

Show all work for full credit, use correct notation, and clearly mark your answer.

1. You are the pricing actuary reviewing cash values on fully discrete whole life insurances of 10,000 on (40). A desired asset share pattern has been chosen. You are to determine cash values that will produce those asset shares: You are given:
 - (i) The gross or contract premium is 90.
 - (ii) Renewal expenses, payable at the start of the year, are 5% of premium.
 - (iii) $q_{55}^{(\text{death})} = 0.004$
 - (iv) $q_{55}^{(\text{withdrawal})} = 0.050$
 - (v) $i = 0.08$
 - (vi) ${}_{15}AS = 1150$ and ${}_{16}AS = 1320$ are the asset shares at the ends of years 15 and 16.

Calculate ${}_{16}CV$, the cash value payable upon withdrawal at the end of year 16.

Numbers 2 through 5 use the following:

For a fully discrete whole life insurance of 1000 on (70), you are given:

- (i) The withdrawal benefit in year 10 is 110.
- (ii) The gross annual premium is 16
- (iii) Expenses are incurred at the beginning of the year.
- (iv) Withdrawals occur at the end of the year.
- (v) 1000 such policies are in force at the beginning of year 10.
- (vi)

	Anticipated experience	Actual experience
Mortality (d)	$q_{79}^{(d)} = 0.01$	15 deaths
Withdrawal (w)	$q_{79}^{(w)} = 0.10$	120 withdrawals
Interest (i)	$i = 0.06$	$i = 0.05$
Expenses (e)	3 per policy	5 per policy

- (vii) Reserves are gross premium reserves.
 - (viii) The gross premium reserve at the end of year 9 is 115.
2. Show that the gross premium reserve at the end of year 10 is 130 to the nearest 10. You should calculate the amount to the nearest 1.
 3. Calculate the total gain for all policies during year 10.
 4. Calculate the gain for all policies due to withdrawals during year 10. (Note: If there is no mention of having previously calculated the gain from another source, then assume no gains from other sources have been calculated yet.)
 5. Calculate the combined gain for all policies from expenses and mortality, after the combined gain from withdrawals and interest has been calculated.