W8 - Problem 1

```
data = {5, 5, 4, 4, 7, 4, 3, 7, 6, 4, 2, 5, 6, 4, 5, 3, 5, 4, 2, 6, 7, 2, 4, 5,
    6, 5, 6, 4, 3, 4, 4, 5, 5, 6, 7, 5, 3, 6, 5, 5, 6, 7, 9, 4, 7, 9, 8, 8, 5, 10};
```

```
Mean[data] // N
```

5.22

```
Mean[data^2] - Mean[data]^2 // N
```

3.1716

$$\sqrt{\text{Mean}\left[\text{data}^2\right] - \text{Mean}[\text{data}]^2} \text{ // N}$$

1.7809

$$\frac{\sqrt{\text{Mean}\left[\text{data}^2\right] - \text{Mean}[\text{data}]^2}}{\sqrt{\text{Length}[\text{data}]}} \text{ // N}$$

0.251857

W8 - Problem 2

```
ErrEval[A_, x_, x0_, σ_] :=
  {A /. Thread[x → x0], Sqrt[Total[(D[A, {x}]^2 /. Thread[x → x0]) σ^2]]};
```

```
ErrEval[T^2, {T}, {298}, {5}]
```

{88 804, 2980}

W8 - Problem 3

```
ErrEval[A0 Exp[-k 10], {A0, k}, {5.0, 0.19}, {0.2, 0.03}]
```

{0.747843, 0.226338}

W8 - Problem 4

```
cheese = {29.8, 30.1, 30.5, 30.6, 31.3, 31.7, 32.6, 33.1, 32.7, 32.8};
stiffs = {327, 456, 509, 497, 596, 573, 661, 741, 809, 717};
```

```
Correlation[cheese, stiffs]
```

0.947091

W8 - Problem 5

$$0.9^{20}$$

0.121577

W8 - Problem 6

$$\sigma_{<x>} = \sqrt{\text{Var}[<x>]} = \sqrt{\text{Var}\left[\frac{1}{N}\sum_{n=1}^{N} x_n\right]} = \sqrt{\frac{1}{N^2}\sum_{n=1}^{N}\text{Var}[x_n]} = \sqrt{\frac{N\,\text{Var}[x]}{N^2}} = \frac{\sigma_x}{\sqrt{N}}$$

W8 - Problem 7

```
ErrEval[x + y, {x, y}, {x, y}, {σx, σy}]
```

$$\left\{x + y,\ \sqrt{\sigma_x^2 + \sigma_y^2}\right\}$$

```
ErrEval[k x, {x}, {x}, {σx}]
```

$$\left\{k\,x,\ \sqrt{k^2\,\sigma_x^2}\right\}$$

```
ErrEval[x y, {x, y}, {x, y}, {σx, σy}]
```

$$\left\{x\,y,\ \sqrt{y^2\,\sigma_x^2 + x^2\,\sigma_y^2}\right\}$$

```
ErrEval[x / y, {x, y}, {x, y}, {σx, σy}]
```

$$\left\{\frac{x}{y},\ \sqrt{\frac{\sigma_x^2}{y^2} + \frac{x^2\,\sigma_y^2}{y^4}}\right\}$$

```
ErrEval[x^k, {x}, {x}, {σx}]
```

$$\left\{x^k,\ \sqrt{k^2\,x^{-2+2k}\,\sigma_x^2}\right\}$$

```
ErrEval[k^x, {x}, {x}, {σx}]
```

$$\left\{k^x,\ \sqrt{k^{2x}\,\text{Log}[k]^2\,\sigma_x^2}\right\}$$

```
ErrEval[Log[k, x], {x}, {x}, {σx}]
```

$$\left\{\frac{\text{Log}[x]}{\text{Log}[k]},\ \sqrt{\frac{\sigma_x^2}{x^2\,\text{Log}[k]^2}}\right\}$$