MAP30#3

Question 1 — Type I/item censoring with replacement

```
n = 24;
t0 = 74 000
data = {2760., 3700., 7100., 17 220., 29 500., 48 400., 52 600., 65 000.}
r = Length[data]
Total[data]
τ = n × t0
α = 0.05;

Quantile[ChiSquareDistribution[2 * r], α / 2]
Quantile[ChiSquareDistribution[2 * r + 2], 1 - α / 2]

λL = Quantile[ChiSquareDistribution[2 * r], α / 2] / (2 * τ)
λU = Quantile[ChiSquareDistribution[2 * r + 2], 1 - α / 2] / (2 * τ)

Exp[-24 000 * λU]
Exp[-24 000 * λL]

(* Using the tables *)
λL = 6.908 / (2 * τ)
λU = 31.53 / (2 * τ)

Exp[-24 000 * λU]
Exp[-24 000 * λL]
```

```
74 000
```

```
{2760., 3700., 7100., 17 220., 29 500., 48 400., 52 600., 65 000.}
```

```
8
```

```
226 280.
```

```
1 776 000
```

```
6.90766
```

```
31.5264
```

```
1.94473 × 10^-6
```

```
8.87567 × 10^-6
```

```
0.808143
```

```
0.954399
```

```
1.94482 × 10^-6
```

```
8.87669 × 10^-6
```

```
0.808123
```

```
0.954397
```

Question 2

```
p0 = 0.001;
α = 0.005;
LCLalpha = Log[1 - α / 2] / Log[1 - p0]
UCLalpha = Log[α / 2] / Log[1 - p0]
ARLalpha[ρ_] = 1 / (1 - (CDF[GeometricDistribution[ρ * p0], Floor[UCLalpha]] -
      CDF[GeometricDistribution[ρ * p0], Ceiling[Max[0, LCLalpha]] - 1]));
Round[ARLalpha[1], 0.001]
Round[ARLalpha[1.1], 0.001]
```

```
2.50188
```

```
5988.47
```

```
181.961
```

```
214.21
```

Question 3

```
n = 9;
μ0 = 350.;
σ0 = 2.;
α = 1 / 370.4;

distmu = NormalDistribution[0, 1];
γmu = Quantile[distmu, 1 - α / 2];
γmu = 3.;
ξmu[δ_, θ_] = 1 - (CDF[distmu, (γmu - δ) / θ] - CDF[distmu, (-γmu - δ) / θ]);
ξmu[0, 1]
ARLmu[δ_, θ_] = 1 / ξmu[δ, θ];
ARLmu[0, 1]
```

```
0.0026998
```

```
370.398
```

```
n = 9;
μ0 = 350.;
σ0 = 2.;
α = 1 / 370.4;

distsigma = ChiSquareDistribution[n - 1];
γsigma = Round[Quantile[distsigma, 1 - α], 0.000001]
ξsigma[θ_] = 1 - CDF[distsigma, γsigma / θ^2];

ξsigma[1];
ARLsigma[θ_] = 1 / ξsigma[θ];
ARLsigma[1]
```

```
23.5746
```

```
370.4
```

```
shiftmu = 0.25;
shiftsigma = Sqrt[23.574603 / 21.95];

Round[ξmu[shiftmu, shiftsigma], 0.000001]
Round[ξsigma[shiftsigma], 0.000001]

Round[0.004839 + 0.005009 - 0.004839 * 0.005009, 0.000001]
1 - CDF[BinomialDistribution[10, %], 1]
Round[1 - (1 - 0.009824)^10 - 10 * 0.009824 * (1 - 0.009824)^9, 0.000001]
```

```
0.004839
```

```
0.005009
```

```
0.009824
```

```
0.00412122
```

```
0.004121
```