Types of motion (TM)

rest	v_c	accel	
no motion formula	$v_c = d/t$	dvt	$d = \bar{v}t$
			$d = (\frac{v_1 + v_2}{2})t$
		vat	$v_2 = v_1 + at$
			$v_2 = v_1 + at$

Steps

1) data + diagram

2) TM + formulas
   cover up "v_1" and look for formula to use

3) list base equation
   then isolate, put measurement, solve

A pitcher has a “windup and pitch” action that covers a distance of 1.70 m. a) How long (time) does he act the ball? b) What the acceleration if the ball leaves his hand at 44.0 m/s? c) What is it’s speed in mph?

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d = 1.70 m

$v_1 = 0$

$v_2 = 44.0$ m/s

a) t = ?

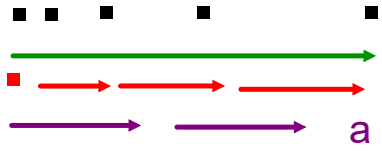
b) a = ?

c) *v* in mph

TM? accel

$a = \Delta v/t$

$d = \bar{v}t$



dvt

a) $d = \bar{v}t$

$t = d/\bar{v} = 1.70 \text{ m}/[(0 + 44.0 \text{ m/s})/2] = .0772 \text{ s}$

vat

b) $v_2 = v_1 + at$

$a = \Delta v/t = (v_2 - v_1)/t = (44.0 \text{ m/s} - 0)/.0772 \text{ s} =$

$= 570. \text{ m/s}^2$

c) $44.0 \text{ m/s} \left(\frac{1 \text{ mil}}{1610 \text{ m}}\right)\left(\frac{3600 \text{ s}}{1 \text{ hr}}\right) = 98.2 \text{ mph}$

1. A little boy throws a rock at a tree at 22.0 m/s.
   a) What is the time the rock takes to stop if it comes to rest in 1.00 cm once it hits the tree?
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$v_1 = 22.0$ m/s

$v_2 = 0$

d = 1.00 cm
↳ .0100 m

a) t = ?

b) a = ?

c) v = ?

TM? --- accel

$a = \Delta v/t$

$d = \overline{v}t$

a)

dvt

$d = \overline{v}t$

$t = d/\overline{v} = d/(v_1 + v_2/2)$

t = .0100m/{(22 m/s + 0)/2]

$t = .0100\text{ m}/11\text{ m/s} = 9.09 \times 10^{-4}$ s

b)

vat

$v_2 = v_1 + at$

$a = v_2 - v_1/t$

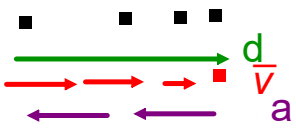
$a = (0 - 22.0\text{ m/s})/9.09 \times 10^{-4}\text{ s} =$

$2.42\text{ s } 10^4\text{ m/s}^2$

c) $22.0\text{ m/s}\left(\frac{1\text{ mil}}{1610\text{ m}}\right)\left(\frac{3600\text{ s}}{1\text{ hr}}\right) = 49.1\text{ mph}$

Little Katie runs at 19 km/hr. Oh no, Little Katie falls. Little Katie slides to rest in 1.2 m. What is Little Katie's acceleration? How long does it take her to come to rest? (some times called extending the pain)

Little Katie runs at 12 km/hr. Oh no, Little Katie falls. Little Katie slides to rest in 1.2 m. What is Little Katie's acceleration? How long does it take her to come to rest?



v_1 = 12 km/hr
↳3.3 m/s
v_2 = 0
d = 1.2 m

a) a = ?

b) t = ?

TM? accel

a = Δv/t
d = $\bar{v}$t

dvt

b) d = $\bar{v}$t
t = d/$\bar{v}$ = *d*/(v_1 + v_2/2)
t = 1.2 s

vat

a) $v_2 = v_1 + at$
$a = v_2 - v_1/t$
a = (0 - 3.3 m/s)/1.2 s = 2.8 m/s^2

you had to do "b" first because you have time to find acceleration

You drop a rock from rest and it hits the ground after 6.0 s. a) What velocity does it hit at?....
b) How far does it fall (it's displacement)?

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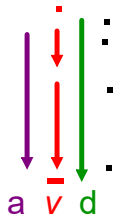

$v_1 = 0$

t = 6.0 s

$a = -9.8\ m/s^2$

v_2 = ?

d = ?

vat

a) $v_2 = v_1 + at$

$v_2 = 0 + (-9.8\ m/s^2)6.0\ s = -59\ m/s$

dvt

b) $d = \bar{v}t$

$d = (v_1 + v_2/2)t$

$d = \dfrac{[(0 + (-59\ m/s)]}{2}$ x 6.0 s = 180 m

TM? accel

$a = \Delta v/t$

$d = \bar{v}t$