

More Problems:

4. A policeman has a radar gun pointed at a car. The radar says 40 m/s. Five seconds later, the car passes a second policeman, whose radar gun clocks the car's velocity at 55m/s. Assuming that the radar guns are correct, how much did the car accelerate between the two policemen?

$$\Delta V = \text{Final Velocity} - \text{Beginning Velocity}$$

$$\Delta V = 55 \text{ m/s} - 40 \text{ m/s} = 15 \text{ m/s}$$

$$a = \frac{\Delta V}{\Delta t} = \frac{15 \text{ m/s}}{5 \text{ s}} = 3 \text{ m/s}^2$$

5. A sprinter takes off from the starting line at time. After 4 seconds, the sprinter has sped up to 15 ~~miles~~ <sup>m/s</sup> per hour. What was the sprinter's average acceleration?

$$a = \frac{\Delta V}{\Delta t} = \frac{15 \text{ m/s}}{4 \text{ s}} = 3.75 \text{ m/s}^2$$

6. A car was traveling down the interstate with a velocity of 28 m/s. The driver sped up to pass, increasing the car's velocity to 33 m/s. It took the driver 2 seconds to speed up to this new velocity. What was the car's acceleration during those two seconds?

$$\Delta V = 33 \text{ m/s} - 28 \text{ m/s} = 5 \text{ m/s}$$

$$a = \frac{\Delta V}{\Delta t} = \frac{5 \text{ m/s}}{2 \text{ s}} = 2.5 \text{ m/s}^2$$

Make them do drawings

Acceleration Measurement and Estimation Practice – \*\*\*Assuming Constant Acceleration\*\*\*

	Distance Traveled (m)	Change in Time (s)	Velocity at starting point (m/s)	Average Velocity (m/s)	Velocity at ending point (m/s)	Change in Velocity (m/s)	Acceleration (m/s <sup>2</sup> )
Example A	16	4					
Example B	3	1.2					
Example C	2	10					

**Velocity and Acceleration Practice Questions:**

- How long is the line below, in cm and in meters?  $9.2 \text{ cm} = 0.092 \text{ m}$
- Fill in the correct units. This school is about 200 m long. A person is about 200 cm tall.
- It takes a pitcher's fastball about 0.46 seconds to travel 18.4m from the pitcher's mound to home plate.
  - For this event,  $t = 0.46 \text{ s}$  and  $d = 18.4 \text{ m}$   $v = \frac{d}{t}$   $v = \frac{18.4 \text{ m}}{0.46 \text{ s}} = 40 \text{ m/s}$
  - What is the fastball's average velocity on the way to the plate?  $40 \text{ m/s}$
  - About how many miles per hour is that?  $(40 \text{ m/s}) \times 2 = 80 \text{ mph}$   $80 \text{ mph}$   $2.24$
- A snail is traveling down the stem of a plant. The length of the stem is 0.4m, and it takes the snail 900 seconds (about 15 minutes) to travel down the stem.
  - For this event,  $t = 900 \text{ s}$  and  $d = 0.4 \text{ m}$   $v = \frac{d}{t} = \frac{0.4 \text{ m}}{900 \text{ s}} = 0.000444 \text{ m/s}$
  - What is the snail's velocity? snail's velocity?  $0.000444 \text{ m/s}$
  - About how many miles per hour is that?  $0.000888 \text{ m/s}$

5. Estimate the velocity of someone walking by. You are not allowed to use any measuring devices. Fill in the following blanks. Then explain how you came up with those numbers.

a. For this event,  $t = 6s$  and  $d = 5m$

$$v = \frac{d}{t} = \frac{5m}{6s} = 0.83 \frac{m}{s}$$

b. What was the person's velocity, in m/s?  $0.83 \frac{m}{s}$

c. About how many miles per hour is that?

$(0.83 \frac{m}{s})(2) = 1.66 \text{ mph}$

Can't mississippi to get time. Estimate long steps to get distance.

6. What is the acceleration of gravity, in  $m/s^2$ ?

$9.8 \frac{m}{s^2}$  (or <sup>about</sup>  $10 \frac{m}{s^2}$ )

7. If something is dropped from a high place, what velocity will it have after falling for four seconds? (ignoring air resistance)

Time	0s	1s	2s	3s	4s
Velocity	0m/s	10m/s	20m/s	30m/s	40m/s

8. Suppose you're standing still. Then you begin accelerating at a rate of  $2 \frac{m}{s^2}$ . What will your velocity be after 6 seconds?

Time	0s	1s	2s	3s	4s	5s	6s
Velocity	0m/s	2m/s	4m/s	6m/s	8m/s	10m/s	12m/s

9. Write the formula for acceleration, and explain what it means.

$a = \frac{\Delta v}{\Delta t}$  ← How much velocity changes  
 ← How long it takes velocity to change

10. If I say, "the ball had an acceleration of  $8 \frac{m}{s^2}$ ", what does that mean?

As each second goes by,  $8 \frac{m}{s}$  is added to its speed.

11. A cheetah crouches in the grass. Then it sprints after a gazelle. After 2 seconds, the cheetah has sped up from 0 m/s to 17 m/s. What is the cheetah's acceleration?

a.  $\Delta v = \underline{17 \text{ m/s}}$       b.  $\Delta t = \underline{2 \text{ s}}$       c. acceleration =  $\underline{8.5 \text{ m/s}^2}$

$$a = \frac{\Delta v}{\Delta t} = \frac{17 \text{ m/s}}{2 \text{ s}} = 8.5 \text{ m/s}^2$$

12. You stop at a stop sign. Then you accelerate. After 10 seconds, you pass one of those speed limit signs that tells you your speed. It says you're going 30 mph (the same as 13.4 m/s). What was your average acceleration?

a.  $\Delta v = \underline{13.4 \text{ m/s}}$       b.  $\Delta t = \underline{10 \text{ s}}$       c. acceleration =  $\underline{1.34 \text{ m/s}^2}$

$$a = \frac{\Delta v}{\Delta t} = \frac{13.4 \text{ m/s}}{10 \text{ s}} = 1.34 \text{ m/s}^2$$

13. You hold a sled on a snowy hill, and then you let it go. While you're doing this, a friend is watching you with a timer. As soon as you let go of the sled, the friend starts the timer. As soon as the sled reaches the bottom of the hill, the friend stops the timer. Then the two of you measure how far the sled as it traveled down the hill. **The sled slid 20 m, in 8 seconds.**

a. What distance did the sled travel?  $d = \underline{\hspace{2cm}}$

b. What amount of time passed by while the sled was sliding?  $t = \underline{\hspace{2cm}}$

c. What was the initial velocity of the sled?  $v_{\text{initial}} = \underline{\hspace{2cm}}$

d. What was the average velocity of the sled?  $v_{\text{average}} = \underline{\hspace{2cm}}$

e. What was the final velocity of the sled?  $v_{\text{final}} = \underline{\hspace{2cm}}$

f.  $\Delta v = \underline{\hspace{2cm}}$        $\Delta t = \underline{\hspace{2cm}}$

g. What was the sled's acceleration?  $a = \underline{\hspace{2cm}}$