Q1 (a) & (b)

By delta method,

$$\begin{aligned}
v\hat{a}r(sin^{-1}\sqrt{\hat{S}(t_0)}) &= \left[\frac{dsin^{-1}\sqrt{\hat{S}(t_0)}}{d\hat{S}(t_0)}\right]^2 v\hat{a}r(\hat{S}(t_0)) \\
&= \left[\frac{1}{\sqrt{1-\hat{S}(t_0)}}\frac{1}{2}\hat{S}^{-1/2}(t_0)\right]^2 \hat{S}^2(t_0)\sigma_s^2(t_0) \\
&= \frac{1}{4}\sigma_s^2(t_0)\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}
\end{aligned}$$

Note that

- Asymptotically, $sin^{-1}\sqrt{\hat{S}(t_0)} \sim N\left[sin^{-1}\sqrt{S(t_0)}, \frac{1}{4}\sigma_s^2(t_0)\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}\right]$.
- $0 \le sin^{-1}\sqrt{S(t_0)} \le \pi/2$ for $0 \le S(t_0) \le 1$.

Hence, $100(1-\alpha)\%$ CI for $sin^{-1}\sqrt{S(t_0)}$:

$$\left[max\left(0, sin^{-1}\sqrt{\hat{S}(t_0)} - z_{1-\alpha/2} \times \sqrt{\frac{1}{4}\sigma_s^2(t_0)\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}}\right), min\left(1, sin^{-1}\sqrt{\hat{S}(t_0)} + z_{1-\alpha/2} \times \sqrt{\frac{1}{4}\sigma_s^2(t_0)\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}}\right)\right]$$

$$\left[max\left(0, sin^{-1}\sqrt{\hat{S}(t_0)} - \frac{1}{2}z_{1-\alpha/2}\sigma_s(t_0)\sqrt{\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}}\right), min\left(1, sin^{-1}\sqrt{\hat{S}(t_0)} + \frac{1}{2}z_{1-\alpha/2}\sigma_s(t_0)\sqrt{\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}}\right)\right]$$

Since $sin^{-1}(\sqrt{S(t_0)})$ is increasing with $S(t_0)$ for $0 \le S(t_0) \le 1$, $100(1-\alpha)\%$ CI for $S(t_0)$:

$$\begin{aligned}
& sin^2\left[max\left(0, sin^{-1}\sqrt{\hat{S}(t_0)} - \frac{1}{2}z_{1-\alpha/2}\sigma_s(t_0)\sqrt{\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}}\right)\right] \\
& \le S(t_0) \le \\
& sin^2\left[min\left(1, sin^{-1}\sqrt{\hat{S}(t_0)} + \frac{1}{2}z_{1-\alpha/2}\sigma_s(t_0)\sqrt{\frac{\hat{S}(t_0)}{1-\hat{S}(t_0)}}\right)\right]
\end{aligned}$$

Q2 (a)

$L(S) =$

$[S(10-)-S(10)]^3[S(11-)-S(11)]^2[S(11)][S(12)]^2[S(13-)-S(13)]^4[S(13)]\times$

$[S(14-)-S(14)]^5[S(14)][S(15-)-S(15)]^3[S(16-)-S(16)]^2[S(16)]^3\times$

$[S(17-)-S(17)][S(17)]^2[S(18-)-S(18)][S(18)]^4[S(19)]^2[S(19-)-S(19)]^2$

Remark: The likelihood function of S(t) should involve only S().

Q2 (b) $\mathrm{St.KM} = \prod_{j=1}^{i}(1-\frac{d_j}{n_j})$, $Var(\mathrm{St.KM}) = \mathrm{St.Km}^2\sum_{j=1}^{i}(1-\frac{d_j}{n_j})$,

i	time	di	ni	St.KM
1	10	3	39	0.9231
2	11	2	36	0.8718
3	13	4	31	0.7593
4	14	5	26	0.6133
5	15	3	20	0.5213
6	16	2	17	0.4600
7	17	1	12	0.4216
8	18	1	9	0.3748
9	19	2	4	0.1874

Q2 (c)

i	time	di	ni	St.NA
1	10	3	39	0.9260
2	11	2	36	0.8759
3	13	4	31	0.7699
4	14	5	26	0.6352
5	15	3	20	0.5467
6	16	2	17	0.4860
7	17	1	12	0.4472
8	18	1	9	0.4002
9	19	2	4	0.2427

Q2 (d) $\hat{\mu}$=15.817, $SE(\hat{\mu})$= 0.508

Q2(e)

(i) Linear CI for S(14)=
[0.6132-1.96*0.0816, 0.6132+1.96*0.0816]=[0.4533, 0.7732]

(ii) CI for S(14) based on Log log transform
=[S14^(1/θ),S14^(θ)], where θ= exp((1.96*0.0816)/(log(0.6132)*0.6132))
=[0.4345 0.7507]

(iii) CI for S(14) based on arc sine square root:
[(sin(min(pi/2,asin(sqrt(0.6132))+ Φ*1.96)))^2,
(sin(max(0,asin(sqrt(0.6132))- Φ*1.96)))^2]

=[0.4501 0.7642]

Where Φ=(1/2)*0.0816/sqrt(0.6132*(1-0.6132))

Q3(i)

3(a). Assume $\sup T = 10$, then $\hat{\mu} = \hat{E}T = \int_0^{10} S(t)\,dt$

i	t_i	d_i	n_i	$\hat{\lambda}_i$	$1-\hat{\lambda}_i$	$\hat{S}_{KM}(t_i)$	$\frac{d_i}{n_i(n_i-d_i)}$	$\int_{t_i}^{10}\hat{S}(t)dt$
0	0	0	9	0	1	1	0	6.5778
1	2	1	9	1/9	8/9	8/9	0.0139	4.5778
2	4	2	8	2/8	6/8	6/9	0.0417	2.8
3	5	1	5	1/5	4/5	8/15	0.05	2.1333
4	7	1	3	1/3	2/3	16/45	0.1667	1.0667

$\mu = 6.5778, \qquad SE(\mu) = 1.0175$

Q3(ii)

3(b) Assume $t_5 = 8$, then $\hat{\mu} = \hat{E}T = \int_0^{8} S(t)\,dt$

i	t_i	d_i	n_i	$\hat{\lambda}_i$	$1-\hat{\lambda}_i$	$\hat{S}(t_i)$	$\frac{d_i}{n_i(n_i-d_i)}$	$\int_{t_i}^{8}\hat{S}(t)dt$
0	0	0	9	0	1	1	0	5.8667
1	2	1	9	1/9	8/9	8/9	0.0139	3.8667
2	4	2	8	2/8	6/8	6/9	0.0417	2.0889
3	5	1	5	1/5	4/5	8/15	0.05	1.4222
4	7	1	3	1/3	2/3	16/45	0.1667	0.3556
5	8	1	1	1	0	0	∞	0

$\mu = 5.8667, \qquad SE(\mu) = 0.7155$

Q4(a)

For Diploid,

time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
1	25	1	0.9600	0.0392	0.88319	1.000
3	24	1	0.9200	0.0543	0.81366	1.000
4	23	1	0.8800	0.0650	0.75262	1.000
5	22	2	0.8000	0.0800	0.64320	0.957
8	20	1	0.7600	0.0854	0.59259	0.927
23	18	1	0.7178	0.0905	0.54039	0.895
26	17	1	0.6756	0.0945	0.49030	0.861
27	16	1	0.6333	0.0976	0.44206	0.825
30	15	1	0.5911	0.0998	0.39551	0.787
42	14	1	0.5489	0.1012	0.35052	0.747
56	13	1	0.5067	0.1019	0.30704	0.706
62	12	1	0.4644	0.1017	0.26504	0.664
69	10	1	0.4180	0.1016	0.21884	0.617
104	8	2	0.3135	0.0995	0.11845	0.509
112	5	1	0.2508	0.0974	0.05994	0.442
129	4	1	0.1881	0.0910	0.00972	0.366
181	2	1	0.0941	0.0806	0.00000	0.252

Q4(a)

For Aneuploidy,

time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
1	51	1	0.980	0.0194	0.942	1.000
3	50	2	0.941	0.0329	0.877	1.000
4	48	1	0.922	0.0376	0.848	0.995
10	47	1	0.902	0.0416	0.820	0.984
13	46	2	0.863	0.0482	0.768	0.957
16	44	2	0.824	0.0534	0.719	0.928
24	42	1	0.804	0.0556	0.695	0.913
26	41	1	0.784	0.0576	0.671	0.897
27	40	1	0.765	0.0594	0.648	0.881
28	39	1	0.745	0.0610	0.625	0.865
30	38	2	0.706	0.0638	0.581	0.831
32	36	1	0.686	0.0650	0.559	0.814
41	35	1	0.667	0.0660	0.537	0.796
51	34	1	0.647	0.0669	0.516	0.778
65	32	1	0.627	0.0678	0.494	0.760
67	31	1	0.607	0.0686	0.472	0.741
70	30	1	0.586	0.0692	0.451	0.722
72	29	1	0.566	0.0697	0.430	0.703
73	28	1	0.546	0.0701	0.409	0.683
77	26	1	0.525	0.0705	0.387	0.663
91	18	1	0.496	0.0723	0.354	0.638
93	17	1	0.467	0.0737	0.322	0.611
96	16	1	0.437	0.0747	0.291	0.584
100	14	1	0.406	0.0756	0.258	0.554
104	12	1	0.372	0.0765	0.222	0.522
157	5	1	0.298	0.0905	0.121	0.475
167	4	1	0.223	0.0936	0.040	0.407

Q4(b)

For Diploid,

i	time	n.risk	n.event	cum.hazard1	std.err1	cum.hazard2	std.err2
[1,]	1	25	1	0.04082	0.04082	0.04000	0.04000
[2,]	3	24	1	0.08338	0.05898	0.08167	0.05776
[3,]	4	23	1	0.12783	0.07385	0.12514	0.07229
[4,]	5	22	2	0.22314	0.10000	0.21605	0.09674
[5,]	8	20	1	0.27444	0.11239	0.26605	0.10890
[6,]	23	18	1	0.33160	0.12609	0.32161	0.12225
[7,]	26	17	1	0.39222	0.13991	0.38043	0.13567
[8,]	27	16	1	0.45676	0.15409	0.44293	0.14937
[9,]	30	15	1	0.52575	0.16883	0.50960	0.16357
[10,]	42	14	1	0.59986	0.18439	0.58103	0.17849
[11,]	56	13	1	0.67990	0.20102	0.65795	0.19436
[12,]	62	12	1	0.76691	0.21906	0.74128	0.21147
[13,]	69	10	1	0.87227	0.24310	0.84128	0.23392
[14,]	104	8	2	1.15996	0.31743	1.09128	0.29321
[15,]	112	5	1	1.38310	0.38828	1.29128	0.35492
[16,]	129	4	1	1.67078	0.48383	1.54128	0.43413
[17,]	181	2	1	2.36393	0.85679	2.04128	0.66217

Q4(b)

For Aneuploid,

i	time	n.risk	n.event	cum.hazard1	std.err1	cum.hazard2	std.err2
[1,]	1	51	1	0.01980	0.01980	0.01961	0.01961
[2,]	3	50	2	0.06062	0.03501	0.05961	0.03442
[3,]	4	48	1	0.08168	0.04085	0.08044	0.04023
[4,]	10	47	1	0.10318	0.04617	0.10172	0.04551
[5,]	13	46	2	0.14764	0.05585	0.14520	0.05492
[6,]	16	44	2	0.19416	0.06482	0.19065	0.06364
[7,]	24	42	1	0.21825	0.06915	0.21446	0.06794
[8,]	26	41	1	0.24295	0.07343	0.23885	0.07219
[9,]	27	40	1	0.26826	0.07767	0.26385	0.07640
[10,]	28	39	1	0.29424	0.08190	0.28949	0.08058
[11,]	30	38	2	0.34831	0.09039	0.34212	0.08876
[12,]	32	36	1	0.37648	0.09468	0.36990	0.09301
[13,]	41	35	1	0.40547	0.09901	0.39847	0.09730
[14,]	51	34	1	0.43532	0.10342	0.42788	0.10164
[15,]	65	32	1	0.46707	0.10818	0.45913	0.10634
[16,]	67	31	1	0.49986	0.11304	0.49139	0.11113
[17,]	70	30	1	0.53376	0.11802	0.52473	0.11602
[18,]	72	29	1	0.56885	0.12312	0.55921	0.12103
[19,]	73	28	1	0.60522	0.12838	0.59492	0.12619
[20,]	77	26	1	0.64444	0.13424	0.63338	0.13192
[21,]	91	18	1	0.70160	0.14591	0.68894	0.14314
[22,]	93	17	1	0.76222	0.15800	0.74776	0.15476
[23,]	96	16	1	0.82676	0.17068	0.81026	0.16690
[24,]	100	14	1	0.90087	0.18608	0.88169	0.18155
[25,]	104	12	1	0.98788	0.20543	0.96502	0.19976
[26,]	157	5	1	1.21102	0.30365	1.16502	0.28267
[27,]	167	4	1	1.49870	0.41897	1.41502	0.37736

Q4(c)

For Diploid, $\hat{\mu}$=80.2,   95%CI for μ =[49.624, 110.776]

For Aneuploid, $\hat{\mu}$=144.2, 95%CI for μ =[90.692, 197.708]

Q4(d)

For, Diploid, median=62.0,   95%CI for median = [26.0, 112.0)

For Aneuploid, median=91.0,   95%CI for median = [65.0, 157.0)

Remark: For CI of median, the upper end point should be an open interval.

Q5(a)

time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
0.0	149	1	0.9933	0.00669	0.98026	1.0000
0.3	148	1	0.9866	0.00943	0.96827	1.0000
1.1	147	2	0.9732	0.01324	0.94754	0.9995
1.5	145	1	0.9664	0.01475	0.93796	0.9958
1.8	144	1	0.9597	0.01611	0.92868	0.9918
1.9	143	1	0.9530	0.01733	0.91964	0.9876
2.5	140	1	0.9462	0.01850	0.91064	0.9832
3.0	139	1	0.9394	0.01958	0.90181	0.9786
3.5	138	1	0.9326	0.02059	0.89311	0.9738
3.6	137	2	0.9190	0.02242	0.87607	0.9640
4.5	133	1	0.9121	0.02330	0.86754	0.9589
4.6	132	1	0.9052	0.02412	0.85910	0.9537
4.7	131	1	0.8983	0.02491	0.85074	0.9484
5.0	129	1	0.8913	0.02567	0.84237	0.9431
5.5	128	1	0.8843	0.02640	0.83408	0.9376
5.8	125	1	0.8773	0.02712	0.82568	0.9320
5.9	124	1	0.8702	0.02781	0.81735	0.9264
6.7	122	1	0.8630	0.02848	0.80900	0.9207
6.8	120	2	0.8487	0.02976	0.79229	0.9091
7.2	117	3	0.8269	0.03154	0.76734	0.8911
7.3	113	2	0.8123	0.03264	0.75075	0.8788
8.1	109	1	0.8048	0.03318	0.74235	0.8725
8.5	108	1	0.7974	0.03370	0.73398	0.8662
8.6	107	1	0.7899	0.03420	0.72565	0.8599
8.9	106	1	0.7825	0.03468	0.71736	0.8535
9.0	105	1	0.7750	0.03514	0.70911	0.8470
9.6	104	1	0.7676	0.03558	0.70089	0.8406
10.2	101	5	0.7296	0.03766	0.65936	0.8072

10.3	96	3	0.7068	0.03871	0.63481	0.7869
10.5	93	2	0.6916	0.03935	0.61859	0.7731
10.6	91	2	0.6764	0.03992	0.60247	0.7593
10.8	88	1	0.6687	0.04020	0.59435	0.7523
10.9	86	1	0.6609	0.04048	0.58614	0.7452
11.0	84	1	0.6530	0.04075	0.57785	0.7380
11.1	82	3	0.6291	0.04153	0.55278	0.7160
11.2	79	1	0.6212	0.04176	0.54449	0.7087
11.3	78	1	0.6132	0.04198	0.53621	0.7013
11.4	77	2	0.5973	0.04237	0.51975	0.6864
11.5	75	1	0.5893	0.04255	0.51156	0.6789
11.6	74	2	0.5734	0.04286	0.49524	0.6639
11.7	72	1	0.5654	0.04300	0.48713	0.6563
11.9	71	1	0.5575	0.04313	0.47903	0.6487
12.0	70	1	0.5495	0.04324	0.47096	0.6411
12.1	69	1	0.5415	0.04334	0.46292	0.6335
12.3	67	2	0.5254	0.04353	0.44662	0.6180
12.4	65	13	0.4203	0.04350	0.34313	0.5148
12.5	52	2	0.4041	0.04330	0.32758	0.4986
12.6	49	1	0.3959	0.04320	0.31966	0.4903
12.9	48	1	0.3876	0.04308	0.31177	0.4820
13.0	47	1	0.3794	0.04294	0.30391	0.4736
13.4	46	2	0.3629	0.04263	0.28826	0.4568
13.5	44	1	0.3546	0.04245	0.28048	0.4484
13.6	43	1	0.3464	0.04226	0.27273	0.4400
13.7	41	1	0.3380	0.04206	0.26479	0.4313
13.8	39	1	0.3293	0.04187	0.25665	0.4225
13.9	38	1	0.3206	0.04165	0.24855	0.4136
14.0	37	3	0.2946	0.04089	0.22446	0.3867
14.1	34	4	0.2600	0.03958	0.19289	0.3504

14.2	30	2	0.2426	0.03879	0.17736	0.3319
14.3	28	4	0.2080	0.03692	0.14685	0.2945
14.4	23	2	0.1899	0.03586	0.13115	0.2749
14.5	21	4	0.1537	0.03328	0.10057	0.2350
14.6	17	1	0.1447	0.03252	0.09312	0.2248
14.8	16	2	0.1266	0.03087	0.07849	0.2042
15.0	14	1	0.1175	0.02996	0.07133	0.1937
15.4	12	4	0.0784	0.02559	0.04132	0.1486
15.5	8	1	0.0686	0.02419	0.03434	0.1369
15.6	7	1	0.0588	0.02263	0.02763	0.1250
15.7	6	1	0.0490	0.02087	0.02124	0.1129
15.8	5	2	0.0294	0.01649	0.00978	0.0883
16.3	3	1	0.0196	0.01360	0.00503	0.0763
16.5	2	1	0.0098	0.00971	0.00141	0.0683
16.9	1	1	0.0000	NaN	NA	NA

Q5(b)

For t=5,

time	n.event	n.risk	Survival	std.err
5.0	129	1	0.8913	0.02567

Q5(c)

records	n.max	n.start	events	median	0.95LCL	0.95UCL
149.0	149.0	149.0	124.0	12.4	11.6	12.5

So, the median estimate=12.4

the 95% median for CI= [11.6,12.5)

Remark: the upper end point should be an open interval.

Appendix(R codes)

```
STAT4008 HW 2 Solution

install.packages("survival")

library(survival)


#############

### Q2(b) ###

#############

#-------------------------------------------------------------------------

Q2<-

data.frame(

time=c(10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,19,19),

n=c(3,0,2,1,0,2,4,1,5,1,3,0,2,3,1,2,1,4,2,2),

status=c(1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0))

mQ2<-

survfit(Surv(time,status)~1,data=Q2,weight=n,

conf.type="plain",error="g")

summary(mQ2)


#pull out useful parameters

ti<-summary(mQ2)$time

ni<-summary(mQ2)$n.risk

di<-summary(mQ2)$n.event

Sti<-summary(mQ2)$surv

Sti.se<-summary(mQ2)$std.err


#output

signif(data.frame(time=ti,di,ni,St.KM=Sti),4)
```

```
#############
### Q2(c) ###
#############
#-----------------------------------------------------------------------
lambda<-di/ni
H.tilde<-cumsum(lambda)
St.NA<-exp(-H.tilde)

#output
signif(data.frame(time=ti,di,ni,St.NA=St.NA),4)

#############
### Q2(d) ###
#############
#-----------------------------------------------------------------------
print(mQ2,print.rmean=T)

#############
### Q2(e) ###
#############
#-----------------------------------------------------------------------
#(i) Linear CI
S14.se<-Sti.se[ti==14]
S14<-Sti[ti==14]
S14.CI.1<-c(S14-0.0816*1.96,S14+0.0816*1.96)
signif(S14.CI.1,4)



#(ii) log-log CI
theta= exp((1.96*0.0816)/(log(S14)*S14))
S14.CI.2<-c(S14^(1/theta),S14^(theta))
signif(S14.CI.2,4)
```

```
#(iii) Arc Sine SQuare Root CI

phi<-(1/2)*0.0816/sqrt(0.6132*(1-0.6132))

UCL<-(sin(min(pi/2,asin(sqrt(0.6132))+phi*1.96)))^2

LCL<-(sin(max(0,asin(sqrt(0.6132))-phi*1.96)))^2

S14.CI3<-c(LCL,UCL)

signif(S14.CI3,4)




#############

### Q4(a) ###

#############

#--------------------------------------------------------------------------

# For Diploid

V.D.time = c(1 ,3 ,4 ,5 ,5 ,8 ,23 ,26 ,27 ,30 ,

42 ,56 ,62 ,69 ,104 ,104 ,112 ,129 ,181 ,8 ,

67 ,76 ,104 ,176 ,231)

V.D.censor = c(rep(1,19),rep(0,6))

KM.D = survfit(formula = Surv(V.D.time, V.D.censor, type = "right")~1,

conf.type="plain")

summary(KM.D)


# For Aneuploid

V.A.time = c(1 ,3 ,3 ,4 ,10 ,13 ,13 ,16 ,16 ,24 ,

26 ,27 ,28 ,30 ,30 ,32 ,41 ,51 ,65 ,67 ,

70 ,72 ,73 ,77 ,91 ,93 ,96 ,100 ,104 ,157,

167 ,61 ,74 ,79 ,80 ,81 ,87 ,87 ,88 ,89 ,

97 ,101 ,104 ,108 ,109 ,120 ,131 ,150 ,231 ,240,

400)

V.A.censor = c(rep(1,31),rep(0,20))

KM.A = survfit(formula = Surv(V.A.time, V.A.censor, type = "right")~1,

conf.type="plain")

summary(KM.A)
```

```
#############
### Q4(b) ###
#############
#------------------------------------------------------------------------------
# For Diploid
temp=KM.D$n.event
I.D=(temp!=0); d.D=KM.D$n.event[I.D]; n.D=KM.D$n.risk[I.D]; t.D=KM.D$time[I.D]
lambda.D=d.D/n.D;
H.D1=-log(cumprod(1-lambda.D));
H.D2=cumsum(lambda.D);
var.H.D1=cumsum(d.D/(n.D*(n.D-d.D)));
var.H.D2=cumsum(d.D/n.D^2);
HA.D=cbind(t.D,n.D,d.D,
H.D1,sqrt(var.H.D1),
H.D2,sqrt(var.H.D2))
colnames(HA.D)=c("time","n.risk","n.event",
"H(t)(KM)","std.err1","H(t)(NA)","std.err2")
print((HA.D),4)

# For Aneuploid
temp=KM.A$n.event
I.A=(temp!=0); d.A=KM.A$n.event[I.A]; n.A=KM.A$n.risk[I.A]; t.A=KM.A$time[I.A]
lambda.A=d.A/n.A;
H.A1=-log(cumprod(1-lambda.A));
H.A2=cumsum(lambda.A);
var.H.A1=cumsum(d.A/(n.A*(n.A-d.A)));
var.H.A2=cumsum(d.A/n.A^2);
HA.A=cbind(t.A,n.A,d.A,
H.A1,sqrt(var.H.A1),
H.A2,sqrt(var.H.A2))
colnames(HA.A)=c("time","n.risk","n.event",
"H(t)(KM)","std.err1","H(t)(NA)","std.err2")
print((HA.A),4)
```

```
####################
### Q4(c,d) ###
####################
#---------------------------------------------------------------------------
# For Diploid
print(KM.D,print.rmean=T)
u.CI.D<-c(80.2-1.96*15.6,80.2+1.96*15.6)



# For Aneuploid
print(KM.A,print.rmean=T)
u.CI.A<-c(144.2-1.96*27.3,144.2+1.96*27.3)



###############
### Q5(a,b) ###
###############
#---------------------------------------------------------------------------
Q5=read.table("ass2Q5.csv", sep = ",",header=TRUE)
time=Q5$Time; censor=Q5$Censor
KM.Q5=survfit(formula = Surv(time, censor, type = "right")~1,
error="g")
summary(KM.Q5)

S5<-summary(KM.Q5)$surv[summary(KM.Q5)$time==5]
S5.SE<-summary(KM.Q5)$std.err[summary(KM.Q5)$time==5]
```

```
#############

### Q5(c) ###

#############

#--------------------------------------------------------------------------

print(KM.Q5)
```

Q6

time	n.risk	n.event	survival	std.err	lower 95% CI	upper 95% CI
1.0	9.0	2.399363	0.733	0.147	0.495	1.00
1.5	6.6	0.000653	0.733	0.147	0.495	1.00
3.0	6.6	1.199995	0.600	0.163	0.352	1.00
4.0	5.4	2.399989	0.333	0.157	0.132	0.84
8.0	1.0	1.000000	0.000	NaN	NA	NA

Q7a

	tj	n.risk
[1,]	60	5
[2,]	62	9
[3,]	63	10
[4,]	65	10
[5,]	66	10
[6,]	68	13
[7,]	69	14
[8,]	70	13
[9,]	71	12
[10,]	72	12
[11,]	73	11
[12,]	74	9
[13,]	76	7
[14,]	77	5

Q7b

	obsfail60	surfun_est60
[1,]	62	0.8571429
[2,]	65	0.6666667
[3,]	66	0.5925926
[4,]	68	0.4938272
[5,]	69	0.4178538
[6,]	70	0.3535686
[7,]	71	0.2946405
[8,]	72	0.2455337
[9,]	73	0.2232125
[10,]	74	0.1984111
[11,]	76	0.1700666
[12,]	77	0.1360533

Q7c

	obsfail65	surfun_est65
[1,]	68	0.8333333
[2,]	69	0.6250000
[3,]	70	0.4861111
[4,]	71	0.4253472
[5,]	72	0.3308256
[6,]	73	0.2940672
[7,]	74	0.2573088
[8,]	76	0.2205504
[9,]	77	0.1764403

Q8

	xi	P(X<xi|X<42)
[1,]	30	0.90000000
[2,]	27	0.83076923
[3,]	25	0.77142857
[4,]	19	0.72605042
[5,]	18	0.68067227
[6,]	17	0.63813025
[7,]	16	0.55836397
[8,]	15	0.43871455
[9,]	13	0.35894827
[10,]	12	0.31906513
[11,]	11	0.27918199
[12,]	9	0.24428424
[13,]	8	0.13959099
[14,]	7	0.11167279
[15,]	6	0.04466912
[16,]	4	0.00000000