Name SOLUTIONS Date _____

# Kinematics Practice 3

$d = vt$ $v_f = v_i + at$ $d = v_i t + (1/2)at^2$

1) An object initially moving at 5 m/s accelerates at 3 m/s$^2$ for 4 s. How far has it gone?

$v_i = 5\ m/s$
$a = 3\ m/s^2$
$t = 4\ s$
$d = ?$

$d = v_i t + \frac{1}{2}at^2$
$d = (5)(4) + \frac{1}{2}(3)(4)^2$
$d = 20 + 1.5(16)$
$d = 20 + 24$
$\boxed{d = 44\ m}$

2) An object initially moving at 2 m/s travels 50 m in 6 s. What was its acceleration?

$v_i = 2\ m/s$
$d = 50\ m$
$t = 6\ s$
$a = ?$

$d = v_i t + \frac{1}{2}at^2$
$50 = (2)(6) + \frac{1}{2}a(6)^2$
$50 = 12 + \frac{1}{2}a(36)$
$50 - 12 = 18a$
$38 = 18a$
$\frac{38}{18} = a = \boxed{2.1\ m/s^2}$

3) An object moving at 57 m/s slows down to 43 m/s in a time of 5 s. What was the object's acceleration?

$v_i = 57\ m/s$
$v_f = 43\ m/s$
$t = 5\ s$
$a = ?$

$v_f = v_i + at$
$43 = 57 + a(5)$
$43 - 57 = a(5)$
$-14 = a(5)$
$\frac{-14}{5} = a = \boxed{-2.8\ m/s^2}$

4) An object travels 40 m in 5 s. If its acceleration was 2 m/s$^2$, what was its initial speed?

$d = 40\ m$
$t = 5\ s$
$a = 2\ m/s^2$
$v_i = ?$

$d = v_i t + \frac{1}{2}at^2$
$40 = v_i(5) + \frac{1}{2}(2)(5)^2$
$40 = v_i(5) + 1(25)$
$40 = v_i(5) + 25$
$40 - 25 = v_i(5)$
$15 = v_i(5)$
$\frac{15}{5} = v_i = \boxed{3\ \frac{m}{s}}$

$d = vt$ $\quad v_f = v_i + at$ $\quad d = v_i t + (1/2)at^2$

5) An object starts from rest. It accelerates at 8 m/s$^2$. It travels a distance of 144 m. How long did this take?

$v_i = 0$ m/s
$a = 8$ m/s$^2$
$d = 144$ m
$t = ?$

$d = v_i t + \frac{1}{2}at^2$
$144 = (0)t + \frac{1}{2}(8)t^2$
$144 = 0 + 4t^2$
$\frac{144}{4} = t^2$
$36 = t^2$ $\quad t = \sqrt{36} = \boxed{6\text{ s}}$

6) An object moves at a constant 7 m/s for 2 minutes. It then begins to accelerate at 5 m/s$^2$ for 40 seconds. How far has it travelled all together?

STEP 1
$v = 7$ m/s
$t = 2\text{ min} \times \frac{60\text{ s}}{\text{min}} = 120\text{ s}$
$d = ?$
$d = vt$
$d = (7)(120) = \underline{840\text{ m}}$

STEP 2
$v_i = 7$ m/s
$a = 5$ m/s$^2$
$t = 40$ s
$d = ?$
$d = v_i t + \frac{1}{2}at^2$
$d = (7)(40) + \frac{1}{2}(5)(40)^2$
$d = 280 + 4000 = \underline{4280}$

TOTAL
1840
+4280
$\boxed{5120\text{ m}}$

7) An object starting at rest travels 1000 m. Its final speed was 100 m/s. What was the objects acceleration?

$v_i = 0$ m/s
$d = 1000$ m
$v_f = 100$ m/s
$a = ?$

$d = vt$
$d = \left(\frac{v_i + v_f}{2}\right)t$
$1000 = \left(\frac{0 + 100}{2}\right)t$
$1000 = 50t$
$\frac{1000}{50} = t = 20\text{ s}$

$v_f = v_i + at$
$100 = 0 + a(20)$
$100 = a(20)$
$\frac{100}{20} = a = \boxed{5\ \frac{\text{m}}{\text{s}^2}}$

Answers 1) 44 m 2) 2.1 m/s$^2$ 3) -2.8 m/s$^2$ 4) 3 m/s 5) 6 s 6) 5120 m 7) 5 m/s$^2$