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Physics

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Physics Handout: Dimensions

- Dimensions, or Kinematics always have to do with velocity, displacement, and acceleration.

Velocity: The speed of something in a given direction.

Displacement: The movement of something from its place or position

Acceleration: Increase in the rate or speed of something

Main formula uses:

$d = \frac{1}{2} * a * t^2$ this formula is also known as the free fall formula or vertical distance. This is used to find the distance or acceleration of an object falling vertically (like something falling off a cliff or whatever.)

$d = vt$ This formula is the opposite of freefall. Instead of finding the velocity or distance of an object falling vertically, we are finding the velocity or distance of an object moving horizontally

$\odot = \omega t$ This formula is used to find how many rotations take place in an amount of time.

$\odot = \omega t = \text{rotation} = \text{rotation per sec.} * \text{seconds}$

$V_f = v_i + at$ This formula is used to find the initial velocity, final velocity, and the acceleration of an object over an amount of time

$d = \frac{1}{2}(v_1 + v_2)t$ this formula is used to find how much time, displacement, or velocity it takes for one object to get from one velocity to another.

Example problems:

How fast is Bethany going it takes 395 seconds to travel 1200 m?

Want: it ask for speed but the problem is asking for the speed of bethany in a certain direction. Because the problem doesn't ask for the increase in speed, we know the problem is asking for velocity.

Given: Distance: 1200m Time: 395s (units for distance is meters and units for time is seconds)

Because we know Bethany probably can't walk on walls, it'll be safe to assume we'll be using the horizontal formula: $D = vt$

$d = 1200\text{m}$

$t = 345\text{s}$

$1200 = v * 345. \rightarrow 1200/345 = v \rightarrow v = 3.4\text{m/s}$ (units for velocity are meters per second)

How high is a ball dropped if it takes 16s to hit the ground?

Given:

Time: 16s acceleration: 9.8m/s^2 (the ball is being dropped, which means the ball is being pulled by gravity).

Because the ball is being dropped vertically, the free fall formula would be used. $d = \frac{1}{2} a t^2$

$$d = \frac{1}{2} \cdot 9.8(16)^2 \rightarrow 4.9(16)^2 \rightarrow 4.9 \cdot 256 = 1254.4\text{m} = D$$

How many rotations does it take a cd player to play a song that's 3 minutes long. A cd player can spin at 3 rotations per second?

Given: Rotations per second=3/s time: 180s Want: how many rotations.

Formula: $@ = w \cdot t$

$$@ = 3 \cdot 180 = 540 = @$$

What is the initial velocity if the final velocity is 7m/s and the acceleration is 0.5m/s^2

Given: Acceleration: 0.5m/s^2 ; Time: 6s; final velocity(v_f): 7m/s

Want: Initial velocity (v_i)

Formula: $v_f = v_i + at$

$$7 = v_i + 0.5(6) \rightarrow 7 = v_i + 3 \rightarrow 3 - 7 = v_i \rightarrow 4\text{m/s} = v_i$$

How much time does it take Reagen to move 400m when she starts from a stand still and ends up with a velocity of 6m/s.

Given: distance: 400m; Final velocity (v_f): 6m/s; initial velocity: 0

Want: time: ?

since we want to know how much time it takes Reagen to get to one place to another we are using the formula: $d = \frac{1}{2}(v_1 + v_2)t$

$$400 = \frac{1}{2}(0 + 6)t \rightarrow 400 = (3)t \rightarrow 400/3 = t \rightarrow t = 133.3$$

Metric system.

| Prefix | # of units | length | volume | weight |
|-----------|------------|-----------------|-----------------|----------------|
| milli (m) | 1/1000 | millimeter (mm) | milliliter (ml) | milligram (mg) |
| centi (c) | 1/100 | centimeter (cm) | centiliter (cl) | centigram (cg) |
| deci (d) | 1/10 | decimeter (dm) | deciliter (dl) | decigram (dg) |
| hecto (h) | 10 | hectometer (hm) | hectoliter (hl) | hectogram (hg) |
| kilo (k) | 1000 | kilometer (km) | kiloliter (kl) | kilogram (kg) |

