I . The age at death in years, in a period of time, of 30 elderly people who reached age 105 is recorded as follows.

105.4, 108.6, 108.4, 106.6, 105.3, 105.7, 109.9, 105.2, 105.6, 107.8
106.8, 106.5, 107.8, 106.7, 108.2, 106.4, 106.7, 106.8, 107.3, 109.6
107.7, 108.2, 109.4, 105.8, 105.2, 107.2, 108.6, 109.8, 106.7, 106.4

Complete the life table below for this group of people.

x	l_x	q_x	L_x	T_x	e_x
105					
106					
107					
108					
109					

II. Suppose that a group of $\ell_0 = 1000$ of people are subject to a hazard of death which changes with age x as: $h(x) = \alpha x^{\frac{1}{2}}$, where $\alpha = 0.003$.

A. Find the survival function $S(x)$, distribution of the lifetime $F(x)$, find also ℓ_{30}.

B. Find q-type death rate at age x, q_x, find numerical values of q_0, q_1, q_2.

C. Find the total number of person-year lived over exact age x, $T(x)$, and life expectation at age x, $e(x)$, write them in the integral form. Find numerical value for $e(30)$ if $\int_{30}^{\infty} S(x)dx = 30.4383$.

. Table9E.2 gives parity progression ratio for a number of recent birth cohorts in England and Wales. Assuming that no woman in any of these birth cohorts had a fifth child. Calculate for **the birth cohorts: 1931-33; 1937-39; 1946-48;**

Table 9E.2

Calendar years of birth	Parity progression ratios			
	0–1	1–2	2–3	3–4
1931–33	0.861	0.804	0.555	0.518
1934–36	0.885	0.828	0.555	0.489
1937–39	0.886	0.847	0.543	0.455
1940–42	0.890	0.857	0.516	0.416
1943–45	0.892	0.854	0.458	0.378
1946–48	0.885	0.849	0.418	0.333

Source: Brass (1989, p. 23).

A. The proportion of women who had exactly 0,1,2,3, and 4 children;

B. The total fertility rate, TFR, for women in each of these birth cohorts.

IV. Table 9.1 is taken from the Tanzania Demographic and Health Survey, 1991-92.

A. In using true parity cohort, find the proportions q_0^*, q_1^*, q_2^*, q_3^* for the first birth. The Index Year = 1970.

B. In using the synthetic parity cohort, find the proportions q_0^{**}, q_1^{**}, q_2^{**}, q_3^{**} for the first birth. The Current Year = 1990.

C. Find an approximate value for the PPR, Parity Progression Ratio, using the 4 proportions q_x^* derived in Part A.; and also find PPR using q_x^{**}, derived in Part B.

Table 9.1 Data for calculation of period parity progression ratios, Tanzania

Year of birth of first child	Number of women having first child	Number of women having second child in relevant year																				
		1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1970	99	1	9	38	24	11	6	2	0	0	1	1										
1971	119		0	9	47	37	7	6	3	1	0	0	0									
1972	121			0	17	51	26	9	4	2	2	0	0	4								
1973	123				0	11	55	30	5	7	1	1	0	1	1							
1974	159					2	12	68	40	10	7	2	3	1	1	2						
1975	110						0	10	40	30	6	6	1	2	1	1	0					
1976	161							0	13	66	42	12	10	6	2	0	2	2				
1977	137								3	12	64	29	16	6	1	2	0	0	1			
1978	149									0	7	55	54	14	7	1	2	2	1	0		
1979	162										1	17	61	40	19	8	2	3	3	1	1	
1980	180											4	5	67	45	23	8	4	2	0	2	0
1981	207												1	12	70	62	23	10	8	3	5	0
1982	185													2	11	62	51	22	8	4	1	3
1983	225														2	13	88	59	19	5	9	8
1984	239															0	25	76	68	28	10	6
1985	274																0	15	102	80	21	19
1986	271																	1	17	94	79	33
1987	314																		3	17	101	91
1988	342																			3	24	108
1989	358																				3	30
1990	367																					3

Source: Extracted from Tanzania Demographic and Health Survey, 1991–92, excluding women with inconsistent birth history data. A copy of these data may be obtained by applying to Demographic and Health Surveys, Macro International, Inc., Suite 300, 11785 Beltsville Drive, Calverton, MD 20705-3119, United States of America. Data may also be ordered via the Internet from **http://www.macroint.com/dhs/**.

V. A. Table 12E.1 gives information on age-specific mortality rate in England and Wales in 1991, together with data on female mortality. assuming 105 boys are born for 100 girls,

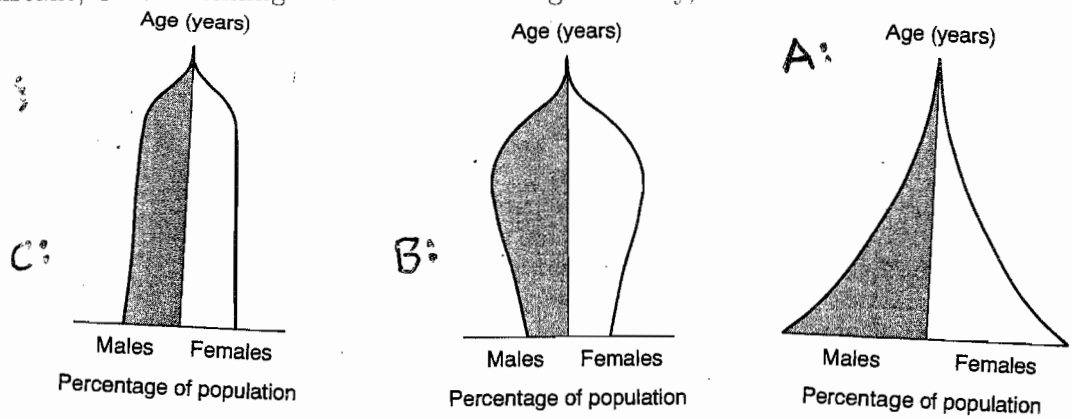
Table 12E.1

Age group	Age-specific fertility rate	Female survivors to mid-point of age group per 10 000 women born
15–19	0.033	9903
20–24	0.090	9890
25–29	0.120	9871
30–34	0.087	9850
35–39	0.032	9817
40–44	0.006	9766
45–49	0.000	9685

Sources: *Population Trends* 87 (1997), p. 52; Office for National Statistics (1997a, p. 2).

A.obtain the gross reproduction rate [GRR] and the net reproduction rate [NRR].

B. For each of the following population pyramids, specify whether the population is growing, is constant, or is declining. Which one has high fertility, and which one has low fertility.



A: Population:

B: Population:

C: Population:

A: Fertility:

B: Fertility:

C: Fertility: