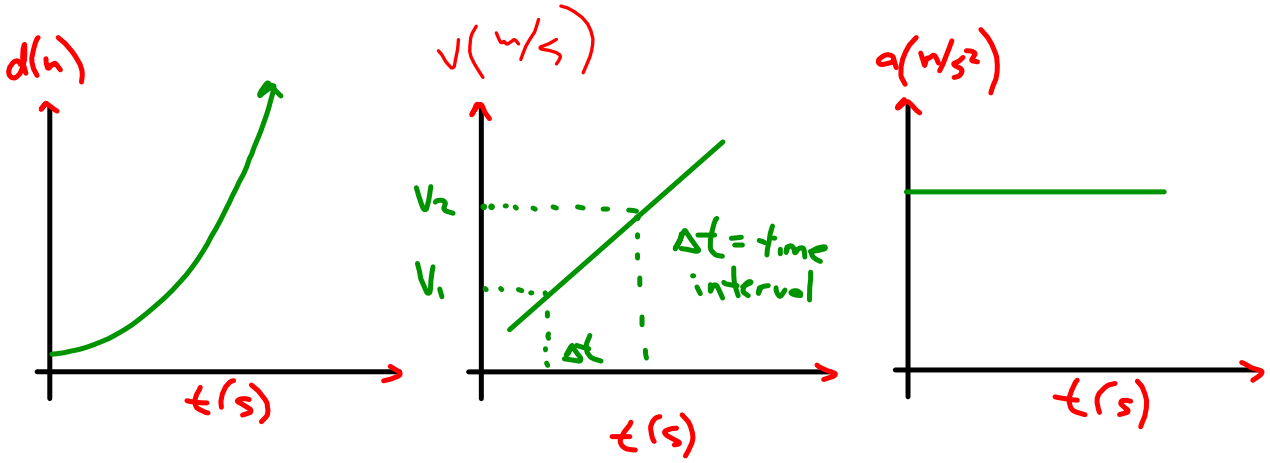
Summary : Uniformly Accelerated Motion:

area under curve

slope of line



area

$$\Delta d = \left(\frac{V_1 + V_2}{2}\right)\Delta t$$

units m

$$\text{slope} = \frac{V_2 - V_1}{\Delta t}$$

$$a = \frac{V_2 - V_1}{\Delta t}$$

units m/s^2

Oct 20-8:25 PM

Kinematics – Key Formulas

Equation	Variable				
	Δd	V_1	V_2	Δt	a
1. $\Delta d = \left(\frac{V_1 + V_2}{2}\right)\Delta t$ or $\Delta d = V_{avg}\Delta t$	☆	✓	✓	✓	X
2. $a = \frac{V_2 - V_1}{\Delta t}$	X	✓	✓	✓	☆
3. $\Delta d = V_1\Delta t + \frac{1}{2}a\Delta t^2$	☆	✓	X	✓	✓
4. $\Delta d = V_2\Delta t - \frac{1}{2}a\Delta t^2$	☆	X	✓	✓	✓
5. $V_2^2 = V_1^2 + 2a\Delta d$	✓	✓	☆	X	✓

SPH3UI : Unit 1 Kinematics - The Big 5 Equations - Using the Summary Chart

1. Tori is riding her horse Daisy at a brisk velocity of 3.6 m/s. For Daisy's daily workout, Tori gets her to start to accelerate at a constant rate for 2:16 minutes, and at the end of this time, Daisy is moving at 9.0 m/s.
   a. How many significant digits should this problem have?
   b. How far did Daisy go while she was accelerating?

G: = 3.6 m/s

= 136 s

= 9.0 m/s

R:

S:

2. Victoria kicks a soccer ball giving it an incredible acceleration. Her foot is in contact with the ball for only 0.085s, but this gets the ball moving from rest to a velocity of 11m/s.
   a. How many significant digits should this problem have?
   b. What is the acceleration that the ball undergoes?

G: = 0.085s

= 11 m/s

= rest (0 m/s)

R:

S:

3. Musician's fingers move with great acceleration when playing their instruments. While playing the fiddle, Deanna moves the bow from a rest position 12.5 cm in 0.135 seconds.
   a. How many significant digits should this problem have?
   b. How much is Deanna accelerating the bow?

G: = 12.5cm

= 0.135 s

= rest (0 cm/s)

R:

S:

4. Nick carefully lines up a putt on a golf green and sends the ball off at 70.3cm/s. The ball goes 5.04m and then stops because it has constantly slowed down (ie. has a constant negative acceleration).
   a. How many significant digits should this problem have?
   b. What is the acceleration of the ball?

G: = 70.3 cm/s

= 5.04m

= stops (0 m/s)

R:

S:

5. A car is accelerating at a constant rate of 0.900 m/s^2 for 20.0 secs. During this 20.0 secs the car travels 220m.
   a. How many significant digits should this problem have?
   b. What was the car's velocity at the end of the 20secs?

G: = 0.900 m/s^2

= 20.0 s

= 220 m

R:

S:

1. Tori is riding her horse Daisy at a brisk velocity of 3.6 m/s. For Daisy's daily workout, Tori gets her to start to accelerate at a constant rate for 2:16 minutes, and at the end of this time, Daisy is moving at 9.0 m/s.
How many significant digits should this problem have?
How far did Daisy go while she was accelerating?

G: V_1 = 3.6 m/s
Δt = 136 s
V_2 = 9.0 m/s
} 2 sig digits.

R: Δd ①

S:

$$\Delta d = \left(\frac{V_1 + V_2}{2}\right)\Delta t$$

$$= \left(\frac{3.6 + 9}{2}\right)136$$

$$= 856.8 \text{ m}$$

$$\Delta d = 860 \text{ m}$$

Nov 17-6:08 AM

2. Victoria kicks a soccer ball giving it an incredible acceleration. Her foot is in contact with the ball for only 0.085s, but this gets the ball moving from rest to a velocity of 11m/s. 0 m/s
How many significant digits should this problem have?
What is the acceleration that the ball undergoes?

G: Δt = 0.085s
v_2 = 11 m/s
v_1 = rest (0 m/s)

} 2 sig digits

R: a

S: ②

$$a = \frac{v_2 - v_1}{\Delta t} = \frac{11 - 0}{0.085} = 129.4\ m/s^2$$

$$= 130\ m/s^2$$

Nov 17-6:09 AM

3. Musician's fingers move with great acceleration when playing their instruments. While playing the fiddle, Deanna moves the bow from a rest position 12.5 cm in 0.135 seconds.
How many significant digits should this problem have?
How much is Deanna accelerating the bow?

G: Δd = 12.5cm
Δt = 0.135 s
V_1 = rest (0 cm/s)
} 3 sig digs

R: a

S: ③ $\Delta d = V_1 \Delta t + \frac{1}{2} a \Delta t^2$

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

$\frac{2\Delta d}{t^2} = \frac{a \Delta t^2}{t^2}$

$a = \frac{2\Delta d}{\Delta t^2}$

$= \frac{2(12.5cm)}{(0.135s)^2}$

$= 1371.7 cm/s^2$

$= 1370 cm/s^2$

$12.5 = \frac{1}{2}(a)(.135)^2$

$12.5 = \frac{1}{2} a (0.018225)$

$12.5 = 0.0091125 a$

$a = \frac{12.5}{0.0091125}$

$= 1371.7$

4. Nick carefully lines up a putt on a golf green and sends the ball off at 70.3cm/s. The ball goes 5.04m and then stops because it has constantly slowed down (ie. has a constant negative acceleration).

How many significant digits should this problem have?

What is the acceleration of the ball?

.703 m/s

G: V_1 = 70.3 cm/s
Δd = 5.04m
V_2 = stops (0 m/s)

} 3 sig digs.

R: a

$a = \frac{V_2^2 - V_1^2}{2\Delta d}$

S: (5) $V_2^2 = V_1^2 + 2a\Delta d$

$0 = (.703)^2 + 2a\,5.04$

$-(.703)^2 = 10.08a$

$a = \frac{-(.703)^2}{10.08}$

$= -0.0490\ m/s^2$

$= -4.90 \times 10^{-2}\ m/s^2$

Nov 17-6:09 AM

5. A car is accelerating at a constant rate of 0.900 m/s^2 for 20.0 secs. During this 20.0 secs the car travels 220m.
How many significant digits should this problem have?
What was the car's velocity at the end of the 20secs?

G: $a = 0.900\ m/s^2$
$\Delta t = 20.0\ s$
$\Delta d = 220\ m$

R: V_2

S:

(4) $\Delta d = V_2 \Delta t - \frac{1}{2} a \Delta t^2$

$\Delta d + \frac{1}{2} a \Delta t^2 = V_2 \Delta t$

$V_2 = \frac{\Delta d + \frac{1}{2} a \Delta t^2}{\Delta t}$

$= 20\ m/s$ ✓

$V_2 = 2.0 \times 10^1\ m/s$