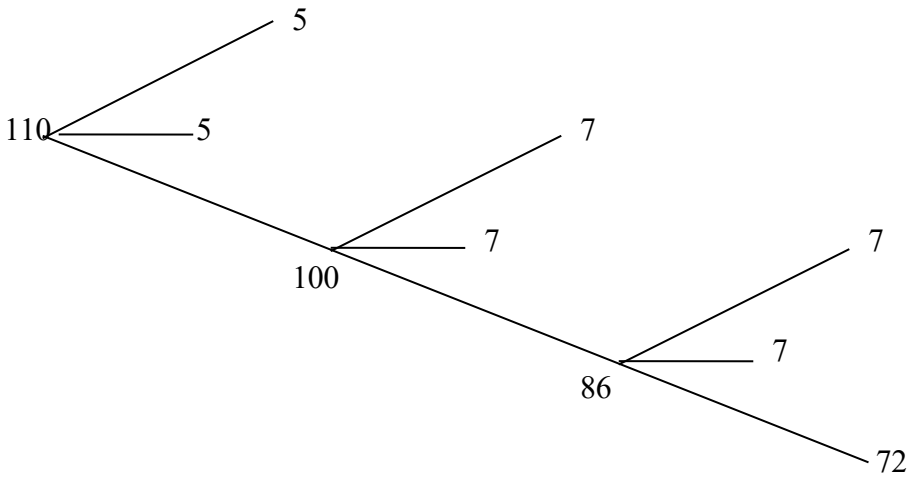
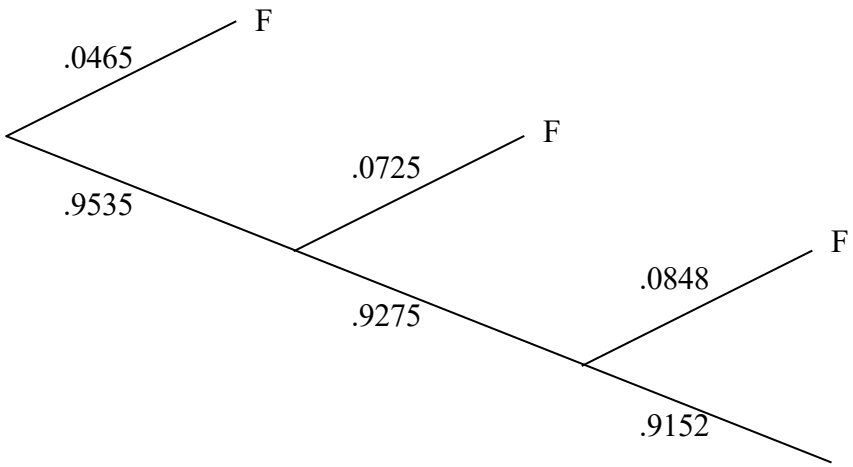
Solutions: Life tables

Q1. Tree Diagram:



Year: 1 2 3

Probability Tree:



Year: 1 2 3

Probabilities of Failure:

1st year = .0465
2nd year = .0725
3rd year = .0848

Probability of surviving 1 year without failing = .9535
" 2 year " = .9535 x .9275=.8843
" 3 year " = .9535 x .9275 x .9152=.8093

Probability of failing at some time during the three years is the sum of probabilities of failing in each year = .0465 + (.0725 x .9535) + (.0848 x .9275 x .9535) = .1906

Q2. a)

Table I

Survival probabilities for Stage I patients:

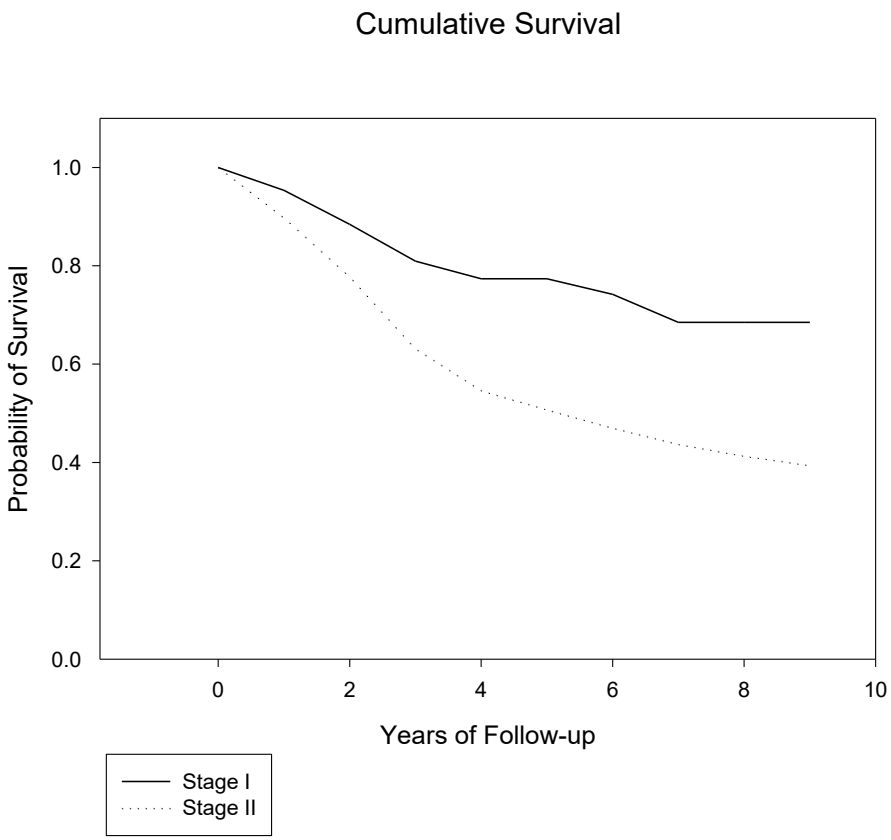
Year	N	L	D	(1)	(2)	(3)	(4)
0	110	5	5	107.5	.0465	.9535	.9535
1	100	7	7	96.5	.0725	.9275	.8843
2	86	7	7	82.5	.0848	.9152	.8093
3	72	8	3	68	.0441	.9559	.7736
4	61	7	0	57.5	0	1	.7736
5	54	10	2	49	.0408	.9592	.7420
6	42	6	3	39	.0769	.9321	.6849
7	33	5	0	30.5	0	1	.6849
8	28	4	0	26	0	1	.6849
9	24	8	1	20	.0500	.9500	.6507

Table II

Survival probabilities for Stage II patients:

Year	N	L	D	(1)	(2)	(3)	(4)
0	234	3	24	232.5	.103	.897	.897
1	207	11	27	201.5	.134	.866	.777
2	169	9	31	164.5	.188	.812	.631
3	129	7	17	125.5	.135	.865	.546
4	105	13	7	98.5	.071	.929	.507
5	85	6	6	82	.073	.927	.470
6	73	6	5	70	.071	.929	.437
7	62	10	3	57	.053	.947	.413
8	49	13	2	42.5	.047	.953	.394
9	34	6	4	31	.129	.871	.343

b) Survival curves:



Survival in Stage II patients is clearly worse than in Stage I patients.

c) **To discuss. Some ideas:**

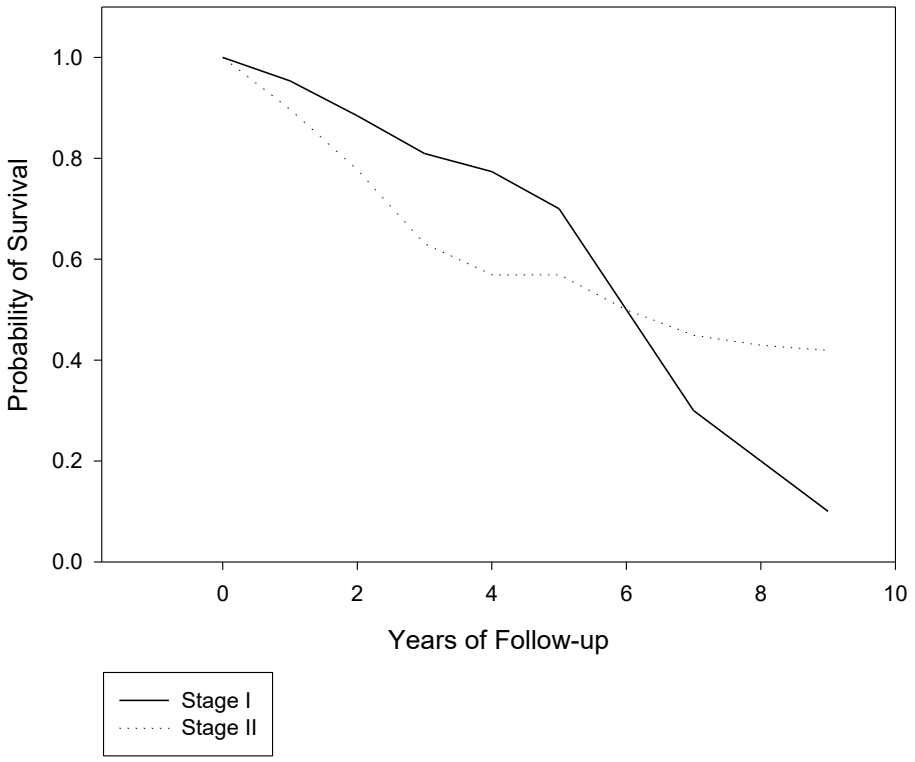
We could summarise the difference in curves with just the 5 and 10 year cumulative survival probabilities:

	5yr	10yr
I	.7736	.6507
II	.507	.343

If we had <u>all</u> patients followed to death we could compare <u>median</u> survival times ie. the time at which survival reaches 50% in each group.

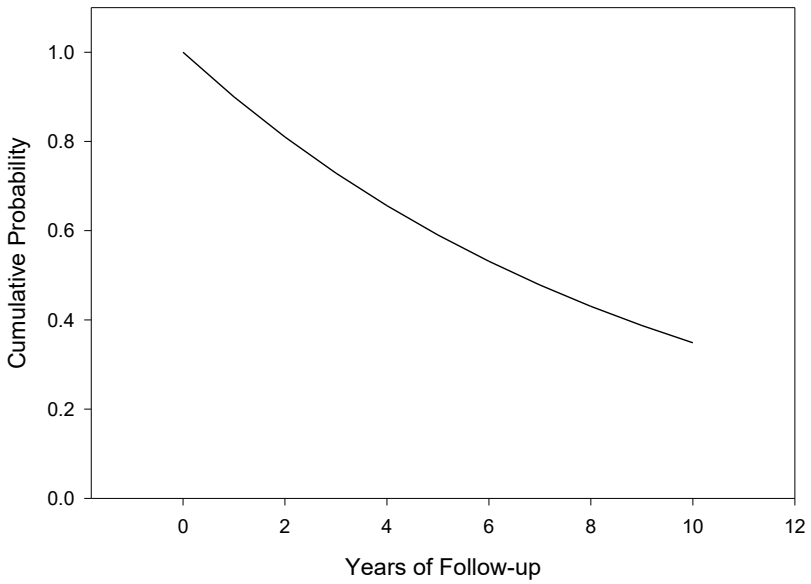
Both these suggestions ignore most of the information in the curve, reducing it to just a few points. We require a method that test for difference over the whole range. Such a test is the <u>Logrank Test</u> which summarises this difference by comparing survival in the separate groups with what would be seen if the groups were pooled. (This test operates on the Kaplan Meier survival probabilities - see references in lecture notes).

d) For example,



The interpretation of this graph is not so straight forward. One group has an early survival advantage but ultimately does worse. Interpretation has to be linked with the biological plausibility of such a result, etc.

e) **Survival curve with constant probability of failure would <u>not</u> be a straight line:** we are dealing with cumulative probabilities.

Eg. lifetable entries

Year	(2)	(3)	(4)
1	0.1	0.9	0.9
2	0.1	0.9	0.81
3	0.1	0.9	0.729
.	.	.	
.	.		
10	0.1	0.9	0.3487