Linear Motion and Freefall
Physics First Honors 2013/14

Name KEY

Kinematics Problem Sheet

Given the variables in each problem, decide which equation to use and solve. Write the "equation number" used in the blank. Remember all your answers need units!

Show your work below each problem!

	Given	Find	Not Used	Equation #
1	$t = 6.0$ s, $V_i = 2.0$ m/s, $V_f = 14$ m/s	$a =$ 2 m/s²	d	1

$V_f = V_i + at$

$14 = 2 + 6a$

$12 = 6a$

$a = \frac{12}{6} = 2\ m/s^2$

2	$t = 4.00$ s, $a = 6.00$ m/s², $V_i = 3.00$ m/s	$V_f =$ 27 m/s	d	1

$V_f = V_i + at$

$V_f = 3 + 6(4)$

$V_f = 3 + 24 = 27\ m/s$

3	$V_i = 0.0$ m/s, $V_f = -25$ m/s, $a = -5.0$ m/s²	$t =$ 5 m/s	d	1

$V_f = V_i + at$

$-25 = 0 - 5t$

$5t = 25$

$t = \frac{25}{5} = 5\ m/s$

4	$V_i = 3.0$ m/s, $V_f = 21$ m/s, $t = 8.0$ s	$d =$ 96 m	a	2

$d = \frac{V_i + V_f}{2} t = \frac{3+21}{2} \cdot 8 = 12 \cdot 8 = 96\ m$

5	$V_i = 0$ m/s, $d = 16$ m, $t = 4.0$ s	$V_f =$ 8 m/s	a	2

$d = \frac{V_i + V_f}{2} \cdot t$

$16 = \frac{0 + V_f}{2} 4$

$16 = (0 + V_f)2 = 2V_f$

$V_f = \frac{16}{2} = 8\ m/s$

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6 $t = 200$ s $V_i = -8.0$ m/s $d = 700$ m $V_f =$ 15 m/s a 2

$d = \frac{V_i + V_f}{2} \cdot t$

$700 = \frac{-8 + V_f}{2} 200$

$700 = (-8 + V_f)100$

$7 = -8 + V_f \Rightarrow V_f = 15$ m/s

7 $V_i = 3.00$ m/s $a = 3.00$ m/s^2 $t = 3.00$ s $d =$ 22.5 V_f 3

$d = V_i t + \frac{1}{2} a t^2$

$d = 3(3) + \frac{1}{2}(3)(3)^2 = 9 + 13.5 = 22.5$ m

8 $t = 4.0$ s $V_f = 48$ m/s $d = 40$ m $a =$ 19 m/s^2 V_i 4

$d = V_f \cdot t - \frac{1}{2} a t^2$

$40 = 48(4) - \frac{1}{2}(4)^2 a$

$40 = 192 - 1/2(16)a$

$-152 = -8a$

$a = 152/8 = 19$ m/s^2

9 $a = 2.0$ m/s^2 $V_f = 10.$ m/s $d = 24$ m $V_i =$ 2.0 m/s t 5

$V_f^2 = V_i^2 + 2ad$

$10^2 = V_i^2 + 2(2)(24)$

$100 = V_i^2 + 96$

$V_f^2 = 4$

$V_f = \sqrt{4} = 2.0$ m/s

10 $V_f = 6.0$ m/s $a = 4.0$ m/s^2 $t = 3.0$ s $V_i =$ -6 m/s d 1

$V_f = V_i + at$

$6 = V_i + 4(3)$

$6 = V_i + 12$

$V_i = -6$ m/s