Important Kinematics and Dynamics Formulas PDF

Formulas
Examples
with Units

List of 12
Important Kinematics and Dynamics Formulas

1) Circular Motion Formulas

1.1) Angular Displacement Formula

Evaluate Formula

Formula	Example with Units
$\theta = \frac{s_{cir}}{R_{curvature}}$	$37.608° = \frac{10\,m}{15.235\,m}$

1.2) Angular Speed Formula

Evaluate Formula

Formula	Example with Units
$\omega = \frac{\theta}{t_{total}}$	$0.0051\,rev/s = \frac{37°}{20\,s}$

1.3) Centripetal Force Formula

Evaluate Formula

Formula	Example with Units
$F_C = \frac{M \cdot v^2}{r}$	$21984.9083\,N = \frac{35.45\,kg \cdot 61\,m/s^2}{6\,m}$

1.4) Speed of Object in Circular Motion Formula

Evaluate Formula

Formula	Example with Units
$V = 2 \cdot \pi \cdot r \cdot f$	$3392.9201\,m/s = 2 \cdot 3.1416 \cdot 6\,m \cdot 90\,Hz$

2) Motion in 1D Formulas

2.1) Acceleration Formula

Evaluate Formula

Formula	Example with Units
$a = \frac{\Delta v}{t_{total}}$	$12.55\,m/s^2 = \frac{251\,m/s}{20\,s}$

2.2) Average Speed Formula

Evaluate Formula

Formula

$$v_{avg} = \frac{D}{t_{total}}$$

Example with Units

$$3\,\text{m/s} = \frac{60\,\text{m}}{20\,\text{s}}$$

2.3) Distance Traveled Formula

Evaluate Formula

Formula

$$s = u \cdot t + \frac{a \cdot t^2}{2}$$

Example with Units

$$331.875\,\text{m} = 35\,\text{m/s} \cdot 5\,\text{s} + \frac{12.55\,\text{m/s}^2 \cdot 5\,\text{s}^2}{2}$$

3) Rotational Mechanics Formulas

3.1) Angular Momentum Formula

Evaluate Formula

Formula

$$L = I \cdot \omega$$

Example with Units

$$0.0353\,\text{kg*m}^2\text{/s} = 1.125\,\text{kg·m}^2 \cdot 0.005\,\text{rev/s}$$

3.2) Torque Formula

Evaluate Formula

Formula

$$\tau = F \cdot l_{dis} \cdot \sin\left(\theta_{FD}\right)$$

Example with Units

$$1.5\,\text{N*m} = 2.5\,\text{N} \cdot 1.2\,\text{m} \cdot \sin\left(30°\right)$$

4) Work and Energy Formulas

4.1) Kinetic Energy Formula

Evaluate Formula

Formula

$$KE = \frac{M \cdot v^2}{2}$$

Example with Units

$$65954.725\,\text{J} = \frac{35.45\,\text{kg} \cdot 61\,\text{m/s}^2}{2}$$

4.2) Potential Energy Formula

Evaluate Formula

Formula

$$PE = M \cdot g \cdot h$$

Example with Units

$$4168.92\,\text{J} = 35.45\,\text{kg} \cdot 9.8\,\text{m/s}^2 \cdot 12\,\text{m}$$

4.3) Work Formula

Evaluate Formula

Formula

$$W = F \cdot d \cdot \cos\left(\theta_{FD}\right)$$

Example with Units

$$216.5064\,\text{J} = 2.5\,\text{N} \cdot 100\,\text{m} \cdot \cos\left(30°\right)$$

Variables used in list of Kinematics and Dynamics Formulas above

- **a** Acceleration *(Meter per Square Second)*
- **d** Displacement *(Meter)*
- **D** Total Distance Traveled *(Meter)*
- **f** Frequency *(Hertz)*
- **F** Force *(Newton)*
- F_C Centripetal Force *(Newton)*
- **g** Acceleration due to Gravity *(Meter per Square Second)*
- **h** Height *(Meter)*
- **I** Moment of Inertia *(Kilogram Square Meter)*
- **KE** Kinetic Energy *(Joule)*
- **L** Angular Momentum *(Kilogram Square Meter per Second)*
- l_{dis} Length of Displacement Vector *(Meter)*
- **M** Mass *(Kilogram)*
- **PE** Potential Energy *(Joule)*
- **r** Radius *(Meter)*
- $R_{curvature}$ Radius of Curvature *(Meter)*
- **s** Distance Traveled *(Meter)*
- s_{cir} Distance Covered on the Circular Path *(Meter)*
- **t** Time Taken to Travel *(Second)*
- t_{total} Total Time Taken *(Second)*
- **u** Initial Velocity *(Meter per Second)*
- **v** Velocity *(Meter per Second)*
- **V** Speed of object moving in Circle *(Meter per Second)*
- v_{avg} Average Velocity *(Meter per Second)*
- **W** Work *(Joule)*
- **Δv** Change in Velocity *(Meter per Second)*
- **θ** Angular Displacement *(Degree)*
- θ_{FD} Angle between Force and Displacement Vector *(Degree)*
- **τ** Torque Exerted on Wheel *(Newton Meter)*
- **ω** Angular Speed *(Revolution per Second)*

Constants, Functions, Measurements used in list of Kinematics and Dynamics Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **cos**, cos(Angle) *Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- Functions: **sin**, sin(Angle) *Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Weight** in Kilogram (kg) *Weight Unit Conversion*
- Measurement: **Time** in Second (s) *Time Unit Conversion*
- Measurement: **Speed** in Meter per Second (m/s) *Speed Unit Conversion*
- Measurement: **Acceleration** in Meter per Square Second (m/s²) *Acceleration Unit Conversion*
- Measurement: **Energy** in Joule (J) *Energy Unit Conversion*
- Measurement: **Force** in Newton (N) *Force Unit Conversion*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion*
- Measurement: **Frequency** in Hertz (Hz) *Frequency Unit Conversion*
- Measurement: **Angular Velocity** in Revolution per Second (rev/s) *Angular Velocity Unit Conversion*
- Measurement: **Torque** in Newton Meter (N*m) *Torque Unit Conversion*
- Measurement: **Moment of Inertia** in Kilogram Square Meter (kg·m²) *Moment of Inertia Unit Conversion*
- Measurement: **Angular Momentum** in Kilogram Square Meter per Second (kg*m²/s)

Download other Important Mechanics PDFs

- Important Elasticity Formulas
- Important Gravitation Formulas
- Important Kinematics and Dynamics Formulas
- Important Simple Harmonic Motion(SHM) Formulas

Try our Unique Visual Calculators

- Winning percentage
- LCM of two numbers
- Mixed fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

9/18/2024 | 11:40:24 AM UTC