


DM2212
Programming
Physics



ML: Dioselin Gonzalez
2007 S1

Image by mindghasa.deviantart.com

3D kinematics:
acceleration and free fall



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Acceleration

- Average acceleration
$$a = \frac{\Delta v}{\Delta t}$$
- Instantaneous acceleration
$$a = \lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t}$$
$$a = \frac{dv}{dt}$$

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Acceleration

$$dv = a dt$$

$$\int_{v_0}^{v_1} dv = \int_{t_0}^{t_1} a dt$$

$$\Delta v = \int_{t_0}^{t_1} a dt$$



$$a = \frac{dv}{dt} = \frac{d^2s}{dt^2}$$

$$v dv = a ds$$

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Constant acceleration

$$\int_{v_0}^{v_1} dv = \int_{t_0}^{t_1} a dt$$

$$\int_{v_0}^{v_1} dv = a \int_{t_0}^{t_1} dt$$

$$v_1 - v_0 = a(t_1 - t_0)$$

$$v_1 = v_0 + a(t_1 - t_0)$$

$$v dv = a ds$$

$$\int_{v_0}^{v_1} v dv = a \int_{s_0}^{s_1} ds$$

$$\frac{v_1^2 - v_0^2}{2} = a(s_1 - s_0)$$

$$v_1^2 = 2a(s_1 - s_0) + v_0^2$$

$$v dt = ds$$

$$\int_{t_0}^{t_1} v dt = \int_{s_0}^{s_1} ds$$

$$\int_{t_0}^{t_1} (v_0 + at) dt = \int_{s_0}^{s_1} ds$$

$$v_0 t + \frac{at^2}{2} = s_1 - s_0$$

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Acceleration

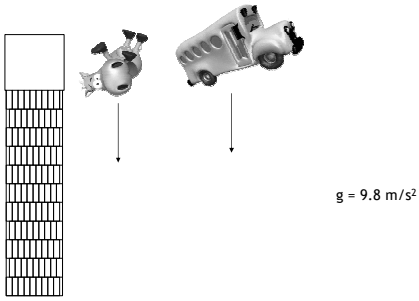


You are able to give puppy $a = 20 \text{ m/s}^2$

How much time to move the puppy 2m?

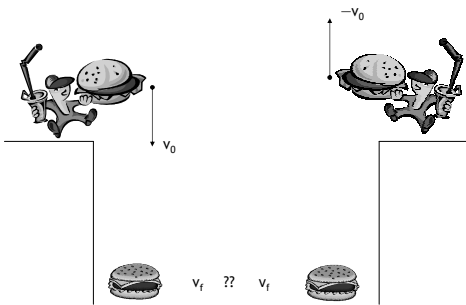
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Free fall



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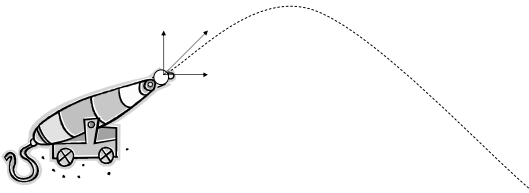
Free fall



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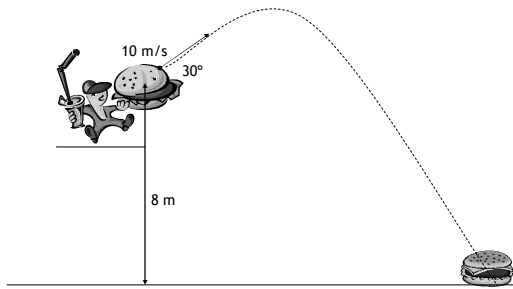
Projectiles

Motion in one direction is independent from motion in perpendicular direction



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Projectiles



How far from the edge will the burger land?

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Reminder!

- Written test on Wednesday 30/May 8.15am, LT.M1
- B. Crowell's book sections 0.5, 2, 3, 7.1-7.3, 8.1-8.2
<http://www.lightandmatter.com/area1book1.html>
- No class on Monday for Group 03

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References

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