

1) Suppose that the 14 failure times (in minutes) given below follow an exponential (λ) distribution.

1, 8, 10, 59+, 72+, 76+, 113+, 117+, 124+, 145+, 149+, 153+, 182+, 320+

a) Find $\hat{\lambda}$.

b) Find a 95% CI for λ .

2) Does the `cox.zph` function output below suggest that the proportional hazards assumption is reasonable?

```
cox.zph(lung.fit2)
      rho      chisq    p
pph.ecog  0.05189  0.3905 0.532
ph.karno  0.14216  2.2081 0.137
pat.karno  0.04773  0.3812 0.537
wt.loss    0.00857  0.0131 0.909
GLOBAL      NA    4.4476 0.349
```

	Value	Std. Error	z	p
(Intercept)	3.74398	8.54299	0.438	0.661
age	-0.36903	0.46004	-0.802	0.422
weight	0.00364	0.00242	1.502	0.133
length	-0.01203	0.03319	-0.362	0.717
Log(scale)	-0.22451	0.21043	-1.067	0.286

Loglik(model)= -101.8 Loglik(intercept only)= -103
Chisq= 2.39 on 3 degrees of freedom, p= 0.49 n = 50

3) Data from Collett (2003, p. 366) is on black ducks. Y is survival time in days, predictors are *age* (0 hatch year bird, 1 bird aged ≥ 1 year), *weight* of duck in grams and *length* of wing in mm. Weibull regression was used.

a) Test $\beta = 0$.

b) Test $\beta_2 = 0$.

c) Test $\beta_3 = 0$.