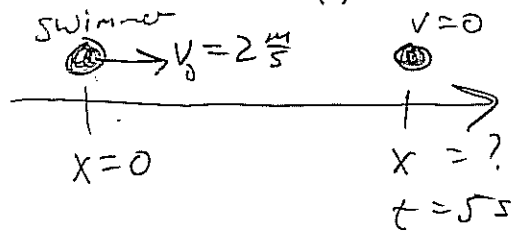
For each question shown below, you must (1) identify the "class" of problem (like uniform motion, constant acceleration, free-fall, etc.); (2) sketch a picture of the situation described in the problem; (3) write given variables and unknowns; (4) use the appropriate equations; and (5) correctly solve for the unknown(s). Be sure to check your final answer and verify that it makes sense and has correct units.

**Your final answer will NOT receive full credit if you do not do the steps above and if your final answer has missing or wrong units.**

17. A swimmer has a constant velocity of 2.0 m/s in the $+x$ direction when he stops kicking and just glides. He comes to a stop, 5 s later. (a) How far does the swimmer glide, assuming that he slows down with a constant acceleration? (b) What is his acceleration?

+5

(a)




constant acceleration

note: $x - x_0 = v_0 t + \frac{1}{2} a t^2$

$v = v_0 + at$

$v^2 = v_0^2 + 2a(x - x_0)$

$x - x_0 = \left(\frac{v + v_0}{2}\right) t$

$v_0 = 2 \frac{m}{s}$

(5) $v = 0$

$x_0 = 0$

$t = 5s$

$x = ?$

$a = ?$

$x - x_0 = \left(\frac{v + v_0}{2}\right) t$ +4

$x = \left(\frac{0 + 2}{2}\right)(5)$

$\boxed{x = 5\,m}$ +4

(b)

$v = v_0 + at$ +4

$0 = 2 + a(5)$

$a = \frac{-2}{5} = \boxed{-0.4 \frac{m}{s^2}}$ +4

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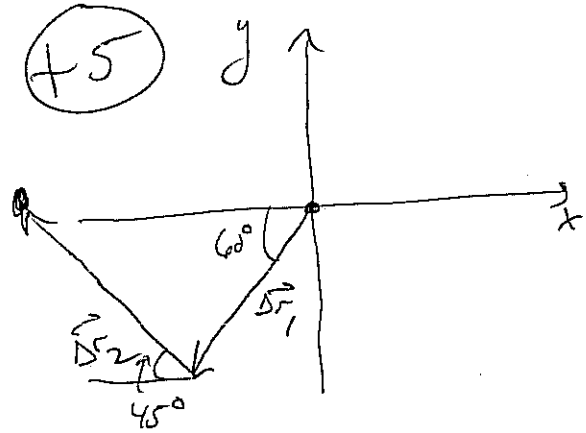
18. A hiking trail goes 800 m in a direction 60 ° S of W (south of west). It then goes 1000 m in a direction 45 ° N of W where it ends at a waterfall. Taking the beginning of the trail as your origin, find the position of the waterfall and write it in vector notation (i.e. $< x, y >$).

Vectors (displacement)

+5




+5

$\vec{\Delta r}_{total} = \vec{\Delta r}_1 + \vec{\Delta r}_2$

$\vec{\Delta r}_{total} = \langle \Delta x_1, \Delta y_1 \rangle + \langle \Delta x_2, \Delta y_2 \rangle$

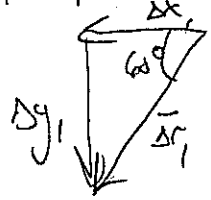
$= \langle \Delta x_1 + \Delta x_2, \Delta y_1 + \Delta y_2 \rangle$

$= \langle -400 + -707, -693 + 707 \rangle$

$\vec{\Delta r}_{total} = \langle -1107, 147 \rangle$ m

+8

$|\vec{\Delta r}_1| = 800$ m




$\sin\theta = \frac{opp}{hyp}$

$\sin(60) = \frac{\Delta y_1}{800}$

$\cos\theta = \frac{adj}{hyp}$

$\cos(60) = \frac{\Delta x_1}{800}$

$\Delta y_1 = 800 \sin(60)$

$\Delta y_1 = -693$ m (to the south)

$\Delta x_1 = 800 \cos(60)$

$\Delta x_1 = -400$ m (− is "to the left")

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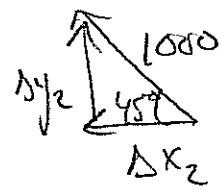
$|\vec{\Delta r}_2| = 1000$ m




+8

$\cos\theta = \frac{adj}{hyp}$

$\cos 45 = \frac{\Delta x_2}{1000}$

$\Delta x_2 = 1000 \cos(45)$

$\Delta x_2 = -707$ m (− is to the West)

$\Delta y_2 = +707$ m since $\theta = 45°$ and $\Delta y$ is to the North

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