Rectangle_0.3

June 23, 2019

Rectangle - Neutral Axis in Middle - Rev 0.3

Abstract:

Given: breadth or width b and depth or height d in identical units of length
Returns: Area, Section Modulus, Plastic Modulus, Second Moment of Inertia, Radius of Gyration, and distance from neutral axis to extreme fibre

Instructions:

Enter breadth and depth below:

In [1]:
```
from pint import UnitRegistry
unit = UnitRegistry()
unit.default_format = '~' # ~ for unit abreviations, P for pretty print, or both
# Define symbols for common units
m = unit.meter; mm = unit.millimeter; inch = unit.inch;
kN = unit.kilonewton; MPa = unit.megapascal; psi = unit.psi
```

In [2]:
```
# Define dimensional quantities
b = 5.5*inch # breadth or width
b.ito(mm) # convert to desired output unit
d = 7.5*inch # depth or height
d.ito(mm) # convert to desired output unit
```

In [3]:
```
# Formulas
A = b*d
Sx = (b*d**2)/6
Sy = (d*b**2)/6
Zx = (b*d**2)/4
Zy = (d*b**2)/4
Ix = (b*d**3)/12
Iy = (d*b**3)/12
rx = d/(12**0.5)
ry = b/(12**0.5)
cx = d/2
cy = b/2
```

In [4]:
```
# Define Output
print('Given:')
print(' Width or breadth, b = {0:n}{1} and'.format(b.magnitude, b.units))
print(' Height or depth, d = {0:n}{1}'.format(d.magnitude, d.units))
```

```
print('')
print('Geometric Properties:')
print(' Area, A = {0:n}{1}'.format(A.magnitude, A.units))
print(' Major Elastic Section Modulus, Sx = {0:n}{1}'.format(Sx.magnitude,
    Sx.units))
print(' Minor Elastic Section Modulus, Sy = {0:n}{1}'.format(Sy.magnitude,
    Sy.units))
print(' Major Plastic Section Modulus, Zx = {0:n}{1}'.format(Zx.magnitude,
    Zx.units))
print(' Minor Plastic Section Modulus, Zy = {0:n}{1}'.format(Zy.magnitude,
    Zy.units))
print(' Major Second Moment of Inertia, Ix = {0:n}{1}'.format(Ix.magnitude,
    Ix.units))
print(' Minor Second Moment of Inertia, Iy = {0:n}{1}'.format(Iy.magnitude,
    Iy.units))
print(' Major Radius of Gyration, rx = {0:n}{1}'.format(rx.magnitude,
    rx.units))
print(' Minor Radius of Gyration, ry = {0:n}{1}'.format(ry.magnitude,
    ry.units))
print(' Distance from Major Axis to Extreme Fibre, cx = {0:n}{1}'.format(
    cx.magnitude, cx.units))
print(' Distance from Minor Axis to Extreme Fibre, cy = {0:n}{1}'.format(
    cy.magnitude, cy.units))
```

```
Given:
 Width or breadth, b = 139.7mm and
 Height or depth, d = 190.5mm

Geometric Properties:
 Area, A = 26612.8mm ** 2
 Major Elastic Section Modulus, Sx = 844958mm ** 3
 Minor Elastic Section Modulus, Sy = 619636mm ** 3
 Major Plastic Section Modulus, Zx = 1.26744e+06mm ** 3
 Minor Plastic Section Modulus, Zy = 929454mm ** 3
 Major Second Moment of Inertia, Ix = 8.04822e+07mm ** 4
 Minor Second Moment of Inertia, Iy = 4.32816e+07mm ** 4
 Major Radius of Gyration, rx = 54.9926mm
 Minor Radius of Gyration, ry = 40.3279mm
 Distance from Major Axis to Extreme Fibre, cx = 95.25mm
 Distance from Minor Axis to Extreme Fibre, cy = 69.85mm
```

Revision History:

- Rev 0.3 19-Jun-2019 E.Durham Added units
- Rev 0.2 18-Jun-2019 E.Durham Added Plastic Section Modulus and revised formatting
- Rev 0.0 28-Mar-2019 E.Durham Created notebook using Figure 11.4 from Wood Design Manual 2017