

Engineering Maths Tutorial 3

- 1) The formula for a physical pendulum is $T = 2\pi \sqrt{\frac{I}{mgr}}$ where I is the moment of inertia, m is the mass, g is the acceleration due to gravity and r is the distance from the pivot to the centre of mass.
- Solve the above formula for I .
 - Solve the above formula for r .

2) Solve $\varepsilon = \sqrt{1 - \frac{b^2}{a^2}}$ for a .

- 3) In fluid dynamics, the Hazen-Williams formula is $h_f = \frac{10.44LQ^{1.85}}{C^{1.85}d^{4.87}}$ where h_f is head loss, L is the length of the pipe, Q is the volumetric flow rate, C is the pipe roughness coefficient and d is the inside pipe diameter.

Solve the Hazen-Williams formula for:

- L
 - d
- 4) The Tsiolkovsky Rocket equation is $\Delta v = v_e \ln\left(\frac{m_0}{m_f}\right)$ where Δv is the maximum change in velocity, v_e is the effective exhaust velocity, m_0 is the total mass of the rocket (including exhaust) and m_f is the final mass of the rocket (without exhaust).

Solve the Tsiolkovsky Rocket equation for:

- v_e
 - m_f
- 5) The Radioactive Decay formula is given by $N = N_0 e^{-\lambda t}$ where N is the number of radioactive atoms, N_0 is the number of radioactive atoms at the beginning, λ is the decay constant and t is the elapsed time.

Solve this formula for t .

6) The Golden Ratio is the positive solution to $x = 1 + \frac{1}{x}$.

Find the Golden Ratio.

7) A right triangle has sides x and $x + 1$. If the hypotenuse is 29 cm, what is the length of the shortest side?

8) Find an equation for the graphs below:

a)

