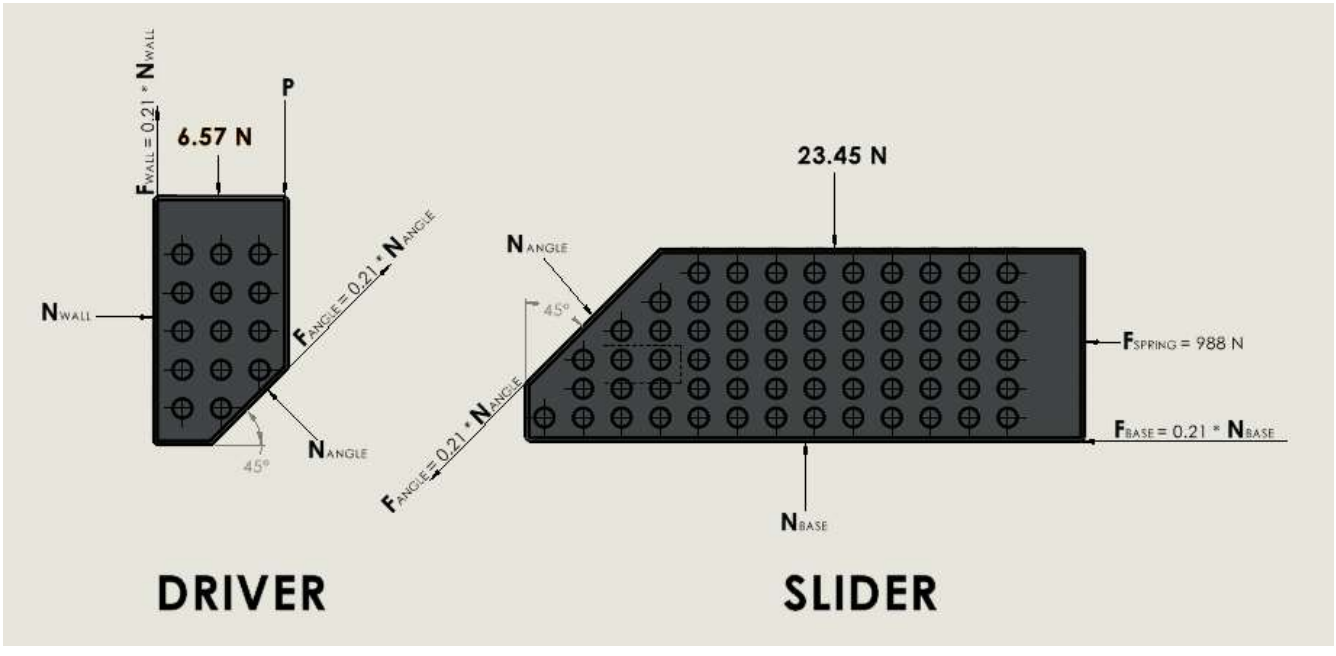


Know Values

```
unit = symunit;
mu = sym(0.21);
Wdriver = 6.57 * unit.N;
Wslider = 23.45 * unit.N;
Theta = sym(45) * unit.deg;
SpringForce = sym(38) * unit.N / unit.mm;
SpringDeflection = 6:26;
SpringDeflection = SpringDeflection * unit.mm;
```

Variables

```
syms Pforce Nwall Nangle Fangle Fwall Nbase Fbase Fspring
Fwall = mu * Nwall;
Fangle = mu * Nangle;
Fbase = mu * Nbase;
```

```
Fspring = SpringForce * SpringDeflection;
```

Slider

Sum of Forces in x-direction and y-direction

```
equ1 = -Fspring - Fbase + Nangle * cos(Theta) - Fangle * cos(Theta) == 0;
equ2 = -Wslider + Nbase - Nangle * sin(Theta) - Fangle * sin(Theta) == 0;

for index = 2:21
equ2(index) = -Wslider + Nbase - Nangle * sin(Theta) - Fangle * sin(Theta) == 0;
end

[NbaseSolutions, NangleSolutions] =  solve(equ1(1), equ2(1), Nbase, Nangle);
for index = 2:21
    [NbaseSolutions(index), NangleSolutions(index)] =  solve(equ1(index), equ2(index), Nbase, Nangle);
end
NbaseSolutions
```

NbaseSolutions =

$$\left(\frac{2944055}{5359}\,\text{N}\quad \frac{3403855}{5359}\,\text{N}\quad \frac{167985}{233}\,\text{N}\quad \frac{4323455}{5359}\,\text{N}\quad \frac{4783255}{5359}\,\text{N}\quad \frac{5243055}{5359}\,\text{N}\quad \frac{5702855}{5359}\,\text{N}\quad \frac{6162655}{5359}\,\text{N}\quad \frac{6622455}{5359}\,\text{N}\quad \frac{7082255}{5359}\,\text{N}\quad \frac{7542055}{5359}\,\text{N}\quad \frac{8001855}{5359}\,\text{N}\quad \frac{8461655}{5359}\,\text{N}\quad \frac{8921455}{5359}\,\text{N}\quad \frac{9381255}{5359}\,\text{N}\quad \frac{9841055}{5359}\,\text{N}\quad \frac{10300855}{5359}\,\text{N}\quad \frac{10760655}{5359}\,\text{N}\right.$$

```
NangleSolutions
```

NangleSolutions =

$$\left(\frac{2329245\sqrt{2}}{5359}\,\text{N}\quad \frac{2709245\sqrt{2}}{5359}\,\text{N}\quad \frac{134315\sqrt{2}}{233}\,\text{N}\quad \frac{3469245\sqrt{2}}{5359}\,\text{N}\quad \frac{3849245\sqrt{2}}{5359}\,\text{N}\quad \frac{4229245\sqrt{2}}{5359}\,\text{N}\quad \frac{4609245\sqrt{2}}{5359}\,\text{N}\quad \frac{4989245\sqrt{2}}{5359}\,\text{N}\quad \frac{5369245\sqrt{2}}{5359}\,\text{N}\quad \frac{5749245\sqrt{2}}{5359}\,\text{N}\quad \frac{6129245\sqrt{2}}{5359}\,\text{N}\quad \frac{6509245\sqrt{2}}{5359}\,\text{N}\quad \frac{6889245\sqrt{2}}{5359}\,\text{N}\quad \frac{7269245\sqrt{2}}{5359}\right.$$

Driver

Sum of Forces in x-direction

```
equ3 = solve(Nwall - Nangle * cos(Theta) + Fangle * cos(Theta) == 0,Nwall);
```

Nwall Values

```
NwallSolutions = subs(equ3, Nangle, NangleSolutions)
```

NwallSolutions =

$$\left(\frac{36802071}{107180}\,\text{N}\quad \frac{42806071}{107180}\,\text{N}\quad \frac{2122177}{4660}\,\text{N}\quad \frac{54814071}{107180}\,\text{N}\quad \frac{60818071}{107180}\,\text{N}\quad \frac{66822071}{107180}\,\text{N}\quad \frac{72826071}{107180}\,\text{N}\quad \frac{78830071}{107180}\,\text{N}\quad \frac{84834071}{107180}\,\text{N}\quad \frac{90838071}{107180}\,\text{N}\quad \frac{96842071}{107180}\,\text{N}\quad \frac{102846071}{107180}\,\text{N}\quad \frac{108850071}{107180}\,\text{N}\quad \frac{114854071}{107180}\,\text{N}\quad \frac{120858071}{107180}\,\text{N}\quad \frac{126862071}{107180}\,\text{N}\quad \frac{132}{10}\right.$$

Sum of Forces in x-direction

```
equ4 = solve(-Pforce - Wdriver + Fwall + Nangle * sin(Theta) + Fangle * sin(Theta), Pforce);
```

Pforce values

```
PforceSolutions = subs(equ4, {Nwall, Nangle}, {NwallSolutions, NangleSolutions})
```

PforceSolutions =

$$\left(\frac{6339199131}{10718000}\,\text{N}\quad \frac{7384883131}{10718000}\,\text{N}\quad \frac{366546397}{466000}\,\text{N}\quad \frac{9476251131}{10718000}\,\text{N}\quad \frac{10521935131}{10718000}\,\text{N}\quad \frac{11567619131}{10718000}\,\text{N}\quad \frac{12613303131}{10718000}\,\text{N}\quad \frac{13658987131}{10718000}\,\text{N}\quad \frac{14704671131}{10718000}\,\text{N}\quad \frac{15750355131}{10718000}\,\text{N}\quad \frac{16796039131}{10718000}\,\text{N}\quad \frac{17841723131}{10718000}\,\text{N}\quad \frac{18887407131}{10718000}\,\text{N}\quad \frac{1993309113}{10718000}\right.$$

```
PKgfSolutions = unitConvert(PforceSolutions, unit.kgf)
```

PKgfSolutions =

$$\left(\frac{63391991310}{1051076747}\,\text{kgf}\quad \frac{73848831310}{1051076747}\,\text{kgf}\quad \frac{523637710}{6528427}\,\text{kgf}\quad \frac{94762511310}{1051076747}\,\text{kgf}\quad \frac{105219351310}{1051076747}\,\text{kgf}\quad \frac{115676191310}{1051076747}\,\text{kgf}\quad \frac{126133031310}{1051076747}\,\text{kgf}\quad \frac{136589871310}{1051076747}\,\text{kgf}\quad \frac{147046711310}{1051076747}\,\text{kgf}\quad \frac{22500507330}{150153821}\,\text{kgf}\quad \frac{167960391310}{1051076747}\,\text{kgf}\quad \frac{178417231310}{1051076747}\,\text{kgf}\quad \frac{1888}{105}\right.$$

```
vpa(PforceSolutions, 6)
```

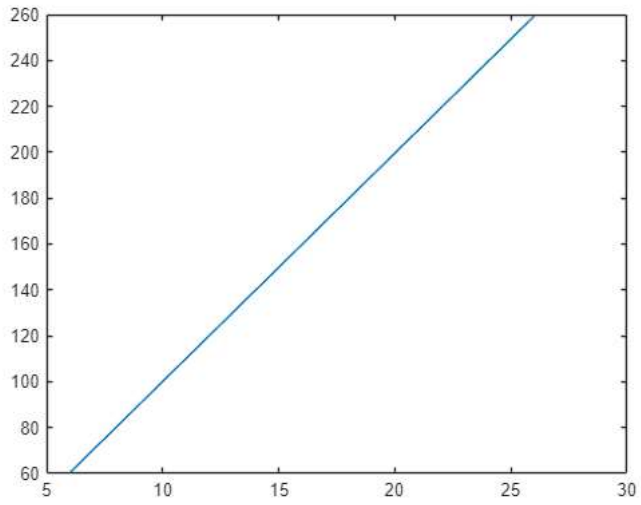
ans = (591.454 N 689.017 N 786.58 N 884.144 N 981.707 N 1079.27 N 1176.83 N 1274.4 N 1371.96 N 1469.52 N 1567.09 N 1664.65 N 1762.21 N 1859.78 N 1957.34 N 2054.9 N 2152.47 N 2250.03 N 2347.59 N 244

```
vpa(PKgfSolutions, 5)
```

ans = (60.311 kgf 70.26 kgf 80.209 kgf 90.158 kgf 100.11 kgf 110.05 kgf 120.0 kgf 129.95 kgf 139.9 kgf 149.85 kgf 159.8 kgf 169.75 kgf 179.7 kgf 189.64 kgf 199.59 kgf 209.54 kgf 219.49 kgf 229.44 kgf 239.39 kgf 249.34 kg

Plot of Spring Deflection vs Press Force Requirements

```
plot(separateUnits(SpringDeflection), separateUnits(PKgfSolutions))
```




```
test = fit(separateUnits(SpringDeflection)', separateUnits(PKgfSolutions)', 'poly1')
```

```
Warning: Converting X to matrix of double.
Warning: Converting Y to vector of double.
test =
     Linear model Poly1:
     test(x) = p1*x + p2
     Coefficients (with 95% confidence bounds):
       p1 =       9.949  (9.949, 9.949)
       p2 =      0.6193  (0.6193, 0.6193)
```

```
plot(test)
```