Kinematic Equations Worksheet

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Acceleration needs to be constant for these equations to be valid.

Equation	Missing Quantity
$v = v_0 + at$	$x - x_0$
$x - x_0 = v_0 t + \frac{1}{2}at^2$	v
$v^2 = v_0^2 + 2a(x - x_0)$	t
$x - x_0 = \frac{1}{2}(v_0 + v)t$	a
$x - x_0 = vt - \frac{1}{2}at^2$	v_0

Problem 1. A runner accelerates to 4.2 m/s^2 for 10 seconds before winning the race. How far did he/she run?

Problem 2. A plane starts from rest and accelerates uniformly over a time of 20 s for a distance of 300 m. Determine the plane's acceleration.

Problem 3. A ball free falls from the top of the roof for 5 seconds. How far did it fall? What is its final velocity at the end of 5 seconds?

Problem 4. A bobsled team accelerates the sled to go to 150 m/s in 3 seconds from rest. (a)What is the sled's acceleration? (b) What is the distance the bobsled team traveled?

Problem 5. A bullet leaves a rifle with a velocity of 452 m/s. While accelerating through the barrel of the rifle, the bullet moves a distance of 0.93 m. Determine the acceleration of the bullet.

Problem 6. The observation deck of the Empire State Building is 381 m above the street. Determine the time required for a penny to free fall from the deck to the street below.

Problem 7. A bowling ball is dropped on the Jupiter from a height of 3 meters with an initial velocity of 0.4 m/s. The acceleration of gravity on Jupiter is 24.5 m/s^2. How long does it take for the bowling ball to reach the surface of Jupiter?

Problem 8. A truck accelerates uniformly from rest to a speed of 9.2 m/s over a distance of 26.2 m. Determine the acceleration of the truck.