1-D kinematics practice problems

I purposely left no space on this page so that you would be forced to complete your work on separate paper. My expectation is that you begin to develop the habit today for showing your work in a neat, legible, and organized manner so that you (and others) might be able to follow your work and so that any potential mistakes may be identified and corrected. It is not enough to arrive at a correct answer. You must be able to communicate your work and your process clearly. -Thanks for reading! -TMP

1. How long does it take an airplane to fly 5000 m if it maintains a speed of 240 meters per second? $t = 20.8\ s$
2. A sailboat travels a distance of 600 m in 40 seconds. What speed is it going? $\vec{v} = 15\ m/s$
3. What distance will a car traveling at a speed of 15 m/s cover in 300 s? $\Delta x = 4500\ m$
4. A car is driving at a velocity of 24 m/s. If its brakes can supply an acceleration of -5.0 m/s^2, how much time will be required to bring the car to a stop? $t = 4.8\ s$
5. An object accelerates at a rate of -3.2 m/s^2 to a velocity of 5 m/s over a time of 10 s. What was its initial velocity? $v_i = 37\ m/s$
6. A snowmobile is moving at 3.0 m/s. If it accelerates at the rate of 0.50 m/s^2 for 7.0 seconds, how fast would it be going? $v_f = 6.50\ m/s$
7. A snowmobile is moving at 3.0 m/s. If it slows at the rate of 0.60 m/s^2, how long would it take to come to a complete stop? $t = 5\ s$
8. A plane starting from rest on a runway undergoes a constant acceleration of 1.6 m/s^2 for 1600 meters before takeoff.

   a. is the plane's velocity when it reaches the end of the runway? $v_f = 71.6\ m/s$

   b. What is the time required to achieve takeoff velocity? $t = 44.75\ s$
9. A boy sledding down a hill accelerates at 1.40 m/s^2. If he started from rest, how far would he travel before reaching a speed of 7.00 m/s? $\Delta x = 17.5\ m$
10. A bus uniformly slows down from 75 km/hr (21 m/s) to a stop over 220 m, how long does it take to come to rest? $\vec{a} = -1\ m/s^2$

1-D Kin problems

1) $P_x = 5000\,m \qquad \vec{v} = 240$

$\vec{v} = \frac{\Delta x}{t}$

$t = \frac{5000}{240}$

$\vec{v}t = \Delta x$

$t = \frac{\Delta x}{\vec{v}}$

2) $\Delta x = 600$

$t = 40$

$\vec{v} = ?$

$\vec{v} = \frac{600}{40}$

3)

$\vec{v} = 15$

$t = 300$

$\Delta x = \vec{v}\,t$

$[\Delta x = 16.300]$

4)

$v_i = 24\ m/s$

$a = -5\ m/s^2$

$v_f = 0$

$a = \frac{(v_f - v_i)}{t}$

$t = \frac{-24}{-5}$

$at = v_f - v_i$

$t = \frac{v_f - v_i}{a}$

5) $a = -3.2\,m/s^2$

$v_f = 5\ m/s$

$t = 10$

$a = \frac{5 - X}{-3.2}$

$a = \frac{v_f - v_i}{t}$

$ta = v_f - v_i$

$v_i = v_f - ta$

$x = 5 - 10 \cdot (-3.2)$

$5 + 32$

6) ~~[illegible]~~ 16 $V_i = 3\ m/s$ $a = -.5\ m/s^2$ $t = 7\ sec$

$V_f = V_i + at$ $[3 + (-.5)\cdot 7]$

7) $V_i = 3\ m/s$ $V_f = 0$ $a = -.6\ m/s^2$

$V_f = V_i + at$

$V_f - V_i = at$ $\rightarrow$ $t = \frac{V_f - V_i}{a}$

$\left[= \frac{-3}{-.6} \right]$

8) $a = 1.6\ m/s^2$ $\Delta x = 1600\ m$ $V_i = 0$

a) ~~$V_f = V_i + at$~~ $[= 0 + 1.6 \cdot 1600]$ $\left[V_f^2 = V_i^2 + 2a\Delta x\right]$

~~$V_f^2 - V_i^2 = 2a\Delta x$~~

~~$\frac{V_f^2 - V_i^2}{2a} =$~~ $\left[V_f^2 = 0 + 2 \cdot 1.6 \cdot 1600\right]$

b)

$\left[t = \frac{7 - 1.6 = 0}{1.6}\right]$

9) $a = 1.4\ m/s^2$ $V_i = 0$ $V_f = 7\ m/s$

$V_f^2 = V_i^2 + 2a\Delta x$ $\rightarrow$ $\left[\Delta x = \frac{V_f^2 - V_i^2}{2a}\right]$

$\left[\Delta x = \frac{49 - 0}{2.8}\right]$

10) $V_i = 29\ m/s$ $\Delta x = 220\ m$

$V_f = 0$

$0 - 441$

$2a = \frac{V_f^2 - V_i^2}{x}$

220