Fundamentals Research - UPOD

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| **Category** | Fundamentals |
| **Subcategory** | Motion |
| **Article** | Introduction |
| **Description** | Motion, one of the many topics in physics, is the branch of mechanics that is directly and only related to the motion of objects. It does not involve the forces that propel motion |
| **Formula** | N/A |
| **Drawing/Animation** | N/A |
| **Relevant Tags** |  |

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| **Category** | Fundamentals |
| **Subcategory** | Motion |
| **Article** | Scalars and Vectors |
| **Description** | Scalars and vectors are mathematical quantities used to describe the motion of objects  Scalars are quantities that are **only defined my magnitude**  Vectors are quantities that are defined by **not only magnitude but are also given a direction** |
| **Formula** | N/A |
| **Drawing/Animation** | N/A |
| **Relevant Tags** |  |

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| **Category** | Fundamentals |
| **Subcategory** | Motion |
| **Article** | Distance and Displacement |
| **Description** | Distance is a **scalar quantity** that refers to the collective movements of an object up until the object reaches its final destination  Displacement is a **vector quantity** that refers to singular change in the objects location from the starting point |
| **Formula** | The formulas for distance and displacement depend on the context. Look below for an example! |
| **Drawing/Animation** | The distance from point A to point B would be 2m + 4m = 6m (taking either route)  However, the displacement from point A to point B would be 42+22 = d2 = sqrt(20) |
| **Relevant Tags** |  |

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| **Category** | Fundamentals |
| **Subcategory** | Motion |
| **Article** | Speed and Velocity |
| **Description** | Speed is a **scalar quantity** that **only** tells us how fast an object is moving  Velocity is a **vector quantity** that tells us the rate at which an object changes its position. |
| **Formula** | An example of speed would be 4m/s  An example of velocity would be 4m/s **north** |
| **Drawing/Animation** | N/A |
| **Relevant Tags** |  |

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| **Category** | Fundamentals |
| **Subcategory** | Motion |
| **Article** | Acceleration |
| **Description** | Acceleration is a **vector quantity** that is given by the rate at which an object changes its velocity  Acceleration due to gravity (on Earth) is the rate at which an object falls towards the Earth. This is defined and calculated by the constant: **g = 9.81m/s towards the Earth.** |
| **Formula** | The average acceleration is equal to the change in velocity over a certain time t. |
| **Drawing/Animation** | Although the blue car seems to be in last place at the start, its acceleration, at some point, must have been greater than the red and green cars for it have finished in first place. |
| **Relevant Tags** |  |

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| **Category** | Fundamentals |
| **Subcategory** | Motion |
| **Article** | Projectile Motion |
| **Description** | Projectile motion is the motion of an object moving in two dimensions under the influence of gravity.  Free-fall is an example of projectile motion where the motion is restricted to one dimension. Examples: Baseball, footballs, bullet  Key points to remember:  When the projectile is at its maximum height, the **vertical velocity** will be zero. Any motion in which one component of the acceleration is 0, and the other component of acceleration is constant, the object follows a parabolic trajectory. |
| **Formula** | The 4 major kinematic equations    1. Distance = (initial velocity)\*(time) + (1/2)\*(acceleration due to gravity)\*(time)  2. Final velocity = sqrt((initial velocity)^2 + 2\*(acceleration due to gravity)\*(distance))  3. Final velocity = Initial velocity + (acceleration due to gravity)\*(time)  4. Distance = ((initial velocity + final velocity)/2)\*(time)  For specifics in calculating certain scenario questions, refer to the following equations:    The first equation states that the **initial** **horizontal** velocity is equal to (velocity)\*(cosƟ)  The second equation states that the **initial vertical** velocity is equal to (velocity)\*(sinƟ) |
| **Drawing/Animation** | Refer to the animation idea in the animations document |
| **Relevant Tags** |  |

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| **Category** | Fundamentals |
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| **Article** | Uniform Circular Motion |
| **Description** | Uniform Circular Motion is motion in a circle with a constant speed.  The velocity vector at any point is tangent to the circle, see the diagram below for a better understanding (drawing 1).  The period, T, of the motion is the time taken for the object to complete one revolution. In one period, an object/particle moving a long the outskirts of the circle, moves in a distance exactly equal to the circumference of the circle (formula 1)  Looking at diagram 2, we can further break down the components of uniform circular motion, with the following equations (formula 2), (diagram 2) |
| **Formula** | 1. Circumference of a circle = 2πr, where r is the radius of the circle  Speed = v = circumference/period = (2πr)/T, where r is the radius and T is the period  2. x = r\*cosƟ, y = r\*sinƟ, r = sqrt(x2+y2), Ɵ = tan-1(y/x) |
| **Drawing/Animation** | 1. 2.   http://www.physicsclassroom.com/Class/circles/u6l1a3.gifhttp://i.stack.imgur.com/jhYJt.png |
| **Relevant Tags** |  |