

OURS  
 now time?  
 (equation 1)

Kinematics Continued

$v_f = v_o + at$  (equation 2)

ne must reach a velocity of 71 m/s for takeoff. If the runway is 1.0 km long, what must the acceleration be?

1. An airplane accelerates from a velocity of 21 m/s at the constant rate of  $3.0 \text{ m/s}^2$  over 535 m. What is its final velocity?
2. The pilot stops the same plane in 484 m using a constant acceleration of  $-8.0 \text{ m/s}^2$ . How fast was the plane before braking began?
3. A person wearing a shoulder harness can survive a car crash if the acceleration is smaller than  $-300 \text{ m/s}^2$ . Assuming constant acceleration, how far must the front end of the car collapse if it crashes while going 101 km/h?
4. A car is initially sliding backwards down a hill at  $-25 \text{ km/h}$ . The driver guns the car. By the time the car's velocity is  $+35 \text{ km/h}$ , it is  $+3.2 \text{ m}$  from its starting point. Assuming the car was uniformly accelerated, find the acceleration.

KINEMATICS REVIEW

	$v_o$	$v_f$	a	d	t
$a = \frac{v_f - v_o}{t}$					
$d = \left(\frac{v_o + v_f}{2}\right)t$					
$d = v_o t + \frac{1}{2} at^2$					
$v_f^2 = v_o^2 + 2ad$					

What do you notice about each equation with respect to the 5 possible variables present?  
 To help you to figure out which equation you should use list all the variables that are given and the unknown variable that you want to find. Use the equation that is missing the variable that you have not previously listed!

Problems: Answer all problems on a separate piece of paper, showing all work.

1. An object accelerates uniformly from rest to a velocity of 12.0 m/s in 3.40 s. Calculate the acceleration of the object.
2. An object accelerates uniformly from rest. If the final velocity of the object after 4.7 s is 15 m/s, what is its displacement?
3. An object accelerates uniformly from rest at a rate of  $1.9 \text{ m/s}^2$  for 5.0 s. Find: a. the displacement b. the final velocity

4. An object initially traveling at a velocity of 2.0 m/s accelerates uniformly at a rate of  $1.3 \text{ m/s}^2$ . During this time of acceleration, the displacement of the object is 15 m. Find the final velocity.
  5. An object accelerates uniformly from a velocity of 5.0 m/s at a rate of  $3.0 \text{ m/s}^2$ . What is the velocity of the object at 2.9 s?
  6. An object accelerates uniformly from rest. If it travels 26.0 m and reaches a velocity of 11.0 m/s, how long was the object accelerating?
  7. An object accelerates uniformly from rest for 8.1 s. If in this time the displacement of the object is 20.0 m, what is the acceleration?
  8. An object uniformly accelerates from 15 km/h to 65 km/h. If the rate of acceleration is  $4.0 \text{ m/s}^2$ , what is the displacement of the object during acceleration?
  9. An object uniformly accelerates from rest and reaches a velocity of 122.0 km/h in 10.5 s. What is the average velocity of the object?
  10. An object accelerates uniformly from rest at a rate of  $2.40 \text{ m/s}^2$ . How long (time) was the object traveling when a velocity of 12.0 m/s was reached?
  11. While accelerating uniformly from rest, an object is displaced 19.0 m in 7.10 s. What is the velocity at this time?
  12. An object travels 8.0 m in 3.2 s while uniformly accelerating at a rate of  $0.71 \text{ m/s}^2$ . What was the initial velocity of the object?
  13. An object uniformly accelerates from 15.0 m/s to 35.0 m/s. What is the rate of acceleration if the displacement during this time was 43.0 m?
  14. An object uniformly accelerates from a velocity of 7.0 m/s to 19.0 m/s. What is the average velocity of the object?
  15. An object accelerates uniformly at a rate of  $1.50 \text{ m/s}^2$  for 10.0 s. If the velocity of the object reaches 25.0 m/s at this time, what was the initial velocity?
  16. An object is displaced 25.0 m while accelerating uniformly. If a velocity of 14.0 m/s is reached in 1.90 s, what was the initial velocity?
  17. An object accelerates uniformly from rest for 5.6 s. What was the velocity of the object in this time if the displacement was 31.0 m?
  18. An object accelerates uniformly at a rate of  $0.900 \text{ m/s}^2$ . This object reaches a velocity of 25.0 m/s while its displacement was 37.0 m. What was the initial velocity of the object?
  19. A ball, starting from rest, accelerates uniformly down an incline at a rate of  $1.4 \text{ m/s}^2$ . Find:
    - a. the distance traveled by the ball in 5.0 s.
    - b. the velocity of the ball at 5.0 s.
  20. An object was traveling at an average velocity of 9.60 m/s. If the time of travel was 2.70 s, what was the displacement of the object?
  21. An object was uniformly accelerated from rest at a rate of  $3.10 \text{ m/s}^2$ . If this object reaches a velocity of 12.4 m/s in 4.00 s, what is the displacement of the object while accelerating?
  22. An object initially at rest is uniformly accelerated to a velocity of 10.0 m/s in 2.50 s. If during this time the displacement of the object was 12.5 m, what was the rate of acceleration?
  23. An object was displaced 19.6 m while uniformly accelerating from rest. If the average velocity of the object was 5.00 m/s, what was the rate of acceleration?
  24. An object uniformly accelerates at a rate of  $1.00 \text{ m/s}^2$ . While accelerating at this rate, the object is displaced 417.2 m in a time of 27.0 s. What velocity did this object reach in this time? this one is tougher!
1.  $3.53 \text{ m/s}^2$  2. 35 m 3a. 24 m b. 9.5 m/s 4. 6.6 m/s 5. 14 m/s 6. 4.73 s 7.  $0.601 \text{ m/s}^2$  8. 39 m 9. 61.0 km/h or 16.9 m/s 10. 5.00 s 11. 5.35 m/s 12. 1.4 m/s 13.  $11.6 \text{ m/s}^2$  14. 13.0 m/s 15. 10.0 m/s 16. 12.3 m/s 17. 11 m/s 18. 23.6 m/s 19a. 18 m b. 7.0 m/s 20. 25.9 m 21. 24.8 m 22.  $4.00 \text{ m/s}^2$  23.  $2.55 \text{ m/s}^2$  24. 29.0 m/s