MAP30#22

Question #2

Question 1

Data

```
ClearAll["Global`*"]
λ1 = 1 / 10 000;
λ2 = 1 / 100;
p = 0.05;
tt = 1200;
data = {121.5, 1425.5, 1657.2, 592.1, 848.2, 5296.6, 279.8, 7201.9, 1883.6, 6303.9,
   2951.2, 5637.9, 10 609.7, 9068.5, 7.5, 2311.1, 6853.7, 6054.3, 1051.7, 711.5}
Sort[data]
n = Length[data]
Mean[data]
```

{7.5, 121.5, 279.8, 592.1, 711.5, 848.2, 1051.7, 1425.5, 1657.2, 1883.6, 2311.1, 2951.2, 5296.6, 5637.9, 6054.3, 6303.9, 6853.7, 7201.9, 9068.5, 10 609.7}

20

3543.37

```
𝒟 = ExponentialDistribution[λ1];
𝒟𝒟 = ExponentialDistribution[λ2];
R[t_] =
```

$$R[t] = \text{If}\left[t < tt,\ 1,\ \frac{(1-p)\times \text{SurvivalFunction}[\mathcal{D}, t] + p\times \text{SurvivalFunction}[\mathcal{DD}, t]}{(1-p)\times \text{SurvivalFunction}[\mathcal{D}, tt] + p\times \text{SurvivalFunction}[\mathcal{DD}, tt]}\right];$$

$$\mu\mu = \int_0^\infty R[t]\, dt$$

```
Round[μμ, 0.1] - tt
```

$$\mu\mu = tt + \frac{(1-p)\times \lambda_2 \times \text{SurvivalFunction}[\mathcal{D}, tt] + p\times \lambda_1 \times \text{SurvivalFunction}[\mathcal{DD}, tt]}{\lambda_1 \times \lambda_2 \times \left((1-p)\times \text{SurvivalFunction}[\mathcal{D}, tt] + p\times \text{SurvivalFunction}[\mathcal{DD}, tt]\right)}$$

```
Round[μμ, 0.1] - tt
```

9928.58

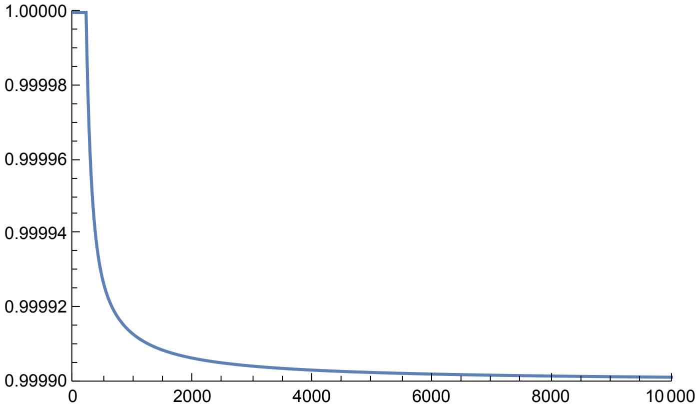
9728.6

10 128.6

9928.6

$$CF[t\_] = R[t]^{\frac{1}{t}};$$

```
Plot[CF[t], {t, 0, 10 000}, PlotRange → {{0, 10 000}, {.9999, 1}}]
```




```
10 128.6 / 3
```

3376.2

Question 2

- Data

```
ClearAll["Global`*"]

data =
 Sort[{121.5, 1425.5, 1657.2, 592.1, 848.2, 5296.6, 279.8, 7201.9, 1883.6, 6303.9,
2951.2, 5637.9, 10 609.7, 9068.5, 7.5, 2311.1, 6853.7, 6054.3, 1051.7, 711.5}]
n = Length[data]
Mean[data]
```

```
{7.5, 121.5, 279.8, 592.1, 711.5, 848.2, 1051.7, 1425.5, 1657.2, 1883.6, 2311.1,
 2951.2, 5296.6, 5637.9, 6054.3, 6303.9, 6853.7, 7201.9, 9068.5, 10 609.7}
```

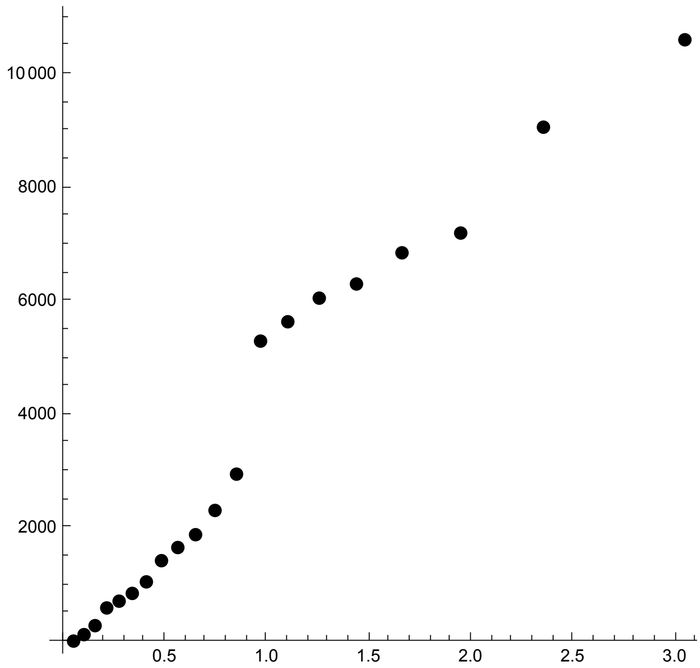
```
20
```

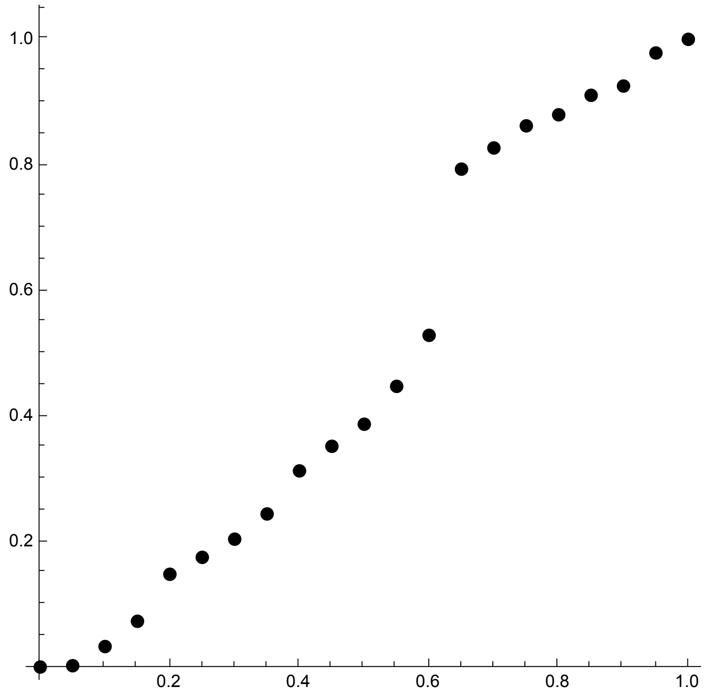
```
3543.37
```

- Probability paper and TTT plot

```
dist = ExponentialDistribution[1];
probpaper = Table[{Quantile[dist, i / (n + 1)], data[[i]]}, {i, 1, n}];
ListPlot[probpaper, AspectRatio → 1, PlotStyle → {PointSize[Large], Black}]

ttt = data;
spac = Table[If[i == 1, ttt[[i]], ttt[[i]] - ttt[[i - 1]]], {i, 1, n}];
x = 0;
tau = {0};
Do[x = x + (n - i + 1) × spac[[i]]; tau = Append[tau, x], {i, 1, n}];
tau;
list1 = Table[{i/n, tau[[i + 1]]/tau[[n + 1]]}, {i, 0, n}];
ListPlot[list1, AspectRatio → 1, PlotStyle → {PointSize[Large], Black}]
```





- Goodness-of-fit tests

```
𝒟estim = EstimatedDistribution[data, 𝒟]
Mean[𝒟estim]

𝒟 = ExponentialDistribution[λ];
KolmogorovSmirnovTest[data, 𝒟, "HypothesisTestData"]
AndersonDarlingTest[data, 𝒟, "TestDataTable"]
```

ExponentialDistribution[0.000282217]

3543.37

HypothesisTestData[Type: KolmogorovSmirnovTest p-Value: 0.285]

	Statistic	P-Value
Anderson-Darling	0.588467	0.377722

Requested confidence interval

```
λhat = 1 / Mean[data]
Total[data]

α = 0.05;
a = Quantile[ChiSquareDistribution[2 * n], α / 2]
b = Quantile[ChiSquareDistribution[2 * n], 1 - α / 2]

λL = λhat * a / (2 * n);
λU = λhat * b / (2 * n);
1 / λU
1 / λL

λL = 24.43 / (2 * 70 867.4);
λU = 59.34 / (2 * 70 867.4);
1 / λU
1 / λL

3543.37 * 2 * 20 / 59.34
3543.37 * 2 * 20 / 24.43
```

```
0.000282217

70 867.4

24.433

59.3417

2388.45

5800.95

2388.52

5801.67

2388.52

5801.67
```