

Frage I

Zug

```
n_Sitz = 46          # Sitzplätze
n_Steh = 2*n_Sitz
n_max = n_Sitz + n_Steh
n = 0.85 * n_max
n
```

```
## [1] 117.3
```

```
N = 6              # Wagon
n_ges = N * n
n_ges
```

```
## [1] 703.8
```

```
n_ges = 700
m_Wagon = 21500
m_Pers = 88.2
m_Insassen = m_Pers*n_ges
m_Insassen
```

```
## [1] 61740
```

```
m = n_ges * m_Pers + N * m_Wagon
m
```

```
## [1] 190740
```

Der Bremsvorgang

```
v = 80 * 0.44704
v
```

```
## [1] 35.7632
```

```
t = 45
F_Brems = m * (v/t)
F_Brems
```

```
## [1] 151588.3
```

Die Fäden

```
d_ges = 0.02
fäden = 8
d = d_ges/fäden
d
```

```
## [1] 0.0025
```

```
G = pi*(d/2)**2
fäden_ges = 16
A = fäden_ges*G
A
```

```
## [1] 7.853982e-05
```

```
sigma = 1.1*10**9
F_n = sigma * A
F_n
```

```
## [1] 86393.8
```

Fazit zur 1. Frage

```
F_n / F_Brems
```

```
## [1] 0.569924
```

Frage II

```
F_Spiderman = 20*10**3*9.81
F_Spiderman
```

```
## [1] 196200
```

Echtheit der Ergebnisse

Durchmesser d

```
d_soll = sqrt(F_Brems / (4*pi*sigma))
d_soll
```

```
## [1] 0.003311552
```

```
d_soll/d
```

```
## [1] 1.324621
```

Anzahl der Fäden

```
fäden_soll = F_Brems / (sigma * G)
fäden_soll
```

```
## [1] 28.07392
```

```
fäden_soll / fäden_ges
```

```
## [1] 1.75462
```

Anhaltezeit

```
t_soll = m*(v/F_n)  
t_soll
```

```
## [1] 78.9579
```

```
t_soll/t
```

```
## [1] 1.75462
```

Masse der Passagiere

```
m_Zug = N*m_Wagon  
m_P = (F_n*t)/v - N * m_Wagon # N: Anzahl Wagons  
m_P
```

```
## [1] -20292.7
```

```
m_P/m_Insassen
```

```
## [1] -0.3286799
```