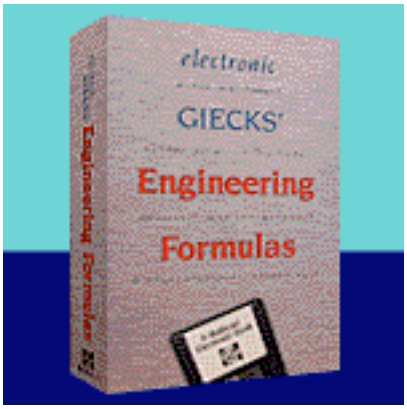
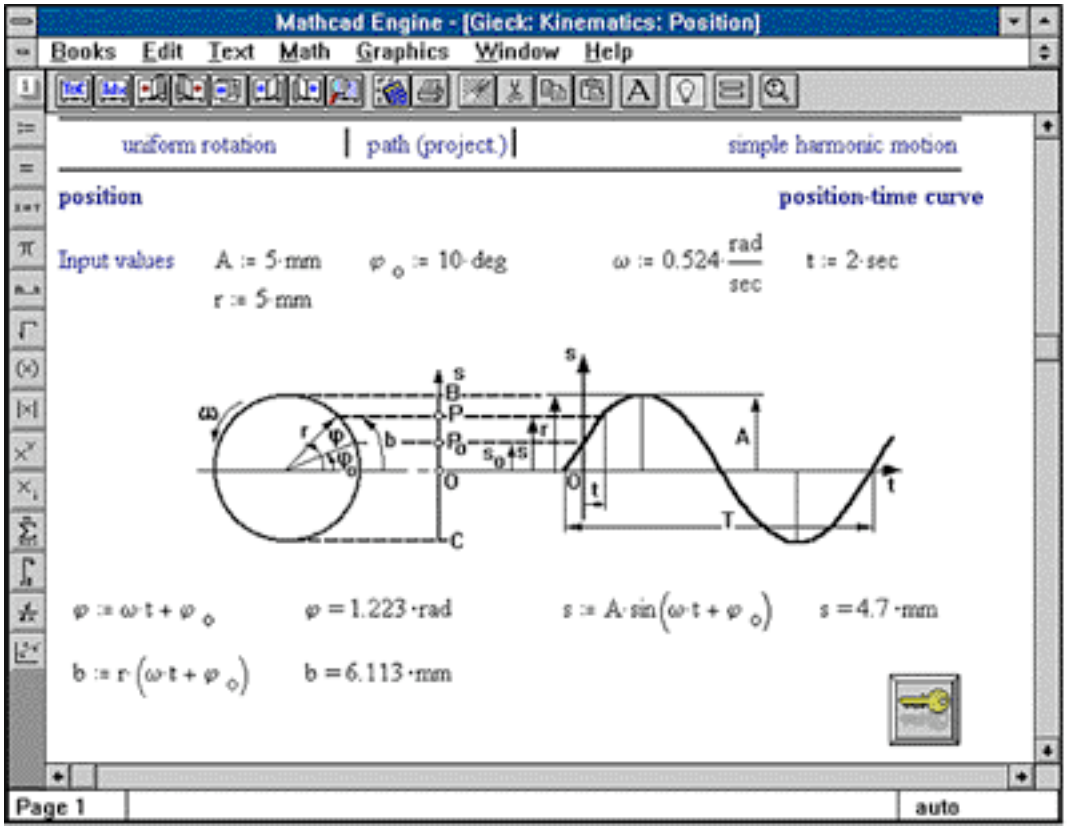
Electronic Giecks': Engineering Formulas



Platform: Windows
Includes the Mathcad Engine; requires 5 MB hard disk space
Available for ground shipment

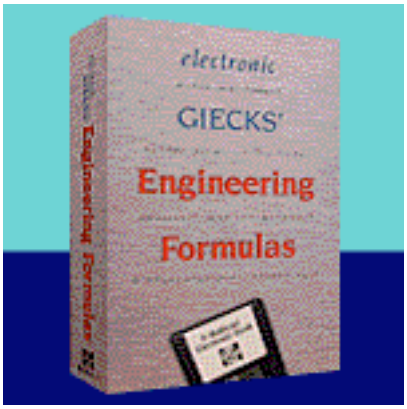
This is an electronic version of McGraw-Hill's well-known *Engineering Formulas, 6th Edition* by Kurt and Reiner Gieck. Designed for students and professionals, this resource uses the Mathcad Engine to present and solve equations using "live" math. When you change a variable Mathcad recalculates the results automatically. You get instant solutions to the more than 300 technical and many of the mathematical problems that have made Giecks' such a classic. Professionals get online access to reference formulas that they can incorporate in their work. Students will use it as an resource, as well as a learning aid for performing calculations and seeing how results change based on different variables.

Table of Contents | Product Sample | Back to Product List



Position-time curve for linear harmonic oscillation of a body supported by a spring.

Topics include: Units, Areas, Solid Bodies, Arithmetic, Functions of a Circle, Analytical Geometry, Statistics, Differential Calculus, Integral Calculus, Differential Equations, Statics and Kinematics, Dynamics, Hydraulics, Heat, Strength, Machine Parts, Production and Electrical Engineering, Radiation Physics, Chemistry, and more.



Electronic Giecks': Engineering Formulas

TABLE OF CONTENTS (page 1 of 13)

Areas

square
equilateral triangle
circle
rectangle
pentagon
annulus
parallelogram
hexagon
sector of a circle
trapezium
octagon
segment of a circle
triangle
polygon
ellipse

Dynamics

General terms
Mass, Mass moment of inertia
Definitions
Basic formula
Circular hoop
Cylinder
Hollow cylinder
Cone
Sphere
Torus
Short bar, thin bar
Rotation
Energy and torque
Transmission ratios
Centrifugal force
Centrifugal force
Stresses in rotation bodies
Harmonic oscillations

Electronic Giecks': Engineering Formulas

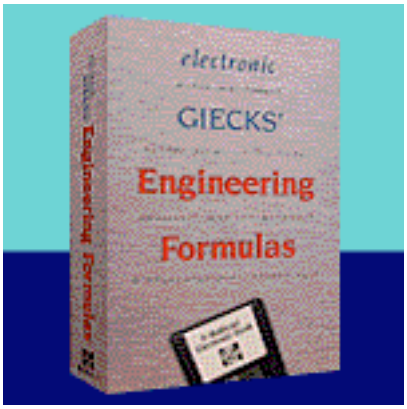


TABLE OF CONTENTS (page 2 of 13)

Mechanical oscillation - General
Mechanical oscillation - Critical speed of shaft
Pendulum
Conical pendulum
Simple pendulum
Compound pendulum
Torsional pendulum
Impact
Impact-direction and Types of impact
Coefficient of restitution

Machine Parts

Screws and bolts
Axles and Shafts
Stability
Bearing stress, shear, deflection, and vibrations
Shaft-hub joints
Friction-locked joints
Specially machined joints
Plain key
Splined shaft
Springs
Spring rate R and spring work W
Springs in bending
Rectangular, trapezoidal, triangular springs
Laminated leaf springs
Disc springs
Coiled torsion spring
Springs in torsion
Torsion bar spring
Cylindrical helical spring
Bearings
Journal bearings
Bearing pressure
Bearing clearance
Minimum permissible lubricant film thickness
Sommerfeld number
Lubricant flow rate

Electronic Giecks': Engineering Formulas

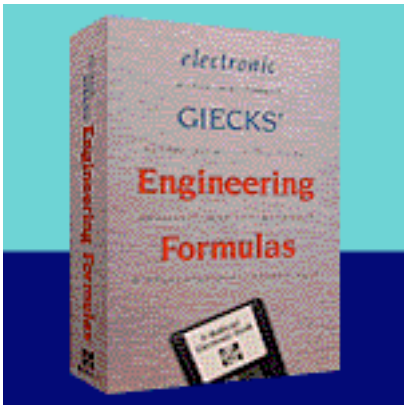


TABLE OF CONTENTS (page 3 of 13)

Heat removal
Crosshead guide
Friction clutches
Slip time and energy loss
Calculating the area of the friction surface
Calculation of contact pressure
Calculation permissible temperature rise
Friction brakes
Disc brakes
Expanding-shoe drum brakes
Involute-tooth gears
Spur gears, geometry
Standard gears
Formulas for dimensions 1
Formulas for dimensions 2
Standard gearing
Formulas for dimensions
Modified gears
Formulas for dimensions 1
Formulas for dimensions 2
Formulas for dimensions 3
Spur gears, design
Load capacity of tooth
Load capacity of tooth flank
Pinion demensions and Tooth width ratios
Bevel gears
Bevel gears, geometry
Bevel gears, design and Axial and radial forces in mesh
Load capacity of tooth root
Load capacity of tooth flank
Epicyclic gearing - Velocity diagram and angular velocities
Type 1
Type 2
Type 3
Worm gearing
Worm gearing, geometry
Formulas for dimensions 1
Formulas for dimensions 2
Worm gearing, design

Electronic Giecks': Engineering Formulas

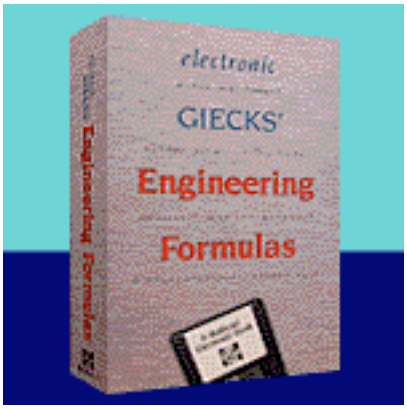


TABLE OF CONTENTS (page 4 of 13)

Efficiency and Coefficient of friction
Calculation of module
Gears, Gearings Symbols

Solid bodies

cube
cone
sphere with conical boring
cuboid
rustum of cone
orus
parallelepiped
sphere
sliced cylinder
pyramid
zone of a sphere
ungula
frustum of pyramid
segment of a sphere
barrel
cylinder
sector of a sphere
prismoid
hollow cylinder
sphere with cylindrical boring

Hydraulics

General - Quantities
Hydrostatics
Pressure distribution in a fluid
Hydrostatic forces on plane surfaces
Hydrostatic forces on curved surfaces
Buoyancy
Determination of density of solid and liquid bodies
Hydrodynamics
Continuity equation and Bernoulli's equation

Electronic Giecks': Engineering Formulas

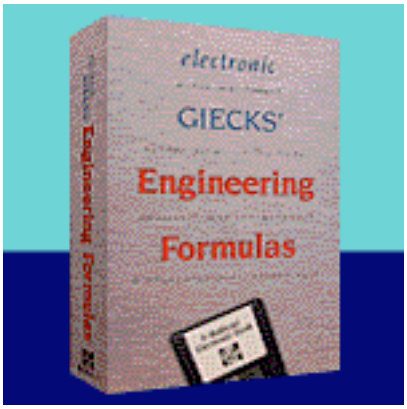


TABLE OF CONTENTS (page 5 of 13)

Power of a hydraulic machine, Momentum equation, Angular-momentum equation
Friction losses in pipe flow
Determination of coefficient of resistance and coefficient of shape
Determination of coefficient
Flow of liquids from containers
Base apertures
Small lateral apertures
Large lateral apertures
Excess pressure on surface of liquid
Excess pressure applied to an outlet point

Production Engineering

Machining
Machine tool design
Cutting drives
Cutting gears
Cutting power
Cutting methods
Turning external longitud
Planing and shaping
Drilling and boring
Plane milling down-cut and up-cut
End milling down-cut and up-cut
Circular grinding flat
Round grinding, outside inside - cutting round
Front grinding
Feed drives and Feed rate
Cutting times
Feed power
Metalworking
Cold working of sheet - Deep drawing
Initial blank diameter
Ist stage
2nd stage
Maximum drawing conditions
Extrusion
Extrusion forward - full body
Extrusion forward - hollow body
Extrusion backward

Electronic Giecks': Engineering Formulas

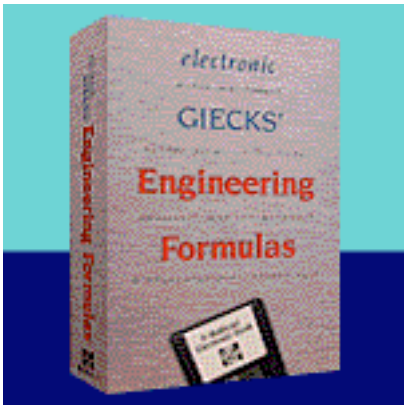


TABLE OF CONTENTS (page 6 of 13)

Statics

General terms
Force composition
Graphical composition of forces
Mathematical composition of forces
Resolution of a force
Moment of a force about a point
Resultant force of any random given forces
Equilibrium
Conditions of equilibrium
Simply supported beam with point loads
Distributed loads
Lattice girder
Mathematical determination of member loads
Graphical determination of forces in members
Center of gravity
Arc of circle
Triangle
Sector of a circle
Trapezium
Sector of an annulus
Segment of a circle
Determination of center of gravity of any random surface area
Friction
Force acting parallel to a sliding plane
Force applied obliquely
Inclined plane
Friction properties
Wedges
Screws
Bearing friction
Rolling resistance
Rope friction
Belt drive
Rope operated machines
Fixed sheave
Free sheave
Ordinary pully block
Differential pully block

Electronic Giecks': Engineering Formulas

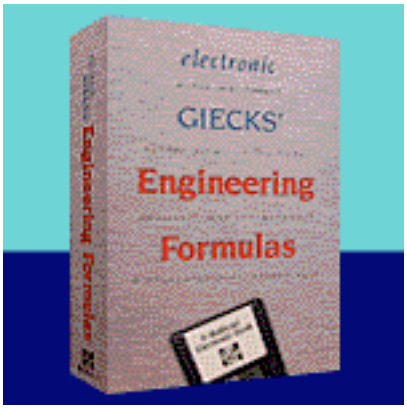


TABLE OF CONTENTS (page 7 of 13)

Heat

Thermal variables of state
Pressure
Temperature
Density
Volume per unit mass
Molecular volume
Heating of solid and liquid bodies
Heat and Heat per unit mass
Specific Heat
Latent heats per unit mass
Expansion of solid bodies
Expansion of liquid bodies
Bending due to heat
Thermodynamic states of gases and vapors
Changes of state of ideal gases
Changes of state of real gases and vapors
Isochoric
Isobaric
Isothermal
Isentropic
Ideal gases in open and closed systems
Isochoric
Isobaric
Isothermal
Isentropic
Polytropic process
Changes of state of gases and vapor
Mixtures of gases
Equivalent molecular mass of a mixture
Conversion between mass- and mole-fractions
Pressure of the mixture and partial pressures of the components
Volume fractions of a mixture
Internal energy and enthalpy of a mixture
Heat transmission
Conduction
Convection and Radiation
Heat transfer
Heat exchanger

Electronic Giecks': Engineering Formulas

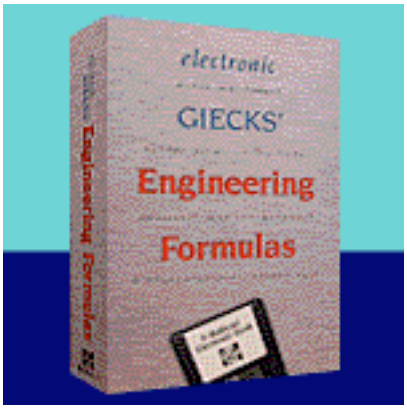


TABLE OF CONTENTS (page 8 of 13)

Electrical Engineering

General terms
Electrical work and Electrical power
Current, Current density, and Potential difference
Resistance, Conductance, and Quantity of electricity
Capacitance, Magnetic flux, and Magnetic induction
Inductance, Magnetic field strength, Magnetomotive force, and Reluctance
Electric circuits
Basic properties and Ohm's Law
Resistance and Electric heating
Resistor combinations
1st Kirchhoff Law
2nd Kirchhoff Law
Combination of resistances
Series and Parallel connection
Multiple connection
Networks
Use of the Superposition theorem
Use of Thevenin's theorem
Resistor combinations
Transformation of delta to a star-circuit
Potential divider
Applications in electrical measurements
Extending the range of a voltmeter and ammeter
Wheatstone bridge for measuring an unknown resistance
Wheatstone bridge used as a primary element
Electric field
Electro-magnetic rules
Magnetic field
Quantities of magnetic circuits
Magnetic flux, and Magnetic induction
Inductance, and Magnetic field strength
Magnetomotive force and Reluctance
Energy stored in a magnetic field, and Leakage flux
The magnetic field and its forces
Forces acting between magnetic poles
Forces acting on a current-carrying conductor
Induced voltage

Electronic Giecks': Engineering Formulas

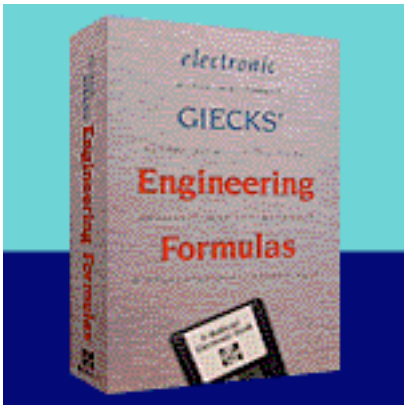


TABLE OF CONTENTS (page 9 of 13)

Induced voltage
Alternating current
General terms
Sense of phase angle and Peak values
Root-mean-square values
Phase shift, and Phase angle
Q factor, damping factor, loss angle
Basic equations for single phase
Components, series- and parallel connections
Resistive and Inductive
Capacitive and Resistive, inductive, capacitive
Choke in series with capacitor, Resistive and inductive in series choke
Resistive+capacitive in series, Resistive+inductive+capacitive in parallel
Resistive + inductive in parallel choke, Resistive + capacitive in parallel
Resonant circuits
Series - resonant circuit
Parallel - resonant circuit
Tank circuit
Alternating-current bridge
Determination of an unknown impedance
Inductance L from impedance and resistance
Calculating L from impedance and resistance
Calculating L for a toroidal coil and for a square coil
Non-magnetic coils with specified inductance L
Calculation of number of turns N of a coil
Hysteresis and Eddy currents
Core losses
Choke coil
Used as a dropping impedance
Constant inductance without core with iron core
Calculations
Transformer
Designation of windings and Nominal values
Core losses and open-circuit measurements
Copper losses and short-circuit measurements
Operating conditions
Three-phase current
Basic connections
Measuring three-phase power

Electronic Giecks': Engineering Formulas

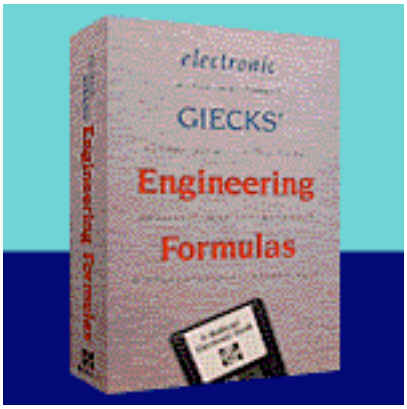


TABLE OF CONTENTS (page 10 of 13)

Reactive and active power, power factor
Power factor correction
Motors
Direct-current machine
D.C. Machines with commutating poles: shunt winding
D.C. Machines with commutating poles: series winding
D.C. Machines with commutating poles: compound winding
Three-phase motor
Transformer switch groups
Measuring instruments
Moving coil and Moving coil with rectifier
Cross coil and Moving coil with thermocouple
Soft iron, Electrodynamic, and Electrostatic
Installation
Current rating
Switches

Kinematics

General terms
Distance, velocity, and acceleration of mass point in motion
The most important kinds of motion
Linear motion
Rotational motion
Oscillations - Linear simple harmonic motion - Position
Oscillations - Linear simple harmonic motion - Velocity
Oscillations - Linear simple harmonic motion - Acceleration
Free fall, projection, (without air resistance)
Free fall
Veritcal projection
Angled projection
Horizontal projection
Motion on an inclined plane
Sliding motion on an inclined plane
Rolling motion on an inclined plane
Mechanism
Simple Conn-Rod mechanism
Scotch-Yoke mechanism
Cardan joint

Electronic Giecks': Engineering Formulas

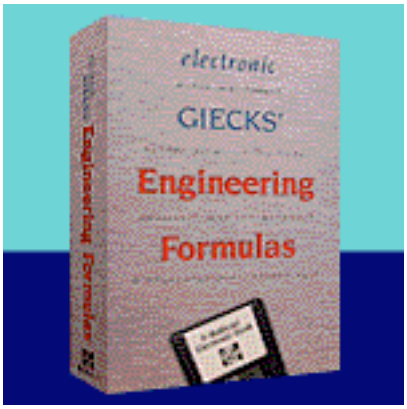


TABLE OF CONTENTS (page 11 of 13)

Strength

General terms
Tensile, compressive, and shear stresses
Stress-strain diagrams
Permissible stress
Loads
Tension, Compression
Formulas
Modulus of elasticity
Tensile and compressive stresses
Strain
Compressive strain under compression
Thermal stresses
Tensile and compressive stresses in thin wall cylinders
Tensile stress in a shrunk-on ring
Energy of deformation and Limit cross section
Loads in beams
End loads and torsion
Referring to the x-y plane
Method of calculation
Relations between w, V and M
Analysis of forces
Curved cantilever beam
Shear force (radial)
Normal force (tangential)

Radiation Physics

General
Distance law, Refraction of light
Optical distance law
Light refraction
Wavelengths, Mirror
Wavelengths
Mirrors
Plane mirrors
Concave mirrors
Convex mirrors

Electronic Giecks': Engineering Formulas

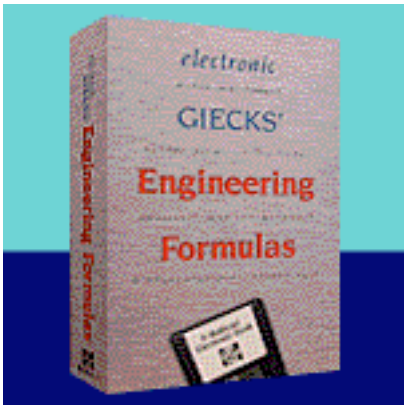


TABLE OF CONTENTS (page 12 of 13)

Lenses
Refraction of a lens
Lens equation
Magnifying lens
Microscope
Macro photography
Ionizing radiation
Units
Definitions

Tables

Properties of solids
agate - chalk
charcoal - magnesium,alloy
manganese - silver
slate - zinc, rolled
Properties of liquids
Properties of gases
Friction numbers
Coefficients of sliding and static friction
Rolling friction
Water pipes, Hydrodynamics values
Galvanized Steel Tubes
Roughness k
Heat values
Latent heat of fusion per unit mass l f
Latent heat of evaporation per unit mass ld
Calorific value Hu
Linear coefficient of expansion a
Cubic coefficient of expansion g
Coefficient of heat transfer k
Gas constant R and molecular mass M
Radiation constant C at 20° C
Dynamic viscosity h of motor oils
Mean specific heat of various gases
Liquids
Gases
Strength values

Electronic Giecks': Engineering Formulas

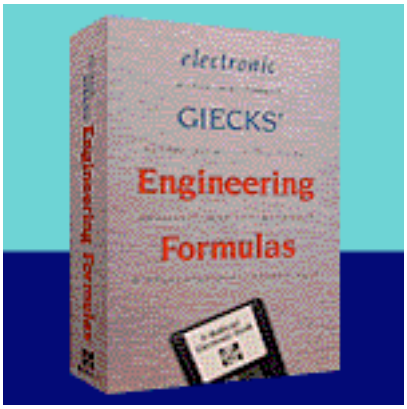


TABLE OF CONTENTS (page 13 of 13)

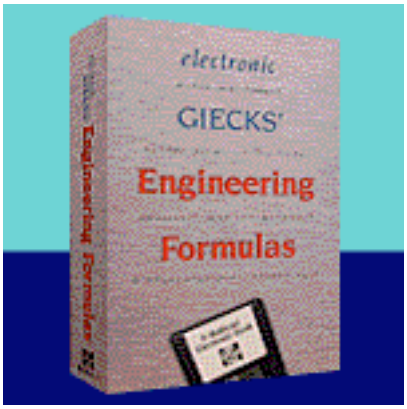
Heat

Permissible contact pressure pb
Bearing pressure of joint bolts
Jounals and bearing, bearing plates
General, non-sliding surfaces
Strength and Machining values
Allowable bending and torsional stresses
Characteristic quantities for machining
Data for clutches and brakes - Properties of friction materials
Electrical properties
Electrical specific resistance r and specific conductance g of conductors
Electrical resistance r of insulators
Electric temperature coeffiecient a20
Dielectric constant er
Electro-motive series
Standardized numbers using progression ration according to E-series
Magnetic properties
Magnetic field strength H and relative permeability mr as a function of induction B
Dynamo sheet properties
Lighting values
Guide values for illumination Ev
Luminous efficacy h
Luminous flux Fv of lamps

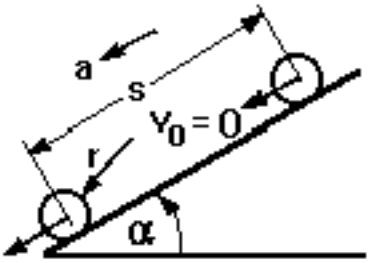
Index

Electronic Giecks': Engineering Formulas

SAMPLE PAGE (page 1 of 2)



Kinematics: Rolling Motion on an Inclined Plane



Input values

$r := 20 \cdot mm$ $\mu_o := 0.15$ $t := 2 \cdot sec$

(assume a ball) $k := \sqrt{\frac{2}{5} \cdot r^2}$ $f := 0.01 \cdot mm$

excluding friction f = 0 0 . . . amax

$\alpha := \operatorname{atan}\left(\mu_o \cdot \frac{r^2 + k^2}{k^2}\right)$ $a := \frac{g \cdot r^2}{r^2 + k^2} \cdot \sin(\alpha)$ $a = 3.256 \cdot \frac{m}{sec^2}$

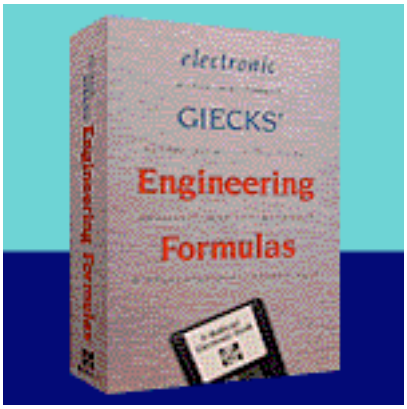
$v := a \cdot t$ $v = 6.512 \cdot \frac{m}{sec}$ $s := \frac{v^2}{2 \cdot a}$ $s = 6.512 \cdot m$

$v := \sqrt{2 \cdot a \cdot s}$ $v = 6.512 \cdot \frac{m}{sec}$ $s := \frac{v \cdot t}{2}$ $s = 6.512 \cdot m$

$v := \frac{2 \cdot s}{t}$ $v = 6.512 \cdot \frac{m}{sec}$ $s := \frac{a \cdot t^2}{2}$ $s = 6.512 \cdot m$

Table of Contents
Back to Product List

Electronic Giecks': Engineering Formulas



SAMPLE PAGE (page 2 of 2)

including friction f > 0

$$\alpha_{min} := \operatorname{atan}\left(\frac{f}{r}\right) \qquad \alpha_{max} := \operatorname{atan}\left(\mu_o \cdot \frac{r^2 + k^2 + f\,r}{k^2}\right) \qquad \alpha := \alpha_{max}$$

$$a := g \cdot r^2 \cdot \frac{\sin(\alpha) - \frac{f}{r} \cdot \cos(\alpha)}{r^2 + k^2} \qquad a = 3.254 \cdot \frac{m}{sec^2}$$

$$v := a \cdot t \qquad v = 6.508 \cdot \frac{m}{sec} \qquad s := \frac{v^2}{2 \cdot a} \qquad s = 6.508 \cdot m$$

$$v := \sqrt{2 \cdot a \cdot s} \qquad v = 6.508 \cdot \frac{m}{sec} \qquad s := \frac{v \cdot t}{2} \qquad s = 6.508 \cdot m$$

$$v := \frac{2 \cdot s}{t} \qquad v = 6.508 \cdot \frac{m}{sec} \qquad s := \frac{a \cdot t^2}{2} \qquad s = 6.508 \cdot m$$

ball $\qquad k^2 = \frac{2}{5} \cdot r^2$

solid cylinder $\qquad k^2 = \frac{r^2}{2}$

Friction numbers pipe with low wall thickness

$$k^2 = \frac{r_1^2 + r_2^2}{2} \qquad \text{approx.} = r^2$$

Table of Contents

Back to Product List